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Lviv Vodokanal Workshops 3 & 4

Lviv, 27 & 28 March 1996

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Environmental Policy and Technology Project
For the New Independent States of the former Soviet Union

A USAID Project Consortium Led by CH2M HILL

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PREFACE

Under the 1992 Freedom Support Act, the United States Congress initiated a program to provide various forms of assistance to new independent states (NIS) of the former Soviet Union. Cooperative Agreements were signed between representatives of the U.S. government and each country in which assistance is to be undertaken. The U.S. Agency for International Development (USAID) was given the responsibility to coordinate all U.S. government assistance to the NIS under the Act.

Through competitive bidding, USAID awarded a multi-year contract to a team managed by CH2M HILL International Services, Inc. (CH2M HILL) to support implementation of an environmental assistance program to republics of the former Soviet Union. Under this contract, termed the Environmental Policy & Technology (EPT) Project, CH2M HILL is to assist USAID's missions in Moscow, Kyiv, and Almaty undertake a program to promote environmental improvements in the NIS. The USAID mission in Kyiv supports environmental, and other, assistance programs to Ukraine, Belarus, and Moldova. CH2M HILL established an office in Kyiv from which to perform services in these countries under the EPT Project.

This report was prepared as a contractually required deliverable under a contract between USAID and CH2M HILL. Although work on this report was conducted in cooperation with the assisted governments and USAID, the findings and recommendations are those of the CH2M HILL team. They do not necessarily represent official positions of the governments of the assisted countries nor of the United States of America.

The CH2M HILL team includes the following organizations:

- Center for International Environmental Law
- Clark Atlanta University/HBCUMI Environmental Consortium
- Consortium for International Development
- Ecojuris
- Environmental Compliance, Inc.
- Harvard Institute for International Development
- Hughes Technical Services Company
- International Programs Consortium
- International Resources Group, Ltd.
- Interfax Newsagency
- K&M Engineering
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NOTE ON TRANSLITERATION

Ukrainian personal and place names used in this report have been transliterated into the English language from the Ukrainian (not Russian) language, according to the modified Library of Congress standard adopted by many Western organizations and institutions, including the *Encyclopedia of Ukraine*, 5 volumes (University of Toronto Press, 1984-1993).

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ABBREVIATIONS, ACRONYMS & GLOSSARY

BAH	Booz,Allen & Hamilton (an international consulting firm that is under contract to the British Know-How Fund to assist in the preparation of a World Bank sponsored municipal water sector reform analysis for Lviv).
CH2M HILL	CH2M HILL International Services, Inc. (a U.S.-based international environmental engineering consulting firm under contract to USAID to implement a large component of the EPT Project).
COWI	COWI Consulting Engineers and Planners AS (a Danish-based international engineering consulting firm that is under contract to the Danish Environmental Protection Agency to assist in the preparation of a World Bank sponsored municipal water sector reform analysis for Lviv).
DO	Delivery Order.
EPT	Environmental Policy & Technology (Project). A USAID-funded program to provide environmental assistance to New Independent Republics of the former Soviet Union.
krb	Karbovanets (Ukrainian currency).
LVK	Lviv Vodokanal.
NIS	New Independent States (of the former Soviet Union).
PADCO	Planning & Development Collaborative, Inc. (a U.S.-based consulting firm under contract to USAID to implement part of the U.S. government's assistance to Ukraine's housing and communal services sector).
oblast	A government territorial-administrative unit in the former Soviet Union that is still in use following Ukraine's independence. A U.S. analogue would be something between a state and a county.
USAID	U.S. Agency for International Development.
WB	World Bank (International Bank for Reconstruction & Development).
vodokanal	A quasi-government agency responsible for municipal water supply and wastewater collection and treatment. A U.S. analogue would be a water utility.
zhek	A municipal entity responsible for operation and maintenance of houses and multi-apartment buildings owned by city administrations, as well water, sewerage, gas, electricity, and heating systems within them. Zhek is a Russian/Ukrainian abbreviation, used in the former Soviet Union, of a city's department of housing and communal services that continues to be used.

Section 1

INTRODUCTION

As part of a United States government bilateral assistance program, the U.S Agency for International Development (USAID) is supporting environmental management in Ukraine. Under direction from USAID, a consortium led by CH2M HILL International Services, Inc. (CH2M HILL), is implementing part of USAID's Environmental Policy & Technology (EPT) Project by undertaking various tasks that have been agreed to by representatives of the governments of both countries.

USAID authorized CH2M HILL to perform a series of tasks in Ukraine under Delivery Order (DO) No. 9. Task U-2 (Lviv Water Management Demonstration) includes a requirement (Subtask 2.5)[1] for CH2M HILL to conduct a series of workshops in Lviv, in western Ukraine, on work-in-progress and lessons-learnt regarding development of methods to demonstrate improvements in vodokanal operations. The workshops are to deal with the following topics:

(i) water utility organization and operations
(ii) water utility financial and legal aspects
(iii) Lviv Vodokanal systems operations
(iv) Lviv Vodokanal financial aspects (income and capitalization)
(v) institutional strengthening.

The first two workshops were held in October 1995, and are reported in the document *Ukraine: Summary Report on Lviv Vodokanal Workshops 1 & 2, Lviv, 25 & 27 October 1995*, submitted to USAID by CH2M HILL.

Workshops 3 & 4 were held on 27 and 28 March 1996, and focussed on technical aspects, and financial and institutional aspects, of the Lviv Vodokanal (LVK). The target audience were representatives of LVK, the City of Lviv administration (including its "Water Task Force"), and the World Bank. Apart from USAID, other donors and lenders represented were the World Bank, Danish Environmental Protection Agency, and the British Know-How Fund. Presenters at the workshop included consultants retained by these donors and lenders, and included CH2M HILL, Planning and Development Collaborative (PADCO), COWI Consultants (COWI), and Booz Allen & Hamilton (BAH).

Under terms of the contract, CH2M HILL is required to submit a Summary Report on each workshop. This document has been prepared in fulfillment of that obligation.

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[1] Subtask 2.5 of Delivery Order 9 states: *During the period of study, the Contractor will conduct a series of workshops for the staff of the Lviv Vodokanal, the City of Lviv, and officials from other cities and vodokanals as appropriate. Each workshop will be up to one day in length for an average of 15 people and will cover a variety of topics related to the findings and methodology being developed. Included in the topics for discussion will be concepts on the value of conducting an economic analysis, and the steps required to complete such an analysis. The analysis performed by the contractor for the Lviv Vodokanal should be used as the case study for the workshop. Workshop materials shall include appropriate translations into a language specified by USAID/Kiev.*

Section 2

RESULTS

The workshops were held in "Session Hall" of the Lviv City Hall, at 1 Rynok Square, Lviv. Invitations were drafted by CH2M HILL, and forwarded by the director of the vodokanal. Appendix A presents the workshop topics, while Appendix B lists workshop attendees.

Among the presenters at the Workshops were:

- Ms. Lea Swanson, USAID/Kyiv's director of environmental development assistance for Ukraine, Belarus & Moldova
- Mr. Alexander Sipivy, CH2M HILL's EPT Project's Lviv-based task leader
- Dr. Kris Buros, a CH2M HILL senior water & wastewater engineer and technical advisor to the EPT Project
- Mr. Walter Stottmann, principal engineer, World Bank's European & Central Asian Region
- Mr. Michael Sinclair, PADCO's Lviv task leader of USAID-funded housing & communal services support project
- Dr. Niels Bent Johansen, COWI's project manager for their Lviv Water & Wastewater Project Preparation Study
- Mr. Vasyl Kravtsiv -- Chief of the Lviv Municipal Engineering Department
- Ms. Tamara Hipp -- CH2M HILL EPT/Lviv water and wastewater engineer
- Ms. Maria Tryliovska -- CH2M HILL EPT/Lviv water and wastewater engineer
- Mr. Mikhail Sharkov -- CH2M HILL EPT/Lviv water and wastewater engineer
- Ms. Valentyna Sviatotska -- legal advisor to PADCO in Lviv
- Mr. Kostiantyn Trachenko -- manager of the PADCO communal services reform program.

English-language versions of overhead slides and handout materials used at the Workshops are presented in the following appendices:

- CH2M HILL EPT handouts in Appendix C
- COWI handouts in Appendix D
- PADCO handouts in Appendix E
- World Bank handouts in Appendix F.

Ukrainian or dual English/Ukrainian-language versions of all materials were actually used during the Workshops, which were presented using sequential English-Ukrainian and Ukrainian-English translation.

Appendix G includes a copy and translation of an article on the issues addressed at the Workshops, that was published in a major western Ukrainian regional newspaper.

2.1 OVERVIEW OF WORKSHOPS 3 & 4 (27 MARCH 1996)

Commencing the two-day workshop session, **Ms. Lea Swanson**, USAID/Kyiv's Director of Environmental Development Assistance to Ukraine, Belarus & Moldova, greeted all the workshop attendees. She emphasized that the among USAID objectives with regard to the city of Lviv are:

- to build up a meaningful and sustainable model that will enable LVK and USAID to integrate their work, enable condominium residents to pay for their own use of electricity, and reduce the Vodokanal's demand on the Ukrainian energy sector

- as a responsible partner, to apply experience and lessons-learned in the USA in order to assist LVK to qualify for a World Bank loan.

Mr. Stottmann of the World Bank expressed hope that Lviv would receive a loan from the Bank. He had never before seen so many foreign projects and consulting groups working together, and expressed his belief that the specialists investigating water supply issues and setting objectives for the improvement of the current situation would succeed in preparing a feasibility study that would convince the World Bank to grant a loan to the City.

Brief greeting statements were given by consultants **Dr. Johansen** of COWI, **Mr. Sinclair** of PADCO, **Mr. Stachow** of BAH.

Introduced by Ms. Swanson, **Mr. Bilotkach**, who is based in Kyiv as co-coordinator of the Urban Water and Wastewater Work Group as part of the Ukraine-U.S. Program to Promote Sustainable Development, presented the scope of their activity, including:

- studying and integrating domestic and international experience in the water and wastewater sector in order to disseminate appropriate results and findings among state agencies, city administrations, and vodokanals

- selecting sectoral problems that could not be resolved at local levels and assisting those problems to be properly addressed at the national level.

Mr. Bilotkach encouraged those present to inform the Work Group on relevant problems.

Mr. Sipivy, CH2M HILL's Lviv task leader for the EPT Project, gave a general overview of the workshop program.

Finally, just prior to the commencement of the workshops proper, **Mr. Kravtsiv** stated that the city administration is counting on external and international donors to contribute to the improvement of the city's deteriorated water supply system. He also assured those present that the city is going to address its own population, as well as the Ukrainian central government, in order to gain their cooperation in accomplishing this difficult task.

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2.2 WORKSHOP #3: LVIV VODOKANAL SYSTEMS OPERATIONS (27 MARCH 1996)

2.2.1 Description of Water System

On behalf of the EPT Project, **Dr. Buros** and **Ms. Hipp** of CH2M HILL presented a description of the Lviv water supply system (see handout materials in Appendix C).

The Lviv water supply system is a complex engineering structure that was founded about 100 years ago. Based only on underground sources, the water supply has increased since then from 18,000 to 412,000 cubic meters per day.

The oldest well fields are situated 25 km west of Lviv. From 1960 until 1980 new water sources were developed north and south of Lviv, and during the last 10 years the construction of well fields was very intensive in the east. Well-field construction was halted in 1990-1995 because of a shortage of funding.

The water supply system comprises 172 water wells, 20 well fields, and 19 pumping stations. The total water supply network length is 1,500 km, of which 700 km were built before 1970. The difference in elevation is about 120 m. The water supply system consists of 6 pressure zones that cover the whole city, with pressure between 1 to 6 atmospheres. The scheduled period of water supply is 6 hours per day (3 hours in the morning and 3 hours in the evening). Water consumption is distributed as follows:

- the residential population consumes 56%
- industrial enterprises consume 7%
- communal and budget enterprises consume 37%.

The key goal for the Lviv water system has been defined as assisting the Vodokanal in becoming a viable organization which supplies water to users 24 hours a day.

2.2.2 Water System Technical Problems

Also on behalf of the EPT/CH2M HILL, **Ms. Tryliovska** described the chief problems of the water supply system (see handout materials in Appendix C).

- limited water sources

- energy-intensive delivery -- to convey 1 cubic meter of water to Lviv requires about 1 kilowatt-hour of electric energy; 1 cubic meter of water costs about 9,000 krb, and 63% of this is energy cost while only 2% is labor cost

- excessive usage and leakage -- water losses or leaks in the water supply amount to 98,000 cubic meters per day, or 24% of the 412,000 cubic meters drawn from the well-fields; thus, the amount of water that reaches Lviv (and can be charged for) is only 295,000 cubic meters per day

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- data lacking on actual flow and usage -- because there are no water meters at the wells and measurement is done only on the basis of energy consumed, there is really no exact information about the quantity of water that gets to Lviv.

Judging from the above problems, appropriate projects could be chosen for implementation.

2.2.3 Description of Wastewater System

On behalf of COWI Consultants, **Mr. Sharkov** presented a description of the wastewater system in Lviv (see handout materials in Appendix D).

Lviv Vodokanal operates a combined wastewater collection system. It consists of 260 km of main collectors, about the same length of street collectors, an 11.5-km tunnel interceptor, and nine sewerage pumping stations. Lviv is located at the headwaters of the Poltva River watershed and the river, now subterranean, is employed as the trunk sewer for combined flows.

LVK operates two wastewater treatment plants, and treated effluent is discharged into the Poltva River. Energy consumption of the pump stations is 0.9 million kilowatt-hours per month, and energy consumption of the water treatment plants is 3.9-4.4 million kilowatt-hours per month.

Based on recorded influent indicators, the two plants receive a load corresponding to an expected population of about 2.6 million. This exceeds by one million persons a conservative estimate of expected loads from the city (the actual population of Lviv is 800,000). The discrepancy could owe to larger industry discharges than reported. The other possibility could be errors in influent measurement at the plants.

2.2.4 Wastewater System Technical Problems

Dr. Johansen of COWI also commented on the main wastewater problems in Lviv (see handout materials in Appendix D).

The wastewater treatment facilities must be redesigned for much higher flows than anticipated by water consumption, or accept combined sewer overflows as currently practiced.

The present economic situation hampers both effective compliance with monitoring and enforcement. Doubts concerning the accuracy of reported consumption and discharge volumes and contaminant concentrations prevent a clear evaluation of actual industrial pollution load. Given the experience in other CIS countries, contamination from industry could exceed that reported.

Improved measurement systems will be needed to establish the actual loads, prior to assigning major new investments. Both treatment plants are showing signs of serious deterioration of facilities. At the first wastewater treatment plant, equipment is being

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employed well beyond its useful life. The second plant, although newer, is in worse physical condition. Both treatment plants have a strong need for rehabilitation of their aeration and pumping systems, to save energy and improve treatment.

2.2.5 VODA '98 Program

Mr. Kinasevych, Chief of the Lviv Water Inspectorate, presented the VODA '98 ("Water 98") program, developed by the city administration's water task force. The aim of the program is to provide a 24-hour per day water supply to the city of Lviv in 1998, and the various measures to be undertaken in order to achieve this would cost $567 million.

Foreign experts see only the negative aspects related to implementing a 24-hour water supply, but they have not taken into account some positive sides which would lead to the reduction of water loss:

- the number of breakdowns would decrease
- corrosion of pipelines would decrease too
- non-production losses would be reduced
- people would stop hoarding water
- the water system would be more available for repairs because it would be easier to identify leaking places: faucets, pipes, etc
- consumers would be willing to pay more for service improvements
- increasing of eastern and southern well fields would permit them to give up using the northern and western well fields, and thus the number of operating well fields would be reduced to 4.

These measures would allow for the improvement of reliability of the water supply system and protection of the well-field zones in accordance with sanitary regulations. Energy consumption of small well fields would be reduced 10 times. Expansion of well fields is not the end in itself; rather, it will be of great importance if every cubic meter of water is charged for. In this case the rate of collected payments will cover the operating cost and will ensure the expected profit.

2.2.6 Summary of Key Technical Issues and General Discussion

The head of Lviv Vodokanal's production engineering department, **Mr. Kompaniiets**, expressed the opinion that the VODA '98 program was unsatisfactory, explaining that it had been developed separately from the LVK, that it had failed to pass the state-required environmental assessment "expertise", and that financial resources for the program had not yet been determined. Also, he pointed out that the city administration had already developed four different programs for water supply improvement, but none of them had

been implemented because of funding shortages. LVK itself had also developed an emergency interim program for 1995, but the city administration had only provided 20% of the necessary funding; and LVK has this type of program for 1996, as well.

Dr. Buros and **Ms. Hipp** pointed out that increased pressurization of the city's water distribution system would not appreciably increase LVK revenues (due to increased consumption), while losses would increase proportionally to the pressure. Thus, their recommendation for improving water supply would be to fix the numerous leaks and try to eliminate wasteful usage of water.

2.3 WORKSHOP #4: LVIV VODOKANAL FINANCIAL ASPECTS (28 MARCH 1996)

2.3.1 Customer Survey

Mr. Jacobsen of COWI described the LVK financial situation, which was based in part on a survey of water consumers in Lviv, designed and implemented by COWI (see handout materials in Appendix D). A random sample of 500 households and 50 industrial enterprises and institutions in Lviv was polled. Key results of the survey are presented below:

- approximately 2/3 of the population have a water supply for less than 6 hours per day, while only 20% have water 24 hours per day
- 70% are unsatisfied or very unsatisfied with the situation, while 30% are satisfied or very satisfied
- approximately 60% indicate a continuous 24-hour water supply as their preferred improvement; other improvements wanted are higher pressure and that the schedule for water supply be observed
- 53% are willing to pay for a water tank that would ensure them a 24-hour supply of water
- 14% of the respondents gave an estimate of what they would be willing to pay for water service; the average value was 500,000 krb (US$2.70) per month (for comparison, the average total monthly living expenditure per person is estimated at 6,110,000 krb, or US$33)
- on average, unsubsidized households pay approximately 1% of their income for water supply and wastewater services.

If the preliminary results are correct, they indicate that large segments of the population may be able to afford another doubling of water tariffs.

The current tariff calculation includes only minimum depreciation and operation and maintenance costs. Tariffs do not include provision for reinvestments or service

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improvements. In addition, the calculation is based on an assumption that consumers will pay their bills. If consumers do not pay -- or pay late -- the LVK is forced to reduce or postpone expenditures. This leads to building up debts with the electroenergy company, and to the postponement of regular maintenance.

2.3.2 Financial Conditions at Vodokanal

Mr. Jacobsen of COWI continued providing details of LVK financial conditions (see handout materials in Appendix D).

LVK is short of money to provide proper operation and maintenance of the water supply and distribution system. In 1995, only 69% of water bills were paid in Lviv, broken down as follows:

- industrial enterprises paid 84% of their water bills
- communal (public) institutions paid 16% of their water bills
- budget institutions paid 96% of their water bills
- households paid 59% of their water bills.

It is important to note that only 51% of the payments from the industrial sector were in cash, while the remaining 49% were in barter form. The annual deficit at LVK for 1995 was estimated at US$3 million.

The COWI study team made a financial model which forecasted the trend in net operating income and cash flow under a "no-policy scenario" (illustrating the situation where no new policy activities are taken, energy prices continue to approach world levels, the collection rate is assumed to remain at 69%, and consumption, wastewater production, and electroenergy costs are assumed to remain at 1995 levels). Based on the assumption that LVK would pay all its expenses and taxes each year, the model forecasted repeated annual cash deficits, which would force LVK to incur new debts, in the form of bank loans or unpaid credit to energy suppliers. Thus, it is clear that for LVK a "no-policy scenario" is not sustainable.

Moreover, even if the collection ratio was increased to 90% (from 69%) there would still not be significant funds for service improvements, unless tariffs were increased more than inflation.

2.3.3 Legal Status of the Vodokanal

Ms. Sviatotska from PADCO spoke on legal relations of the LVK with the City Council and the City Executive Committee (see handout materials in Appendix E).

In accordance with Articles 5 and 7 of the Law of Ukraine "On Local Councils", the City Council is a legal subject of the people's property (including its communal enterprises). The City Council has right to assign objects of the people's property for temporary management, to rent them, or to sell them to enterprises, organizations, institutions, or individual citizens. The Lviv City Council transferred the assets of the LVK into its full

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economic self-management. Having this right, the enterprise owns, uses and disposes of the assets at its own discretion, and can perform operations which do not contradict current legislation or its Charter.

At first sight, LVK has a free hand regarding ownership and control of fixed assets. However, the Council as an owner reserves the right to control the assets. It means that, in theory, the Council can at any time adopt a decision on liquidation and reorganization of the enterprise, take assets back, rent it out, etc. A paradoxical situation therefore exists where the LVK has the right of full economic management up to using all assets, but the City Council is the owner and also reserves a full range of rights as owner.

One way of improving the LVK operations is to provide it with much broader responsibilities regarding ownership and control of fixed assets. The relationship of the Council as the owner with the vodokanal should be clearly regulated, defined and simple in order to avoid possible conflicts in future.

2.3.4 Financial Implications of Solution Projects

On behalf of COWI, **Mr. Jacobsen** emphasized that the main objective of LVK should be to achieve revenues that exceeded its costs. He suggested the following measures:

- use existing legal instruments to ensure payments from communal enterprises
- introduce a policy of eliminating barter payments over a reasonable period
- increase tariffs
- gradually implement meter-based consumption for large customers.

2.3.5 Institutional Options

Mr. Stachow of BAH presented recommendations on restructuring and private sector participation, as submitted to the Lviv Water Task Force on March 14, 1996.

Current LVK activities are focused on the creation of a master plan and a feasibility study, as well as identifying a potential private operator. Current practice adopted in Central Europe and the Baltic states suggests that to restructure LVK into a legal entity, the following steps should be taken:

- incorporation of the existing state enterprise by transforming LVK, with formal separation of ownership and management responsibilities

- analysis of the existing situation

- development of an investment program, based on the results of the analysis: designing a program of long- and short-term water and wastewater facilities improvements

- institutional change: recommendations for organizational restructuring

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- feasibility study

- lending process: the World Bank will determine whether the financial results of the feasibility study merit the decision to move forward with the project.

The World Bank has stated that it believes that one of the primary requirements of this project is the identification of a private operator who will be willing to cooperate with LVK. The following represent three potential forms of association with a private operator (with assets remaining in city ownership pursuant to current Ukrainian legislation):

(i) Lviv City Council draws up a contract with a private operator who, in turn, will manage and operate the water and wastewater system

(ii) the City establishes an incorporated City-owned water and wastewater company which, in turn, will draw up a contract with the private operator

or

(iii) the City encourages the establishment of a company comprising joint shareholding by the city, the private operator, and possibly other entities which may provide funding, who will collectively draw up a contract with the City.

The Lviv City Council's preference is to have a lease relationship between it and a joint-stock water/wastewater company owned by LVK and a private operator. **Ms. Sviatotska** confirmed that the current legal relationships do not contradict such a potential arrangement.

2.3.6 Tariff-Setting, Approval, and Collection Procedures

Mr. Trachenko of PADCO recommended the following steps to improve tariff-setting and collections (see handout materials in Appendix E):

- To apply maximum authority, enumerated in local and national legislation, regarding sanctions against delinquent users.

- To decrease gradually in-kind payments and in the future to refuse this method of payment.

- To improve payment collection from the population, eg, to remove zheks (state housing and tenant services) as an intermediate mechanism of collecting payments.

- In case of multi-storeyed buildings transformed into condominiums (associations of co-owners of residential buildings), to consider:

  - installing one water pump in the condominium in order to provide all the residents with water

  - installing meters (if there are none)

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- installing locking valves in order to terminate water supply for the whole condominium (in case of non-payment)

The collecting procedure within the condominium would be legally regulated; the condominium would be responsible for collecting payments for provided services and would be able to apply sanctions regarding financial discipline within their condominium.

Mr. Trachenko stressed that pursuant to the latest decree on government tariffs for water and sewerage in Ukraine, services for the population should be set at a level not less than 60% of the real cost of services. However, the Lviv Oblast Administration, which is authorized to approve tariffs, does not want to set residential tariffs higher than 60%. He proposed a formula for tariff calculation that accounts for inflation, and also recommended the establishment of a special advisory committee at the oblast level to review tariffs and to deal with other issues related to water supply and sewerage. In reply, a LVK representative declared that the oblast administration had transferred tariff-setting responsibilities to the LVK, except for residential tariffs.

2.3.7 World Bank Lending Process

Mr. Walter Stottmann, principal engineer for the World Bank's European & Central Asian Region, shared his point of view about the LVK financial situation, and outlined what should be achieved in the institutional, financial, and technical areas for the loan application to received a favorable response (see handout materials in Appendix F).

Consumers must pay for water consumed. LVK should start using all legal means available in order to make consumers pay for the water they consume. LVK should cut-off water for those who do not pay for water. Before choosing the right project all the major problems of the Lviv water supply system must be thoroughly investigated, including specifying where there are more water losses -- in the transmission lines or in the city water network or in consumer faucets.

In order to convince the World Bank to grant a loan, LVK should start making appropriate changes in their tariff system, which means increasing tariffs in order to ensure viability of the enterprise. Having made this step, it will be possible to pay back the loan of the World Bank. A feasibility study should be done and having done this the World Bank will make the decision whether to move forward with the project.

He was surprised that LVK accepts in-kind payments. He wondered how LVK could be sure that they would succeed in selling, for a reasonable price, trucks or other items which they received? He also doubted that LVK could negotiate a good price for the items. It would be unclear whether LVK or anyone else could be sure that it was not the other side that has really profited more from the transaction. He stated that any water sell/purchase agreement should specify that industrial enterprises or water consumers are not allowed to pay in-kind.

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He made the following recommendations for improvements of LVK, which would apply to all vodokanals in Ukraine:

- Institutional improvements: an autonomous vodokanal should be established, working with a private operator responsible for operation and maintenance, as well as investment, under City of Lviv oversight

- Financial improvements: costs must meet revenues, therefore revenues must increase while costs must be realistic:

  - labor costs must increase
  - operation and maintenance costs must increase significantly (by 3 to 5 times)
  - suppliers should be paid in full (debts renegotiated)
  - collection rate should increase significantly
  - tariffs should increase significantly
  - bad debts should be written-off

- Technical improvements: operations should be improved:

  - water leakages and energy consumption should be reduced
  - system rehabilitation should begin
  - minor system expansions should be undertaken

A time frame for loan agreement preparation has been specified, with World Bank board assessment slated for April 1997.

Mr. Wilczynski outlined the Water Resource Management component of the World Bank project in Lviv. The major focus of the project would be devoted to waste discharge management and monitoring, and to development of a river-basin management approach. He stressed that financing for this part of the project will be provided under the Bank's Black Sea Program, as well as from other financial sources.

2.3.8 Comments and General Discussion

Mr. Sulypa, director of LVK, stated that the organization has had to receive in-kind payments because as many enterprises are on the state bank list of debtors, they cannot pay in cash. But certainly it would be interesting to find out whether all the enterprises that have paid in kind are really on the list of debtors. In fact, last year LVK was paid with trucks, which are needed in our work. LVK also carried out 8 consecutive barter transactions in order to obtain some necessary pipelines.

Mr. Kravtsiv, chief of the engineering department of the Lviv city administration, added that although the water supply problems have been evident for a long time, the latest updated technologies in Ukraine were used first of all in space exploration and for military defense purposes. As far as the water supply is concerned, from a technical point of view the system mainly developed on account of new water wells, and it has undergone very few technical improvements. Now, with the restructuring of LVK in

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order to improve the water supply system, people need to be prepared for these changes, first of all from the psychological point of view. They must be aware that they should pay for water consumed and for improvements in the water supply system.

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Section 3

CONCLUSIONS

It was apparent that Workshops 3 and 4 were successful, with World Bank officials quite pleased with the outcome and the cooperative effort between the various consultants relative to assisting the Lviv administration with their desire for improvements to the water system. Each workshop has helped to create a better understanding among all participants. They represent an important step to continue the project preparation in Lviv which will help to solve profound and vital problems for the city.

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Appendix A

TOPICS OF WORKSHOPS 3 & 4

Topics presented at the workshops are listed in this appendix.

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OVERVIEW

USAID Welcome -- Swanson, USAID/Kyiv
World Bank Involvement -- Stottmann, World Bank
Consultants' Greeting -- Johansen/COWI, Sinclair/PADCO, Stachow/BAH
National Urban Water Work Group -- Bilotkach, EPT/CH2M HILL
Workshop Agenda and Topics -- Sipivy, EPT/CH2M HILL
Greeting on behalf of the City of Lviv -- Kravtsiv, Lviv City Executive Committee

WORKSHOP #3: LVIV VODOKANAL SYSTEMS OPERATIONS

Current Problems

Water Supply System

Description of Water System -- Buros & Hipp, EPT/CH2M HILL
Water System Technical Problems -- Tryliovska, EPT/CH2M HILL

Wastewater System

Description of Wastewater System -- Sharkov, COWI
Wastewater System Technical Problems -- Johansen, COWI

Possible Solutions and General Discussion

VODA '98 -- Kinasevych, City of Lviv
Summary of Key Technical Issues and General Discussion

WORKSHOP #4: LVIV VODOKANAL FINANCIAL ASPECTS

Current Problems

Customer Survey -- Jacobsen, COWI
Financial Conditions at Vodokanal -- Jacobsen, COWI
Legal Status of the Vodokanal -- Sviatotska, PADCO

Possible Solutions

Financial Implications of Solution Projects -- Jacobsen, COWI
Institutional Options -- Stachow, BAH
Tariff-Setting, Approval, and Collection Procedures -- Trachenko, PADCO

World Bank Lending Process -- Stottmann, World Bank

Comments and General Discussion

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Appendix B

LIST OF WORKSHOP ATTENDEES

Attendees at the workshops are listed in this appendix, with their affiliations presented in alphabetical order.

22

Booz,Allen & Hamilton:
Mr. Leszek Stachow

COWI:
Dr. Niels Johansen -- project manager for the Lviv Water & Wastewater Project preparation study
Mr. Michael Jacobsen -- economist
Mr. Leif Johansen -- head of department
Mr. Serhij Stepanyshev -- engineer

EPT/CH2M HILL -- Kyiv:
Mr. Ulian Bilotkach -- Urban Water & Wastewater Work Group Co-coordinator

EPT/CH2M HILL -- Lviv:
Dr. Kris Buros -- senior water & wastewater engineer
Mr. Alex Sipivy -- the EPT Project's Lviv-based task leader
Ms. Tamara Hipp -- water & wastewater engineer
Ms. Maria Tryliovska -- water & wastewater engineer
Mr. Mikhail Sharkov -- water & wastewater engineer
Ms. Svetlana Shekhovtsova -- economist
Mr. Sergei Bautkin -- computer engineer
Ms. Marina Gozha -- office manager/secretary
Ms. Olga Duranova -- office manager
Ms. Ludmila Grigoreva -- translator

Lviv City Administration:
Mr. Vasyl Kravtsiv -- chief of engineering department of the Lviv City Executive Committee
Mr. Bohdan Stefanyshyn -- chief of communal services department of the Lviv City Executive Committee

Lviv Water Inspectorate:
Mr. Volodymyr Kinasevych -- chief

Lviv Vodokanal:
Mr. Volodymyr Sulypa -- director
Mr. Mykola Odukha -- deputy director
Mr. Serhij Kompaniiets -- chief of production engineering department
Ms. Oksana Turchyn -- chief of LVK sector
Mr. Valentyn Parkhomenko -- chief of sales
Ms. Alla Nykytiuk -- chief of planning & economy department
Mr. Yaroslav Frys -- chief power engineer
Mr. Orest Dytiuk -- chief of the water treatment plant
Mr. Volodymyr Vasylchenko -- chief of labor department

PADCO:
Mr. Michael Sinclair -- USAID resident advisor
Mr. Kostiantyn Trachenko -- manager of communal services reforms program

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Mr. Anatoli Kopets -- manager of housing condominium program
Mr. Tom Lemley

Research Triangle Institute (RTI):
Mr. David Bauer -- resident technical advisor, City of Lviv

USAID::
Ms. Lea Swanson -- director of environmental development assistance
Dr. Dona Mularkey -- environmental advisor

IIAREP:
Mr. Yaroslav Chopyk
Ms. Nina Dmyterko

World Bank:
Mr. Walter Stottmann -- principal engineer, Europe & Central Asia Region
Mr. Piotr Wilczynski -- senior environment economist
Mr. Ihor Korabliov

Zaporizhia:
Mr. Petro Spasiuk

Information, Technology, and Monitoring Ltd:
Mr. Ihor Kravets -- director

Press:
Ms. Halyna Myts -- "Moloda Halychyna" newspaper
Mr. Stepan Koshla

Other guests:
Mr. B. Nenmann, DITT (Germany)
Mr. R. Koschade, DHGR (Germany)
Mr. I. Schlapak, Lwowev IHK
Mr. M. Lahola, IDRC (Canada)
Mr. H. Zavoiko

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Appendix C

WORKSHOP HANDOUTS PROVIDED BY EPT/CH2M HILL

Following is a copy of the English-language version of the Workshop handout materials provided by CH2M HILL.

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CH2M HILL INTERNATIONAL LTD

- Water, Wastewater, Industrial and Transportation Designs
- Environmental, Economic, Management and Planning Studies
- Water and Wastewater Plant Construction & Operations

Staff of 7000 with offices in 25 countries

Headquarters: Denver, USA

CH2M HILL'S LVIV Urban Water Management Project for USAID is part of the Environmental Policy and Technology Project (EPT) for the newly independent states of the former USSR.

It consists of three major parts:

1. Water system studies in Lviv
2. Water demonstration projects in Lviv
3. Vodokanal strategy and planning manual for Lviv and Ukraine

Alexander Sipivy, Resident Project Manager

Kris Buros, Technical Adviser

Lviv staff of 15 people

EPT- CH2M HILL

USAID

CH2M HILL INTERNATIONAL LTD

- Водопостачання, каналізація, промислові та транспортні проекти
- Дослідження в галузі охорони навколишнього середовища, економіки управління та планування
- Будівництво та наладка водних і водоочисних споруд

Персонал із 7000 спеціалістів в 25 країнах світу

Штаб квартира: Денвер, США

Проект по управлінню системою водопостачання м. Львова, підготовлений CH2M HILL для USAID є частиною проекту по природоохоронній політиці і технології (EPT) для нових незалежних держав бувшого Радянського Союзу.

Проект складається з трьох основних частин:

1. Вивчення водної системи Львова.
2. Демонстраційні проекти по водопостачанню м. Львова
3. Планування і стратегія роботи водоканалів м. Львова та України.

Олександр Сіпівий, керівник проекту

Кріс Бурос, технічний консультант

Львівський персонал складається з 15 чоловік

EPT- CH2M HILL

USAID

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LVIV WATER SYSTEM - CURRENT STATUS
СИСТЕМА ВОДОПОСТАЧАННЯ ЛЬВОВА-ІСНУЮЧИЙ СТАН

Presentation in Ukranian by:
Tamara Gipp, Engineer

Презентація по-українські:
Тамара Гіпп, інженер

Presentation in English by:
Alexander Sipivy, Project Manager

Презентація по-англійські:
Олександр Сіпівий-керівник проекту

EPT- CH2M HILL

USAID

WATER SYSTEM EVALUATION
ОЦІНКА СИСТЕМИ ВОДОПОСТАЧАННЯ ТА КАНАЛІЗАЦІЇ

INTERNATIONAL COOPERATION
Міжнародна співпраця

CH2M HILL (USAID) + COWI (DEPA) + WORLD BANK + CH2M HILL COWI VODOKANAL CITY ADMINISTRATION

CH2M HILL (АМЕРИКАНСЬКА АГЕНЦІЯ ПО МІЖНАРОДНОМУ РОЗВИТКУ)

COWI (ДАТСЬКА АГЕНЦІЯ ПО ПРИРОДООХОРОНІ)

СВІТОВИЙ БАНК

CH2M HILL - COWI
ВОДОКАНАЛ
МІСЬКА АДМІНІСТРАЦІЯ

EPT- CH2M HILL

USAID

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KEY GOALS FOR LVIV WATER SYSTEM
ГОЛОВНІ ЗАВДАННЯ СИСТЕМИ ВОДОПОСТАЧАННЯ ЛЬВОВА

- FINANCIALLY VIABLE VODOKANAL ORGANIZATION
- Фінансово-життєздатна структура Водоканалу
- WATER SERVICE FOR 24 HOURS A DAY
- Цілодобове водопостачання

Without a financially viable Vodokanal that can make major investments in water system improvements it will not be possible to have a long-term 24-hour water service.
Якщо Водоканал не буде рентабельним , здатним робити капіталовкладення в удосконалення системи водопостачання, не можливо буде забезпечити цілодобове водопостачання.

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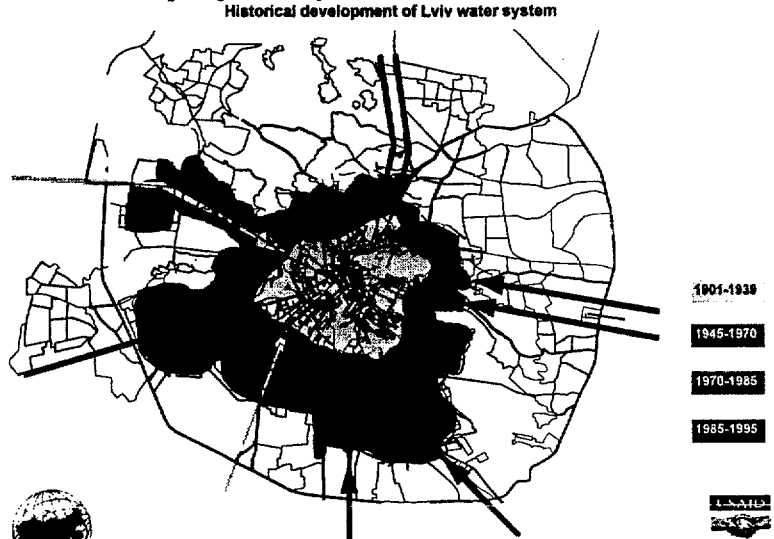
Історія розвитку водопостачання м.Львова
Historical development of Lviv water system



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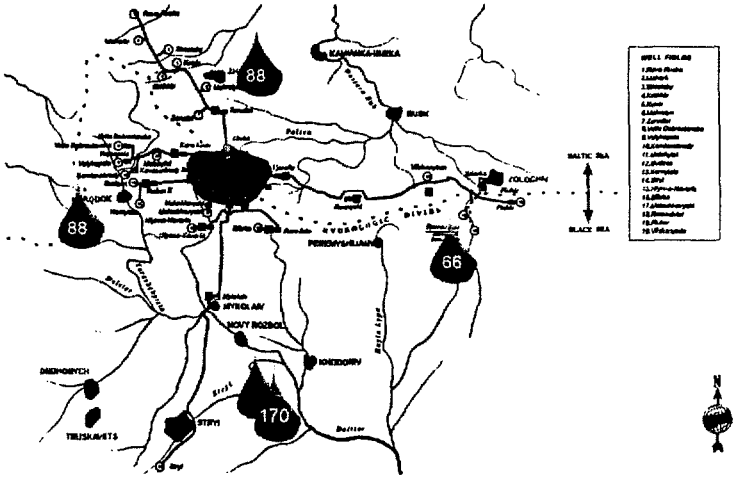
Розвиток трубопровідної системи
Development of Distribution and Transmission system

Рік Year	Населення Population	Довжина , км Total pipe length, km
1939	318 100	202
1945	165 000	202
1970	563 600	700
1985	734 800	1 300
1995	831 200	1 500

EPT- CH2M HILL



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Подача води Львівськими водозаборами у 1995 році
Water Pumped from Lviv Well Fields in 1995

Напрям Location		Кількість, м³/добу Quantity, m3 /day	Затверджені запаси Safe yield
Північ	North	88 000	120 500
Захід	West	88 000	158 900
Південь	South	170 000	184 000
Схід	East	66 000	176 200
Всього	Total	412 000	639 600

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USAID

Споживання електроенергії на 1м³ води
Reported Energy Usage per 1m³ of Water from Wells

Водозабори Well Fields	0.6 kWh
Насосні станції Pump Station	0.3 kWh
Втрати Other	0.1 kWh
Всього Total	1 kWh

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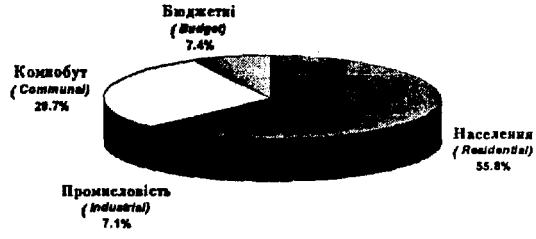
Собівартість води у 1995р
Water cost in 1995

Найменування статей витрат Expenditures	Питома вага, % %
Електроенергія Energy	63
Амортизаційні відрахування Depreciation	7
Фонд оплати праці Labor	2
Інші витрати Other	28
Всього Total	100

EPT- CH2M HILL

Споживання води окремими групами споживачів м.Львова
Water consumption for different groups of consumers in the city of Lviv

Назва споживачів (Group of consumers)	Кількість спожитої води (Water consumption) Q.м3/добу(m3/day)	%
Населення (Residential)	164000	55.8
Промисловість (Industrial	21000	7.1
Комобут (Communal)	88000	29.7
Бюджетні (Budget)	22000	7.4
Всього (Total)	295000	100



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Звітні дані по водоспоживанню Львівської системи
Reported current Water Use in Lviv Water System

Споживачі Consumers	м3/добу (m3/day)	%
Всього Total Produced by Wells	412 000	100
Шляхові населені пункти Village - consumption	19 000	4
м. Львів City Lviv - consumption	295 000	72
Разом Consumption (Total)	314 000	76
Втрати води у водогонах Transmission Leakage	58 000	14
Втрати в міській мережі City Losses	40 000	10
Разом втрати Losses (Total)	98 000	24

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Існуюче зонне водопостачання м.Львова
Pressure zones

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Споживання води окремими групами споживачів м Львова
Water consumption for different groups of consumers in the city of Lviv

Назва споживачів Group of consumers	м3/добу (m^3/day)	%
Населення Residential	164 000	55.8
Промисловість Industrial	21 000	7.1
Компобут Public	88 000	29.7
Бюджетні Budget	22 000	7.4
Всього Total	295 000	100

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LVIV WATER SYSTEM - PROBLEMS
СИСТЕМА ВОДОПОСТАЧАННЯ ЛЬВОВА-ПРОБЛЕМИ

Presentation in Ukranian by:
Maria Triliovoska, Engineer

Презентація по-українські:
Марія Трільовська, інженер

Presentation in English by:
Kris Buros, Technical Adviser

Презентація по-англійські:
Кріс Буров, технічний порадник

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KEY GOALS FOR LVIV WATER SYSTEM
ГОЛОВНІ ЗАВДАННЯ СИСТЕМИ ВОДОПОСТАЧАННЯ ЛЬВОВА

- FINANCIALLY VIABLE VODOKANAL ORGANIZATION
- Фінансово-життєздатна структура Водоканалу
- WATER SERVICE FOR 24 HOURS A DAY
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Without a financially viable Vodokanal that can make major investments in water system improvements it will not be possible to have a long-term 24-hour water service.
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EPT- CH2M HILL

Key Problems - Головні проблеми

1. Excessive Water Usage (Consumption + Leakage + Wastage)
   Надмірне використання води (Споживання+Витоки+Втрати)

2. Energy Intensive Production and Delivery System
   Енергоємке виробництво і система передачі

Data lacking on actual flows and usage
Відсутність даних про фактичну кількість води і її використання

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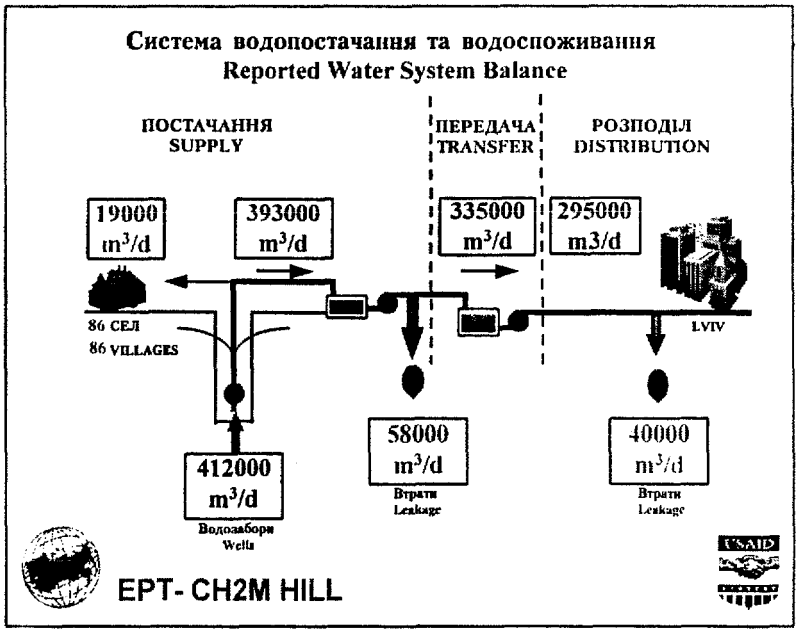
Система водопостачання та водоспоживання
Reported Water System Balance
ПОСТАЧАННЯ
SUPPLY
ПЕРЕДАЧА
TRANSFER
РОЗПОДІЛ
DISTRIBUTION
19000 m³/d
393000 m³/d
335000 m³/d
295000 m3/d
86 СЕЛ
86 VILLAGES
LVIV
412000 m³/d
Водозабори
Wells
58000 m³/d
Втрати
Leakage
40000 m³/d
Втрати
Leakage
EPT- CH2M HILL
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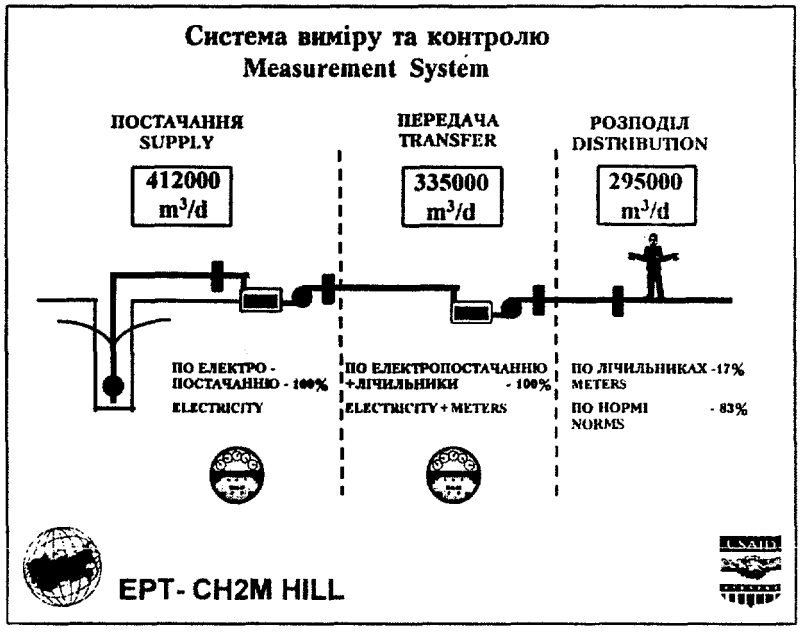
Система виміру та контролю
Measurement System
ПОСТАЧАННЯ
SUPPLY
ПЕРЕДАЧА
TRANSFER
РОЗПОДІЛ
DISTRIBUTION
412000 m³/d
335000 m³/d
295000 m³/d
ПО ЕЛЕКТРО - ПОСТАЧАННЮ - 100%
ELECTRICITY
ПО ЕЛЕКТРОПОСТАЧАННЮ +ЛІЧИЛЬНИКИ - 100%
ELECTRICITY + METERS
ПО ЛІЧИЛЬНИКАХ -17%
METERS
ПО НОРМІ - 83%
NORMS
EPT- CH2M HILL
USAID

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Використання води у Львові
Water use for Lviv

Тип Type	За звітом ЛВК Current reported	Припущення консультантів Consultant guess	
		При 6 год. подачі Current (6-HR)	При 24 год. подачі* 24-HR*
Споживання Consumption	76%	60-75%	40-65%
Втрати Losses	24%	25-40%	35-60%

* Необмежене водопостачання
Unlimited supplay of water

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Втрати води у Львові
Water losses for Lviv

Тип Type	За звітом ЛВК Current reported	Припущення консультантів Consultant guess	
		При 6 год. подачі Current (6-HR)	При 24 год. подачі 24-HR*
Магистральний водогін Transmission	14%	5-10%	5-19%
Міська мережа Distribution	10%	20-30%	30-50%

* Необмежене водопостачання
Unlimited supply of water

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TERMS - ТЕРМІНИ

ВИКОРИСТАННЯ

USAGE

- CONSUMPTION СПОЖИВАЧІ
- WASTE ВТРАТИ
- LEAKAGE ВИТОКИ

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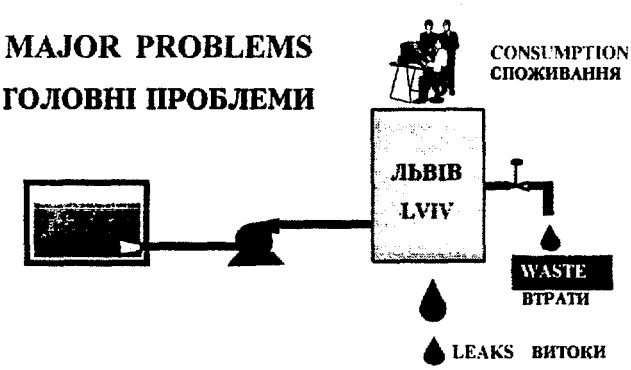
MAJOR PROBLEMS
ГОЛОВНІ ПРОБЛЕМИ



LIMITED SOURCE ОБМЕЖЕНЕ ДЖЕРЕЛО	ENERGY INTENSIVE DELIVERY ВЕЛИКА ЕНЕРГО-ЄМНІСТЬ	EXCESSIVE USAGE НАДМІРНЕ СПОЖИВАННЯ

EPT- CH2M HILL

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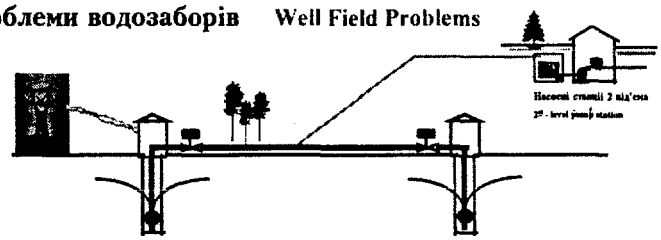
Проблеми водозаборів Well Field Problems

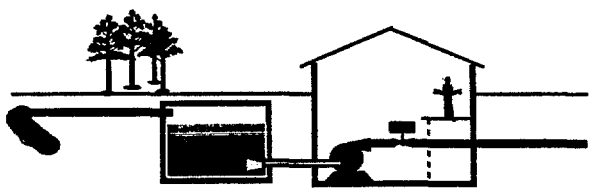


Функціонування та експлуатація	Operation and maintenance
Ефективність енергозаспечення	Energy efficiency
Вандалізм	Vandalism
Термін експлуатації насосів та двигунів	Pump and motor life
Конструкція свердловин	Well construction and design
Контрольно- вимірювальні приклади	Instrumentation and control
Хімічний склад води	Chemical quality of water
Гідравліка системи	System hydraulics
Коливання напруги	Voltage fluctuations
Пошкодження водогонів	Pipeline damage

EPT- CH2M HILL

USAID

Проблеми у системі передачі Transmission problems



Вік обладнання	Age of equipment
Ефективність енергопостачання	Energy efficiency
Матеріал водогонів	Pipeline materials
Гідравліка системи	System hydraulics
Трубопровідна мережа	Pipeline installation
Подача води селам (тиск та втрати)	Supply to villages (pressure & losses)
Місткість резервуарів	Reservoir capacity
Контрольно- вимірювальні приклади	Instrumentation and control
Втрати води	Water losses

EPT- CH2M HILL

USAID

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Проблеми розподілюючої системи
Distribution problems

Матеріали, використані при будівництві	Materials used in construction
Витоки з трубопроводів	Leakage in pipes
Недіючі засувки,лічильники	Inoperative valves, meters
Втрати в сантехнічному обладнані	Wastage in plumbing fixtures
Мала кількість лічильників	Low percentage of installed meters
Довгочастість ліквідації аварій	Long repair periods
Відсутність зонування по тиску	Inoperative pressure zones
Обмежений час водоподачі	Restricted distribution time

EPT- CH2M HILL

LVIV WATER SYSTEM - SOLUTIONS
СИСТЕМА ВОДОПОСТАЧАННЯ - РІШЕННЯ

Presentation in Ukranian by:
Tamara Gipp, Engineer

Презентація
по-українські:
Тамара Гіпп,інженер

Presentation in English by:
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Background - Design & Operation
Передумови- Проект & Робота

	1960 - 1980	1996
Energy Енергія	5 - 10% of costs/затрат	70 - 80% of costs/затрат
Capital Капітал	Scarce Дуже малий Limited service life Обмежений термін служби	Scarce Дуже малий Service life over Термін служби закінчився
Data Дані	Meet norms Задовільняти нормам	Make decisions Приймати рішення

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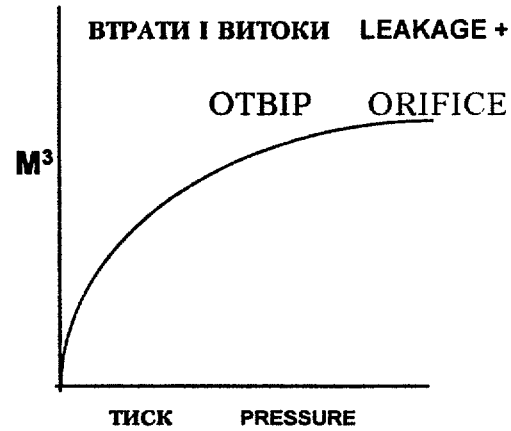
ВТРАТИ І ВИТОКИ LEAKAGE + WASTAGE



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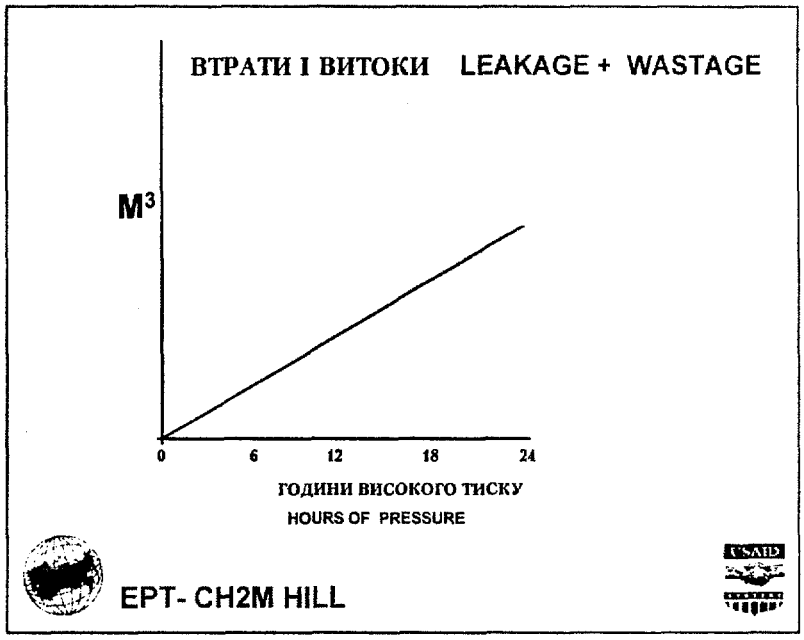
ВТРАТИ І ВИТОКИ LEAKAGE + WASTAGE
M3
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ГОДИНИ ВИСОКОГО ТИСКУ
HOURS OF PRESSURE
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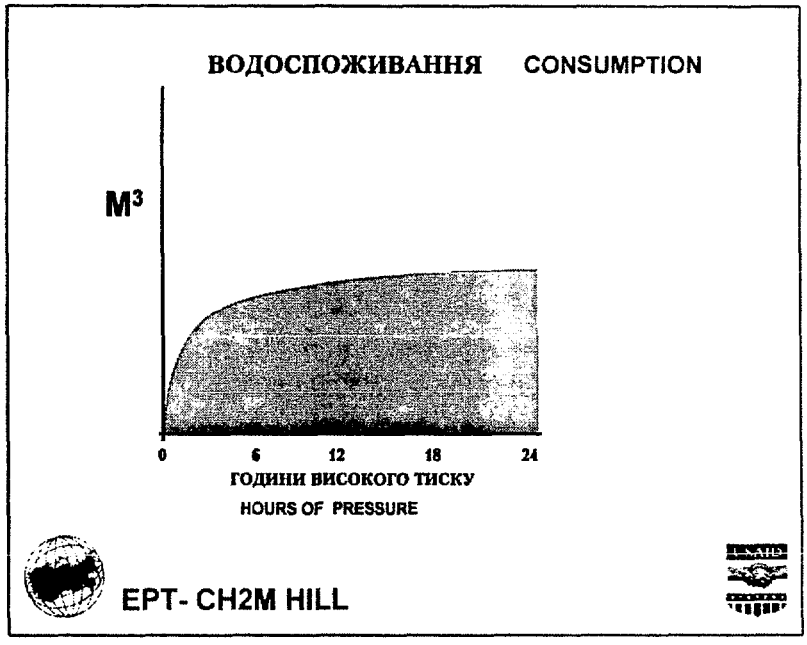
ВОДОСПОЖИВАННЯ CONSUMPTION
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HOURS OF PRESSURE
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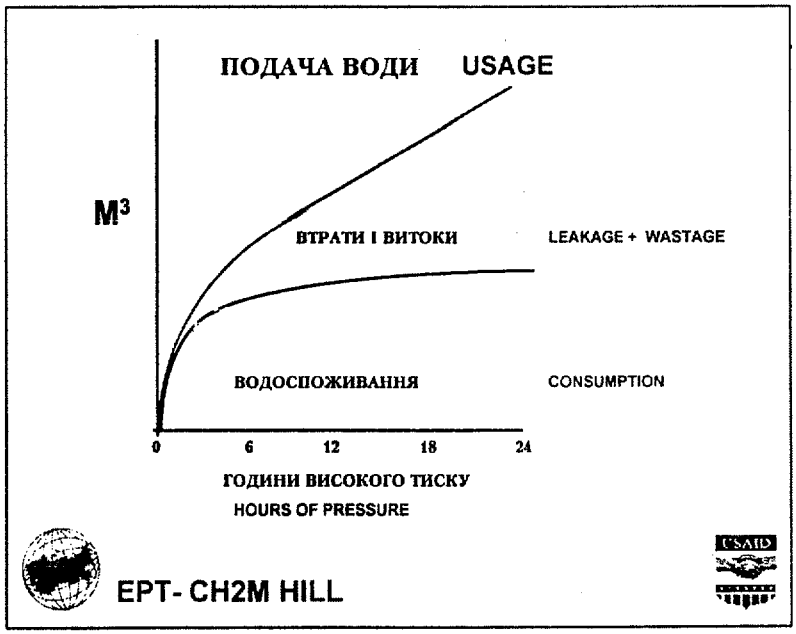
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LEAKAGE + WASTAGE
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HOURS OF PRESSURE
EPT- CH2M HILL
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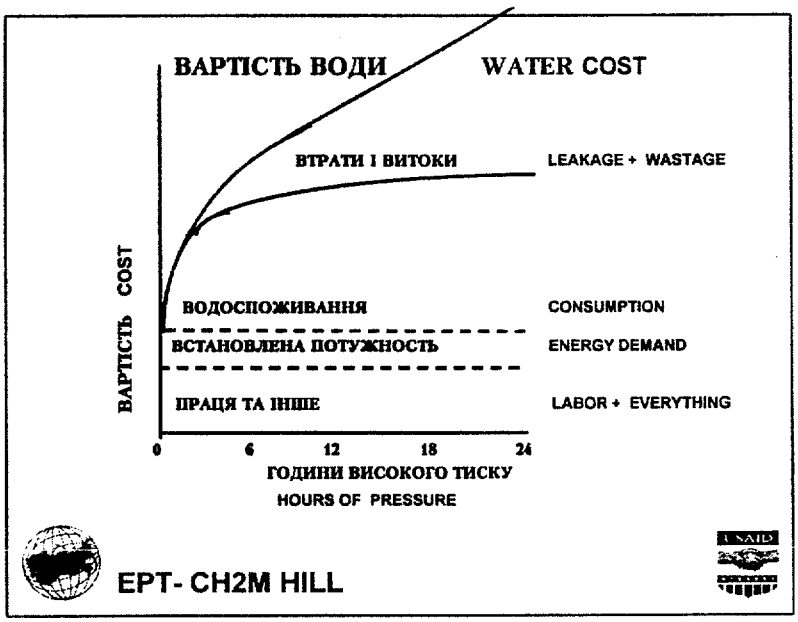
ВАРТІСТЬ ВОДИ WATER COST
ВТРАТИ І ВИТОКИ
LEAKAGE + WASTAGE
ВАРТІСТЬ COST
ВОДОСПОЖИВАННЯ
CONSUMPTION
ВСТАНОВЛЕНА ПОТУЖНОСТЬ
ENERGY DEMAND
ПРАЦЯ ТА ІНШЕ
LABOR + EVERYTHING
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ГОДИНИ ВИСОКОГО ТИСКУ
HOURS OF PRESSURE
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SOLUTIONS - SUPPLY
РІШЕННЯ - ВОДОПОСТАЧАННЯ

IMPROVED UTILIZATION - ВДОСКОНАЛЕНЕ ВИКОРИСТАННЯ

SUPPLY - ПОСТАЧАННЯ

- Rehabilitate & clean wells -Відновити і очистити свердловини
- Reconstruct wells - Перебудувати свердловини

DEMAND & FLOW - ПОТРЕБА І ОБСЯГ ВОДИ

- Decrease leaks and waste - Зменшити витоки і втрати

EFFICIENCY- ЕФЕКТИВНІСТЬ

- Improved pumps & motors - Вдосконалені насоси і двигуни
- Improved pumping hydraulics - Вдосконалення гідравліки насосів
- Instrumentation - Вимірювальне обладнання

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SOLUTIONS - TRANSFER
РІШЕННЯ - ПЕРЕДАЧА

INCREASE ENERGY EFFICIENCY - ЗБІЛЬШИТИ ЕНЕРГОЕФЕКТИВНІСТЬ

REDUCE FLOW -ЗМЕНШИТИ КІЛЬКІСТЬ ВОДИ

ENERGY - ЕНЕРГІЯ

- Variable speed controllers - Регулятори змінної швидкості
- Energy efficient pumps - Енергоефективні насоси
- Improved hydraulics - Вдосконалена гідравліка
- Energy management systems - Системи по управлінню енергією
- Instrumentation - Вимірювальні прилади

FLOW - КІЛЬКІСТЬ ВОДИ

- Decrease leaks and waste in transmission & distribution- Зменшити витоки і втрати при передачі і розподілу

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SOLUTIONS - DISTRIBUTION
РІШЕННЯ - РОЗПОДІЛ

REDUCE USAGE - ЗМЕНШИТИ ВИКОРИСТАННЯ
INCREASE SERVICE - ЗБІЛЬШИТИ ЧАС ВОДОПОСТАЧАННЯ

LEAKS - ВИТОКИ

- Line or replace pipes - Виконати покриття труб або замінити труби.
- Use & add pressure zones - Використовувати і додати зони тиску

WASTE - ВТРАТИ

- Consumption based billing - Тарифи, що базуються на споживанні
- Public education - Виховання населення

CONSUMPTION - СПОЖИВАННЯ

- Consumption based billing - Тарифи, що базуються на споживанні

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SOLUTIONS - GENERAL PROBLEMS
РІШЕННЯ-ЗАГАЛЬНІ ПРОБЛЕМИ

INCREASE SERVICE LEVEL - ПОКРАЩИТИ РІВЕНЬ ОБСЛУГОВУВАННЯ

SERVICE - ОБСЛУГОВУВАННЯ

- Improved repair equipment - Вдосконалене ремонтне обладнання
- Add cutoff valves - Встановити відключаючі засувки
- Instrumentation - Вимірювальні прилади
- Training of staff in operations and repair - Підготовка персоналу для роботи і ремонту
- Increase spare parts inventory - Збільшити склад запчастин
- Public education (usage) - Виховання населення (як користуватися водою)
- Routine maintenance (valves) - Регулярний профтехогляд (засувки)

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Можливий розподіл капіталовкладень до проектів по вдосконаленню водопостачання.

Вкладення в процентах:	1996 - 2001	2001 - 2006	2006 - 2011	2011 - 2016
Управління використання енергії	40	27	15	10
Зменшення втрат води	35	40	35	30
Відновлення свердловин і насосних станцій	11	13	8	2
Робоче і ремонтне обладнання	7	7	7	7
Комп"ютеріізація (бухоблік& операції)	3	7	3	2
Облік споживання лічильниками	4	7	15	8
Розширення системи розподілу	0	0	12	18
Будівництво нового водозабору	0	0	8	23

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Possible Distribution of Capital Investments in Water Projects

Percent investment in:	1996 - 2001	2001 - 2006	2006 - 2011	2011 - 2016
Energy management	40	27	15	10
Water loss reduction	35	40	35	30
Well & pump station rehabilitation	11	13	8	2
Operation and maintenance equipment	7	7	7	7
Computerization (accounts & operations)	3	7	3	2
Metering of consumption	4	7	15	8
Distribution system expansion	0	0	12	18
New well field construction	0	0	8	23

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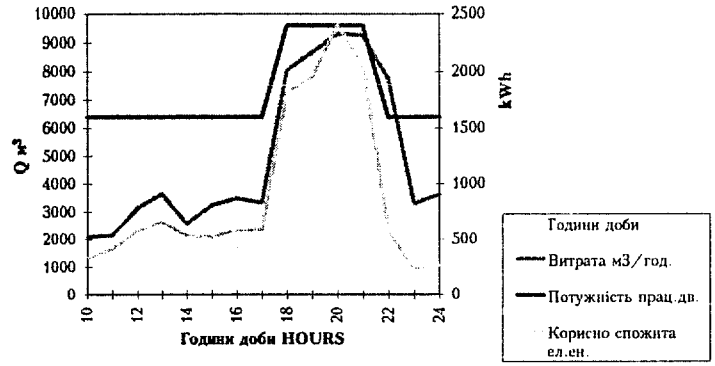
Споживання електроенергії н.ст. "Сокільники"
Power consumption at Sokilnyky PS



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Appendix D

WORKSHOP HANDOUTS PROVIDED BY COWI

Following is a copy of the English-language version of the Workshop handout materials provided by COWI.

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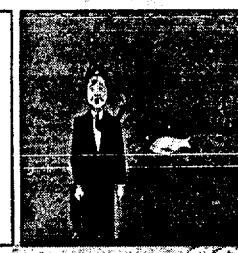
Wastewater collection and treatment

Presented by Mikael Sharkov

NBJ-1

Characteristics

- 95% sewer coverage
- 5600 ha in Baltic sea catchment
- 15600 ha in Black sea catchment
- 5200 ha combined system
- 6800 ha separate system



NBJ-2

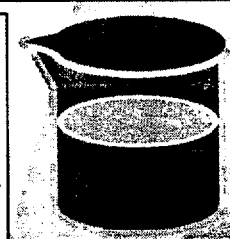
Pipes and pumping stations

- 260 km main collectors
- 260 km street collectors
- 11,5 km tunnels
- 9 pumping stations in the Black Sea catchment

NBJ-3

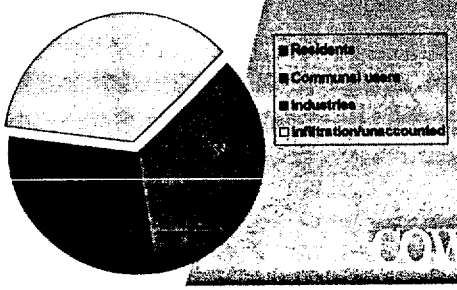
Flow

- Average dry weather flow 4,12 m^3/s in Poltva collector
- Average dry weather flow 1,62 m^3/s in collector IV
- Maximum storm water flow to Poltva collector: 116 m^3/s



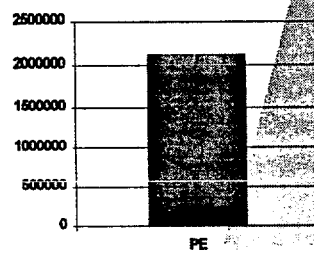
NBJ-4

Reported discharge to the sewer system 490.000 m3/day



NBJ-5

Reported load on the treatment plant



NBJ-6

Treatment principles

- Line 1: Capacity 150000 m3/day
- Line 2: Capacity 350000 m3/day
- Total designed capacity: 2,5 mill PE
- Stormwater capacity 19,6 m3/s
- Both plants activated slugde with primary and secondary sedimentation

NBJ-7

Sludge

- Production 8000 m3/day (97% water)
- Pumped to drying beds and lagoons,
- Lagoons and drying beds 8 ha, 250000 m3
- Storage capacity for four years on treatment plant area

NBJ-8

Energy consumption

- Pumping stations in collections system: 0,9 mill kWh/month
- Wastewater treatment 3,9 - 4,4 mill kWh/month,
- 0,8 - 1 kWh/kg BOD

NBJ-9

Wastewater Problems

NBJ-10

Failing sewers

- High danger for flooding by collapse of collector IV - health hazard
- Danger for falling in of streets by collapses of street collectors
- Increased load to treatment plant because of infiltration

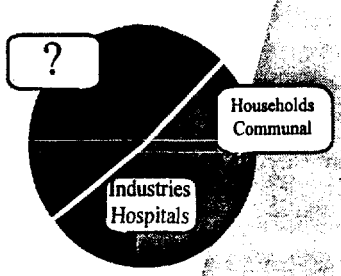
NBJ-11

Pollution

- Tributaries in the Black sea catchment affected by stormwater discharge and wastewater in periods when the pumps fail or the electricity is cut off
- Increased loads of BOD in Poltva, from leakage of unstabilized sludge and unidentificed outlets

NBJ-12

Calculated and measured organic load on the treatment plant



NBJ-13

Possible explanations

- Larger contribution from industries
- Errors in flow measurement
- Errors in BOD measurement

NBJ-14

Process performance

- Reported performance of line 1 seems likely
- Good effluent quality of line 2 does not suit reported load/tank volumes.
- Monitoring and regulation can improve performance and reduce energy consumption

NBJ-15

Aeration

- Existing ceramic diffusors breakes
- Uneven oxygen distribution because of leakages
- Not energy efficient

NBJ-16

Sludge

- Dried for 30-40 days (summertime)
- disposed of unstabilized on the treatment plant area
- high risk of leakage to the river
- high risk of periodical informal disharge

NBJ-17

Structural and mechanical conditions

- Mechanical equipment used beyond lifetime
- Concrete in bad condition- especially for line 2

NBJ-18

Proposed solutions for wastewater

NBJ-19

Why care about wastewater!

- Risks - flooding, sewer collapses
- Energy savings
- Environmental concerns

NBJ-20

Priorities

Short term options

- "Hot spot" rehabilitation of sewers
- Energy reduction at treatment plant: aerators and inlet pumps
- Control of industries
- Sludge treatment

Long term options

- Ongoing rehabilitation of sewers
- Finalization of schemes for sewers
- Upgrading of mechanical and structural conditions at treatment plant

NBJ-21

Benefits

- Reduced health risks from uncontrolled wastewater
- Stabilizing LVK economy
- Reducing environmental impact

NBJ-22

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Lviv Water and Wastewater

Consumer Profiles

Households

Industry & Communal Services

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Main Points

- COWI has carried out a survey of 500 households and 50 industries/institutions
- While 7 of 10 households have water supply 6 hours or less
- Industries have better supply - 5 of 10 have 24 hours water supply
- Households are able to pay higher tariffs
- And some are willing to pay for better service

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Beneficiary Assessment Methodology

- Two step procedure
- Step 1: Beneficiary Survey
  3 consumer groups:
  - Households
  - Industry
  - Communal services (incl. public institutions)
- Step 2: Stated Preference Survey
  Households only

Design of Beneficiary Survey

- Household characteristics
- Perceived service level
- Water consumption characteristics
- Water use attitudes
- Willingness to pay
- Ability to pay

Mode of Survey

Consumer group	Attempted survey size (number of respondents)	Mode of survey
Households	500	Telephone interviews
Communal service	12	Submitted questionnaires accompanied by tel ephone and personal i nterviews
Budget institutions	13	
Industries	25	

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Sample biases ?

- Final acceptance rate = 85%
- Representativeness checked:
  - Distribution by district
  - Distribution by household size
  - Distribution by apartment size and floor
  - Age distribution
  - Occupational distribution

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Biases found

- Districts: Galitsky is overrepresented
- Household size: No significant bias
- Apartment size: 1 room is underrepresented
- Floor of apartment: High floors are underrep.
- Age distribution: No significant bias
- Occupational distribution: More unemployed in our sample

Conclusion on biases

- Slight underrepresentation of new housing areas
  = >
  - May give too positive picture of water supply situation
- Other socioeconomic parameters are OK

Water Consuming Installations are Widely Present

Type of installation	Number of household in survey with installation	Percentages with installation
Toilet	482	98
Bathtub	468	95
Shower	293	60
Washing machine	385	78

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But Water Consumption Habits are not Particularly Wasteful

Type of behavior	Average amount or number
Average liter of daily water storage	41
Average number of bathes in bathtubs per person per week	1.9
Average number of showers per person per week	1.8
Washing the dishes under running w ater Percentages of households	75
How often are clothes washed ?	app. one time per week

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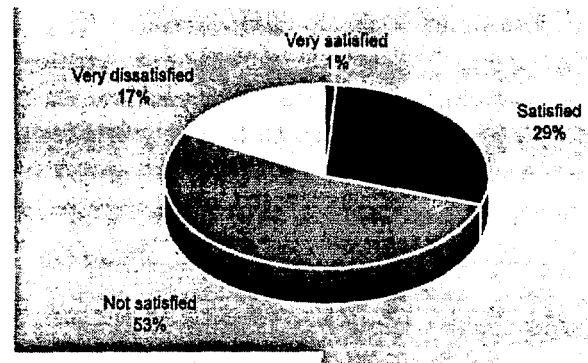
Many Households are Dissatisfied with Water Supply



Improvements Most OftenWanted

- 60% want 24 hour water supply
- Increased water pressure
- Strict observation of the schedules for water supply

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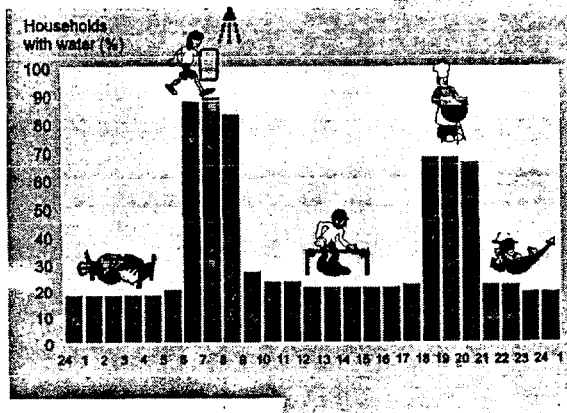
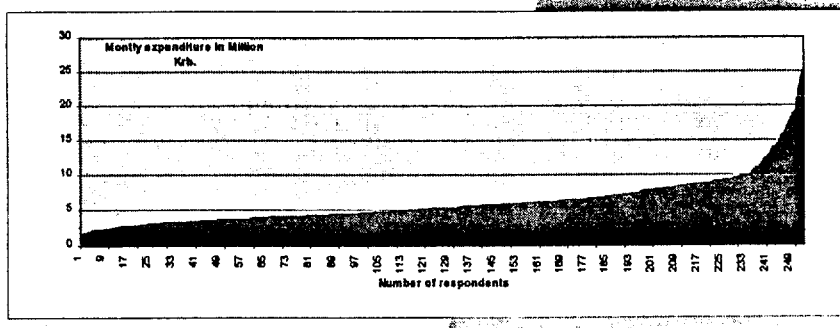
Leakages are Claimed to be Infrequent

	Number of answers	Percentages distribution
Leakage's hereof:	73	15
Leakage's for more than one week	40	8
Leakage's for more than one month	17	3
Leakage's for more than a half year	13	3
No leakage's	418	85
Total number of answers	491	100

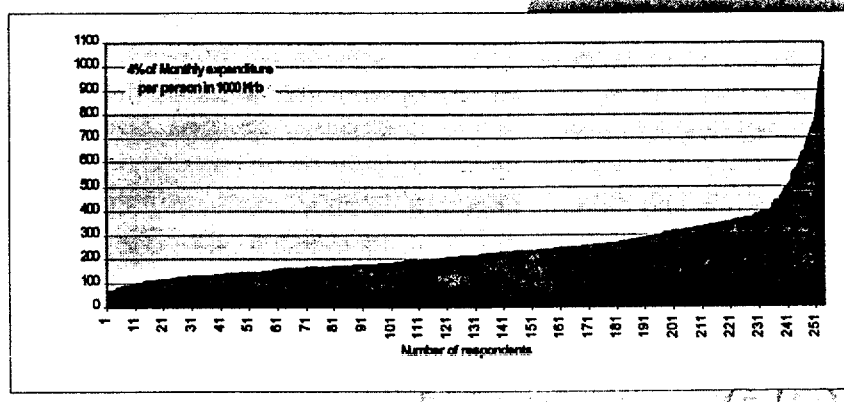
Household Survey Perceived Service Level



Ability to Pay may be Significant



Ability to Pay may be Significant (II)



Tariffs:
December 1995 vs January 1996

in USD / m3	December 1995	January 1996
Residential	0.05	0.10
City Budget Org.	0.06	0.19
State Budget Org.	0.21	0.19
Public Services etc	0.21	0.21
Enterprises	1.74	1.30

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Water Tariffs

- Water & waste water tariffs for households have just doubled
- Even if they were doubled again most households would still pay less than 4% of their income for water services

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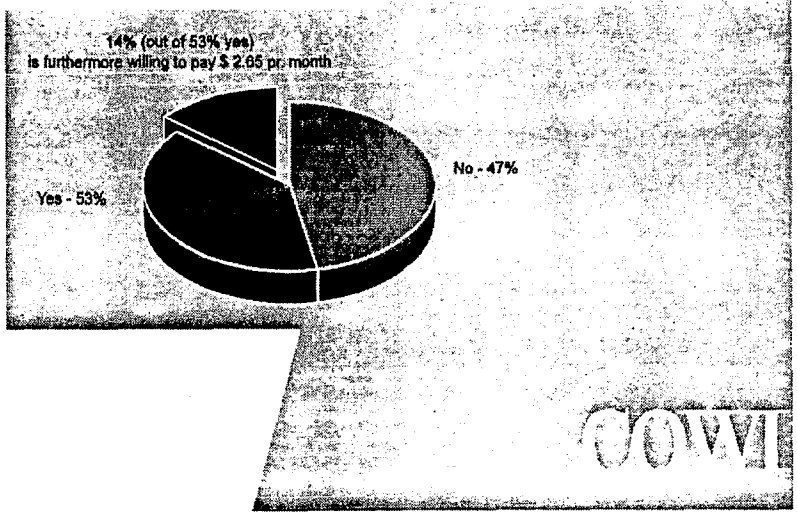
Willingness to Pay is also Significant



Survey of Industry

- Service level is better than for households
  - Industries have own supply
  - Industries have tanks
- Still 50 % are willing to pay for better service
  - Industries want 24 hour service, higher pressure and less breakages

Survey of Communal Services / Public Institutions

- Institutions have better water supply than households because more have water tanks
- 2 of 3 institutions indicate willingness to pay for better service
- But almost 1 in 2 currently pay only irregularly for water
- Indications that payment for water is low priority

Lviv Water and Wastewater

Financial Conditions of Lviv Vodokanal

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Main Points

- Collection rate is too low
- Structure of expenditures is not sound
- Insufficient tariff increases (!) lead to vicious circle
- LVK is short of cash
- Situation is not sustainable
- Ideas for improvement

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Water Bills are much Higher than Payments Collected

	Sales / billed KRB 10**6	Collected KRB 10**6
Annual 1992, total	912,30	694,90
Annual 1993, total	51.597,50	42.321,60
Annual 1994, total	398.374,60	307.734,30
Annual 1995, total	2.588.832,00	1.783.401,40

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Collection Rates Vary between Consumer Groups

- Industry paid 84 % of their bills in 1995
- Communal organisations paid 16 % of their bills,
- But budget organisations paid 96%, and
- Households paid 59% of their bills

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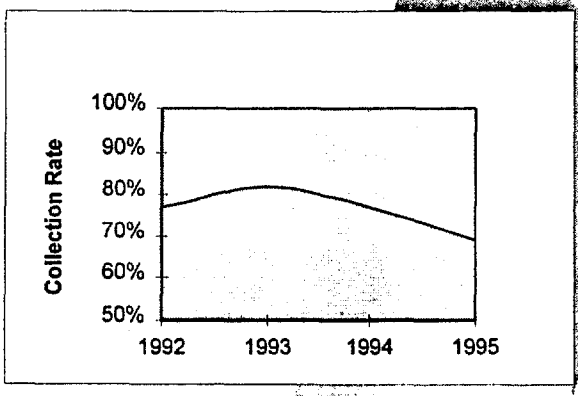
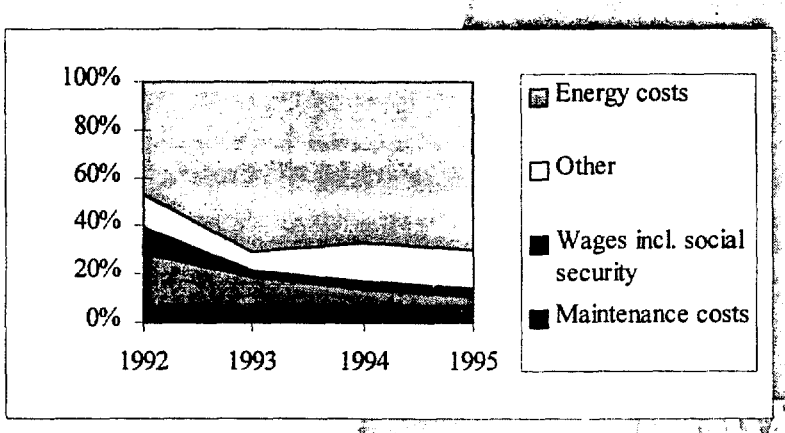
Unfortunately the Collection Rate is Falling



And Industry Does not Pay Cash

- Only 49 % of industry's payments were cash
- Barter payments give problems:
  - Transaction costs
  - Reduced liquidity
  - Valuation risk
  - Lack of transparency
  - etc

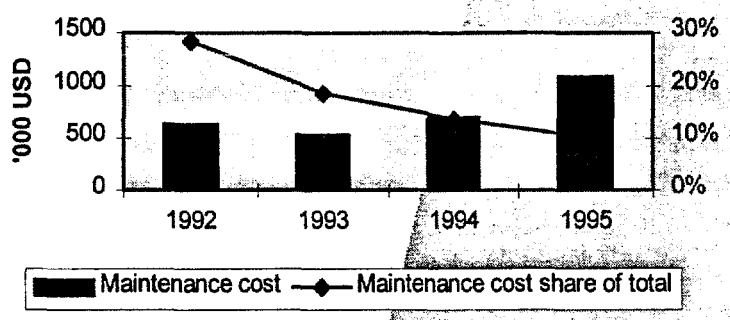
Energy Costs Tend to Squeeze Other Costs



Operation and Maintenance Costs are Still too Low

- While maintenance costs have increased
- Their share has not
- And they are still far too low
  - 5% of assets would be reasonable

Maintenance costs have increased but their share of total costs have not



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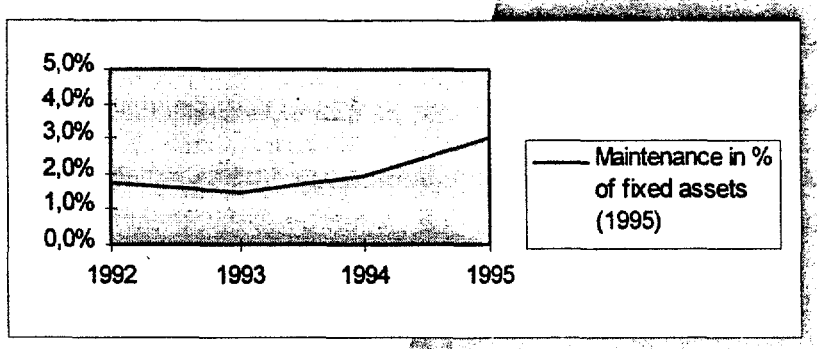
Maintenance is still too low compared to fixed assets



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Increased Costs Could Lead to Better Results If Tariffs were Increased !

- Tariffs are calculated on cost plus basis
- =>
- When costs go up - profit go up
- If tariffs could be increased
- =>
- It would give room for increased costs for e.g. maintenance, and better financial results

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Instead Increased Costs Start a Vicious Circle

- Energy costs increase
- Other costs are squeezed
- Service levels fall
- Consumers are less willing to pay
- LVK is cash strapped
- Other costs are squeezed even more

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Key Ratios Explained

- Net operating margin
  - The profit rate on the primary activity of the Vodokanal
  - Must be positive
- Current ratio
  - Ratio of current assets to current liabilities
  - Must be larger than 1 for LVK to be able to pay all its creditors

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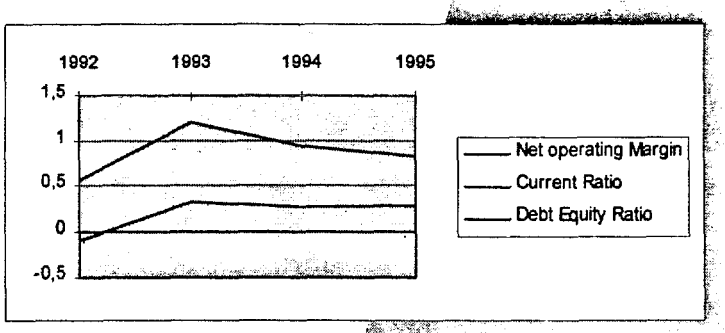
Key Ratios Explained (II)

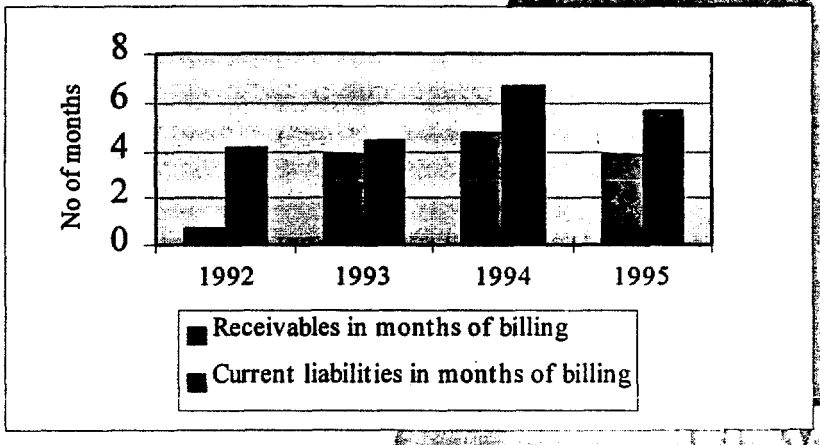
- Debt Equity Ratio
  - Ratio of long term debt to equity
  - Should be less than 1 for LVK to be able to pay long term debt
- Receivables in number of months of billing
  - Money owed to LVK expressed as months of billing
  - Should be around ordinary credit period, say 2 months

COWI

Key Ratios have Deteriorated



Receivables and Current Liabilities have Increased



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Debtors Must be Written Off

- In our financial forecast we have assumed that
  - 25% of bills not paid during the year are paid within two years
  - 75% is written off as bad debt after two years

Financial Forecast Shows: Situation is not Sustainable

- If LVK paid all their bills they would have had a negative cash flow in 1995 of -2.6 million USD
- In year 2001 the negative cash flow would be -3.2 million USD

LVK is Short of Cash
And the Future Will be Worse
Unless Policies are Changed

Accounting Conventions

- Western type income statements are on accrual basis. So was LVK before 1993
- => Water sold generates income even when bills are not paid
- => And on the balance sheet there is an increase in receivables. Therefore
- Debtors must be liquidated

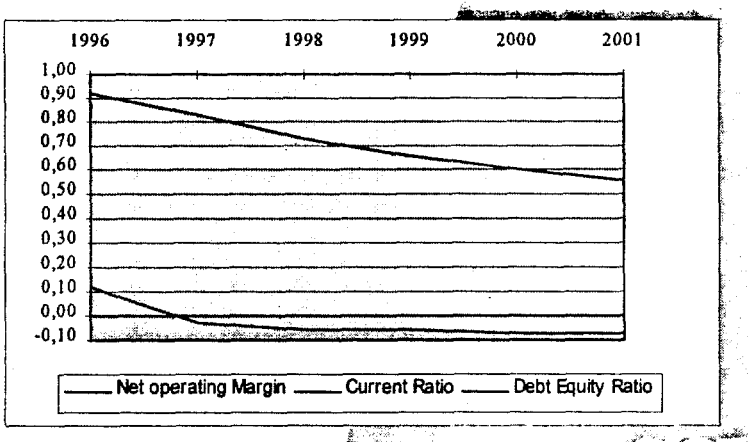
Key Assumptions behind "No-policy scenario"

- Tariffs increase slightly as a function of higher energy costs 1996 - 2001
- Water demand increases a little due to population growth
- All operating costs except electroenergy are maintained constant at 1995 level
- Price of electroenergy increases to world market price by year 2001
- Collection rate is maintained at 69%
- 75% of debts are written off after 2 years

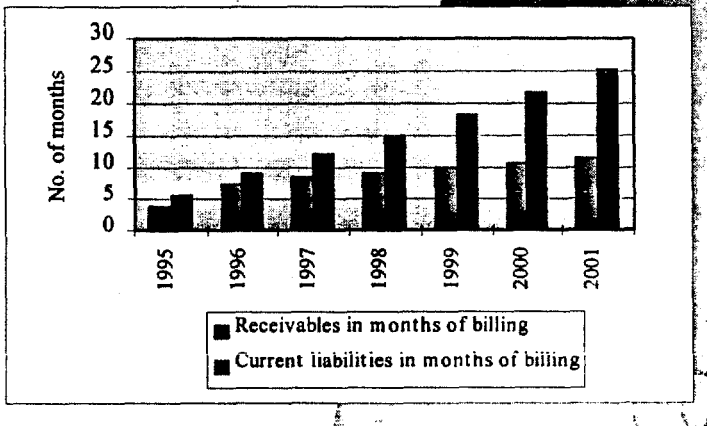
Financial Implications of "No-policy scenario"

- Direct production cost rise by 46% from 1996 to 2001 as a result of increased price of energy
- Since prices are on a mark-up basis gross revenue rise by 42 % from 1996 to 2001
- But bad debts are written off
- Therefore net operating income falls from 2.6 mill USD in 1995 to - 2.2 mill USD in 2001
- And net cash flow is highly negative

Key Ratios Deteriorate Further



Receivables and Current Liabilities Reach Unsustainable Levels



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Possible Improvements
Short Term
Revenue Side

- Use existing legal instruments to ensure payment from communal services
- Introduce policy of elimination of barter payments over a period, say 5 years
- Increase tariffs
- Gradual implementation of meter based consumption for large consumers

Possible Improvements
Short Term
Expenditure Side

- Increase budgets for operation and maintenance - this would lead to higher tariffs
- Focus on energy saving investments
- Avoid service improvements which increase energy costs

Appendix E

WORKSHOP HANDOUTS PROVIDED BY PADCO

Following is a copy of the English-language version of the Workshop handout materials provided by PADCO.

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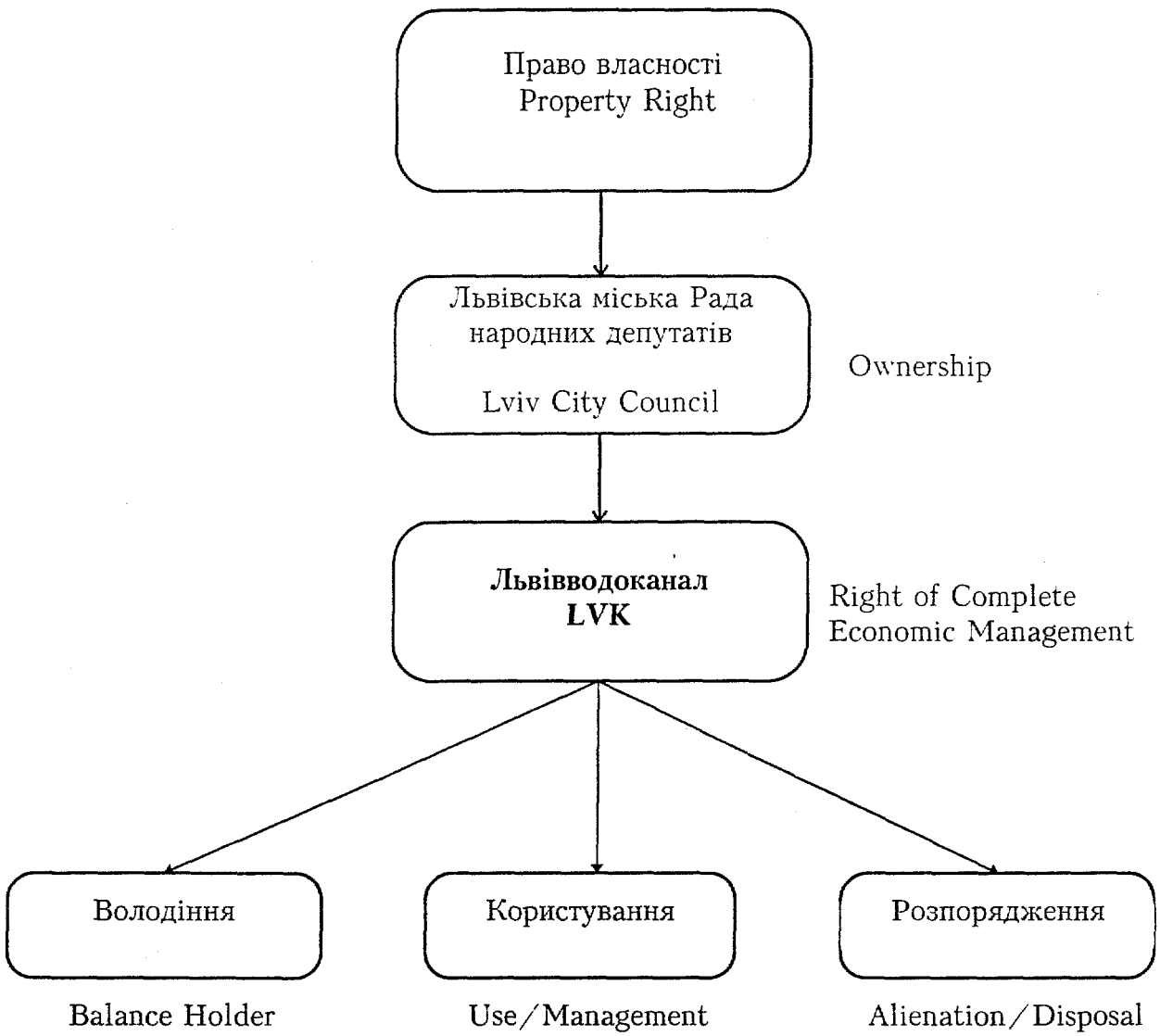
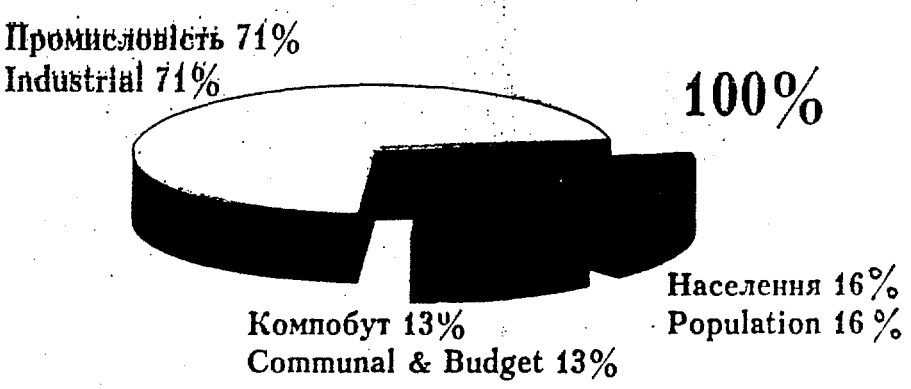
СХЕМА ВІДНОСИН ЩОДО ВОЛОДІННЯ І КОНТРОЛЮ ЗА ОСНОВНИМИ ЗАСОБАМИ МІЖ МІСЬКОЮ РАДОЮ ТА ЛЬВІВВОДОКАНАЛОМ

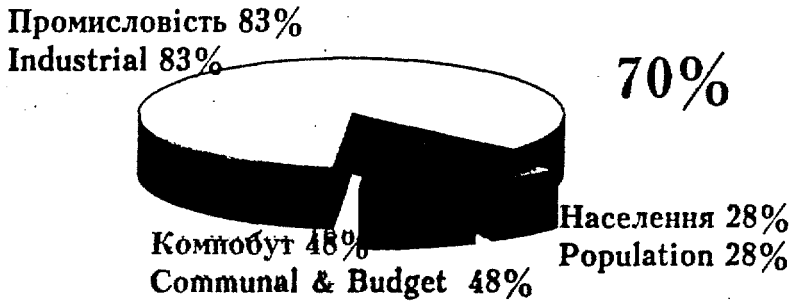
OWNERSHIP AND CONTROL OF FIXED ASSETS



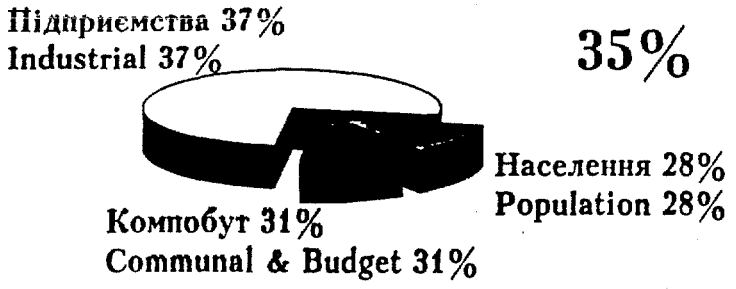
Співвідношення виставлених рахункі
Amount billed in % to total



Платежі користувачів з врахуванням бартеру
Collection with barter



Платежі користувачів без бартеру
Collection without barter



Запланований бюджет у 1995 р. Planned Budget in 1995	2,978 млрд. крб $15,700,000
Запланована рентабельність у 1995р. "Assigned profit" (planned) in 1995	496 млрд. крб. $2,600,000
Запланована рентабельність після сплати податків у 1995р. Net "assigned profit" (planned) in 1995	305 млрд. крб. $1,600,000
Сума позики, яку можна отримати (при умові 100% збору платежів; процентна ставка 9%, виплата позики протягом 15 років) Amount of Loan to Support (assuming for 100% of collections; 9% interest rate, 15 year amortization)	$12.9 млн. $12.9 mln.

- *Revenues Recoverable through Water and Wastewater Tariffs*

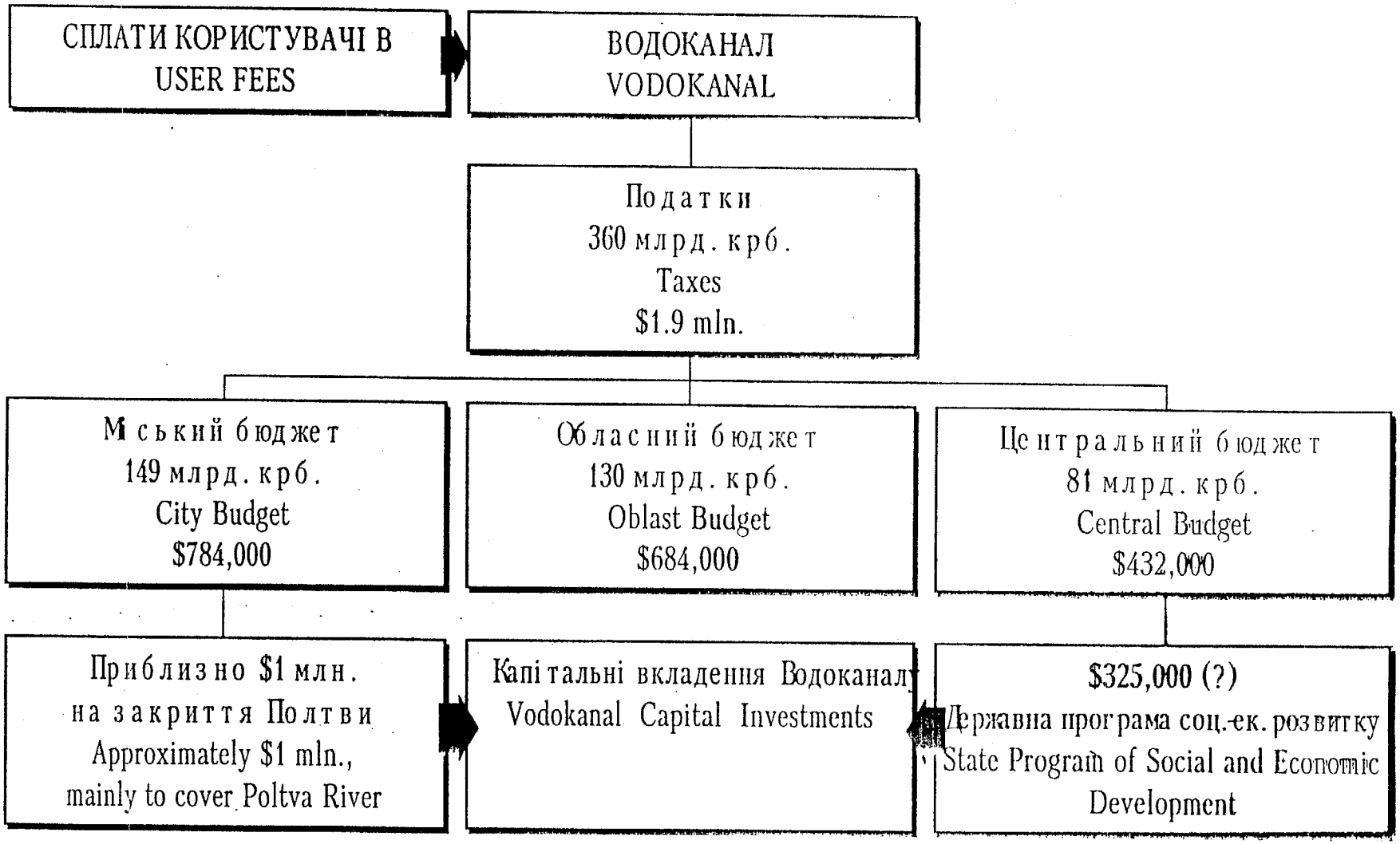
- *Доходи, які плануються отримати з тарифів на послуги водопостачання та водовідведення*

TC=TPC+P+VAT+OP

TC = total costs
TPC = total production costs permitted under Resolution of Supreme Council # 247/95-BP
P = allowable "profit" (0.25 x TPC)
VAT = value-added tax (0.20 x (TPC + P))
OP = other obligatory payments (taxes and fees, etc.)

ЗВ=ВВ+Р+ПДВ+ОП

ЗВ = загальні витрати
ВВ = витрати, які дозволено включати у витрати виробництва згідно Постанови Верховної Ради №247/95-ВР
Р = виробничі витрати (0.25 х ВР)
ПДВ = податок на добавлену вартість (0.20 х (ВВ +Р))
ОП = обов`язкові платежі (платежі у позабюджетні фонди)


СПЛАТИ КОРИСТУВАЧІ В
USER FEES
ВОДОКАНАЛ
VODOKANAL
Податки
360 млрд. крб.
Taxes
$1.9 mln.
Міський бюджет
149 млрд. крб.
City Budget
$784,000
Обласний бюджет
130 млрд. крб.
Oblast Budget
$684,000
Центральний бюджет
81 млрд. крб.
Central Budget
$432,000
Приблизно $1 млн.
на закриття Полтви
Approximately $1 mln.,
mainly to cover Poltva River
Капітальні вкладення Водоканалу
Vodokanal Capital Investments
$325,000 (?)
Державна програма соц.-ек. розвитку
State Program of Social and Economic
Development

Протягом певного періоду часу тарифи на послуги водопостачання і водовідведення включають виробничі витрати, що підраховуються приблизно за наступною формулою:

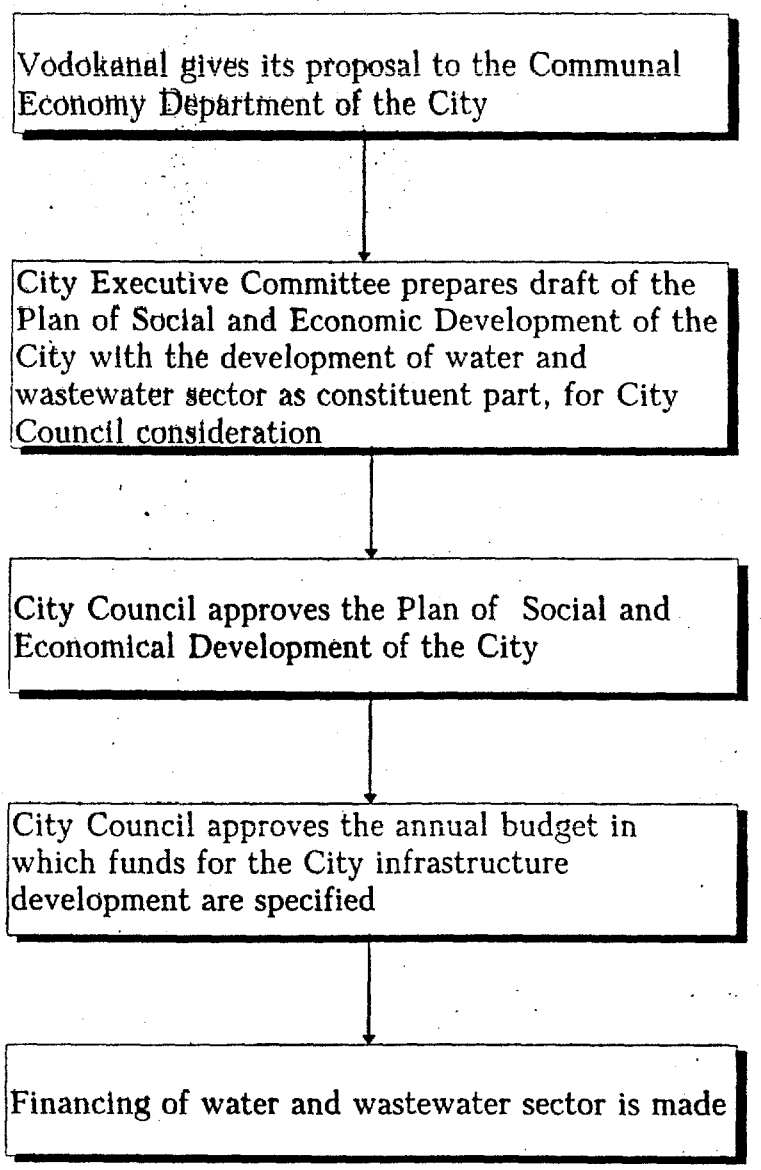
During a given period of time production costs (and therefore tariffs) can be approximately calculated using the following formula:

Виробничі витрати = 0.68 x (Витрати на спожиту електроенергію) + 0.06 x (Витрати на підкачку на вищі поверхи) + 0.05 x (Витрати на амортизацію) + ...,

Production costs = 0.68 x (Cost of electricity) + 0.06 x (Cost of pumping water to upper floors) + 0.05 x (Depreciation) + ...,

0.68 + 0.06 + 0.05 + ... = 1.

Vodokanal Capital Financing



Appendix F

WORKSHOP HANDOUTS PROVIDED BY WORLD BANK

Following is a copy of the English-language version of the Workshop handout materials provided by the World Bank.

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WALTER STOTTMANN

PRESENTATION
WORKSHOP 4
LVIV, March 28,1996

THE WORLD BANK

SUMMARY / CONCLUSIONS

INSTITUTIONS
FINANCES
TECHNICAL
TIME FRAME / STEPS

THE WORLD BANK

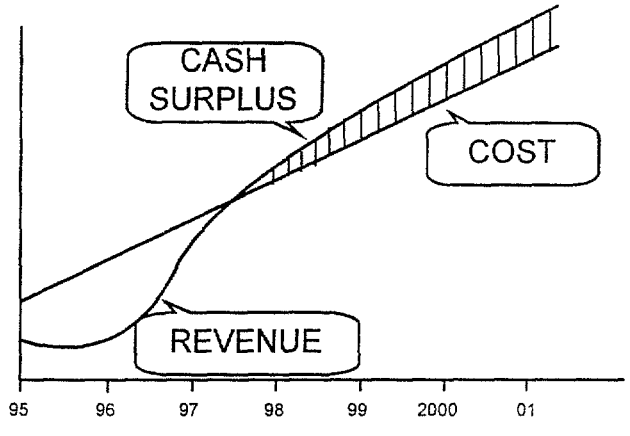
85

INSTITUTION

- Autonomous Vodokanal
- Working with private operator
- Responsible for:
  - Operation and maintenance
  - Investments
- Under City oversight

THE WORLD BANK

FINANCES



THE WORLD BANK

COSTS

- Realistic
- Labor Cost - ↑
- Operating & maintenance costs - ↑↑↑↑
- Suppliers are paid in full (renegotiate debt)

THE WORLD BANK

REVENUES

- Collection ↑↑↑
- Tariff increases ↑↑↑↑
- Write off bad debt

THE WORLD BANK

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TECHNICAL

- Priority - water
- Improve operations
- Rehabilitate
- Reduce energy consumption
- Reduce leakage
- Minor expansions

THE WORLD BANK

TIME FRAME

Pre-appraisal	9/96
Appraisal	12/96
Negotiations	2/97
Board	4/97

THE WORLD BANK

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PRE- APPRAISAL 9/96

- Studies completed
- Decision on institutions
- Viable financial plan-targets
- Investment components defined

THE WORLD BANK

APPRAISAL

- Operator selection under way
- Tariffs increased to targets
- Collection increased to targets

THE WORLD BANK

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Appendix G

PRESS COVERAGE

Following is a copy and translation of an article on the issues addressed at the Workshops, that was published in *Moloda Halychyna*, a major western Ukrainian regional newspaper.

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КОЛИ Б АМЕРИКАНЦІ МАЛИ ЧАРІВНУ ПАЛИЧКУ, НАСАМПЕРЕД ЛІКВІДУВАЛИ Б УСІ ВИТОКИ

Проблема водопостачання Львова здається такою ж старою, як і саме місто. Можливо, тому, що досі, незважаючи на численні розмови, води у нас так і не побільшало.

Допомогти вітчизняним фахівцям у складній проблемі водопостачання узялися спеціалісти з-за кордону. Представники від проекту ЕРТ (у рамках Агенції США з міжнародного розвитку) і спеціалісти датської фірми COWI, які працюють у Львові від нового року й облаштовують офіс у приміщенні «Львівводоканалу», розповіли про свої спостереження та своє бачення проблеми на семінарі, який відбувся минулого тижня у приміщенні мерії.

Проект, що його хочуть створити закордонні фахівці, має різнитися від інших насамперед тим, що розраховують вони не на якісь міражні величезні суми, котрих нема і ніколи не буде, а на ті реальні гроші, які можна відшукати для вирішення питання. Так, відомо, що Агенція із міжнародного розвитку багатьом країнам надає безповоротну допомогу. Можливо, вдасться отримати її й Україні. Сподіваються на 20 - 25 мільйонів доларів. Приблизно у такі фінансові рамки і повинен вкластися новий проект.

Як можна було зрозуміти на конференції, закордонні спеціалісти вважають систему водопостачання Львова складною і доволі специфічною. Насамперед тому, що воду місто бере виключно із свердловин і транспортується вона на великі відстані - від 80 до 100 кілометрів. Друге - використано тут неефективне обладнання, яке, до того ж, застаріло. Однією з найбільших бід є та, що приблизно від 1950 року усі водогони у нових районах будували із таких непридатних труб, які нині практично розвалені, порржавілі. Причому, ситуація своєрідна - усередині труби зіпсовані більше, аніж зовні (через так звану «агресивність» нашої води - насиченість сірководнем). Ці та інші факти змушують закордонних спеціалістів зробити висновок, що проблему не вдасться розв'язати упродовж року чи двох. На її вирішення піде щонайменше десятиліття.

На конференції докладно окреслено ті головні напрями, якими потрібно рухатися. Наприклад, такий: зменшення втрат електроенергії. Адже нині у собівартості води вартість електроенергії становить 50 процентів (насоси працюють без зупинки по 24 години на добу, на семи станціях - надпотужні двигуни по 880 кіловат кожен).

Другим напрямом є вирішення проблеми надмірного використання води. У Львові, наприклад, норма споживання така ж висока, як у Таллінні чи Копенгагені. А увесь малопривабливий «секрет» такого надмірного споживання - до банальності простий. Із 400 кубометрів води, яка подається, львів'яни отримують лише 250, решту ж води - це втрати.

Втрати спостерігаються буквально на кожному еталі водопостачання. На водозаборах, на водогонах, навіть у будинках через поламане сантехнічне обладнання. Ситуацію ускладнює і той факт, що лише 17 відсотків води обліковується лічильниками. А в історії нашого міста уже відомий випадок, коли лише завдяки ощадливості вдалося упродовж п'яти років утриматися від введення нових джерел водопостачання (було це у 1928 році).

Закордонні спеціалісти також вважають, що за такого сантехнічного обладнання, яке є у нас, воду протягом 24 годин на добу подавати просто неможливо - втрати узагалі будуть колосальні.

Свердловини на Львівщині старі. Особливо ті, що на заході та півночі, бо безперервно працюють понад 40 років. Окремі з них пробурювали додатково, але й це не дало бажаного ефекту. Не кращою є ситуація і з водогонами. Західні принаймні виготовлені із чавуну, і їх не потрібно замінювати. А от нові, залізобетонні, уже давно на ладан дихають.

Справжньою «дірою» у водопостачанні, яка поглинає немало необлікованої води, є сільські мережі (люди поливають городи і т. ін.).

Зважаючи на усі ці перераховані біди, один закордонний фахівець зауважив, що коли б він мав чарівну паличку - насамперед забажав би ліквідувати усі витоки. І поінформував, що, на думку американців, на якомусь етапі перехід до більш досконалої пластмасової трубопровідної системи є просто неминучий.

Американських і датських спеціалістів із водопостачання турбує також питання достовірності даних, що їх подав «Львівводоканал». Пояснюють свою тривогу тим, що кошти під проект будуть обмеженими, тому потрібно знати напевне, де найболючіше місце, аби їх туди вкласти. Найближчим часом усі цифри від «Львівводоканалу» будуть детально перевірені і вивчені.

На семінарі також велася мова про проект «Вода-98», висловив свою позицію представник Світового банку Уолтер Статмен. Після обговорення проблеми на семінарі закордонні спеціалісти повернуться до інтенсивної праці. Немає сумніву, що незабаром вони подадуть готовий проект, який, судячи із попередніх напрацювань, міститиме немало цікавих і слушних ідей.

Галина МИЦЬ.

На фото: Керівник проекту ЕРТ Олександр Сіпиний;

Представник Агенції США з міжнародного розвитку Ді Свонсен.

Фото Володимира ДУБАСА

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BEST AVAILABLE DOCUMENT

*Water Supply

IF AMERICANS HAD A MAGIC WAND, FIRST OF ALL THEY WOULD PLUG ALL [OUR] LEAKS

Lviv's water supply problems seem as old as the city itself, possibly because there hasn't ever been an actual increase in the water supply, regardless of all the talk on this subject.

Now, foreign specialists have undertaken to assist our own in tackling this complex problem. Representatives from the EPT Project (under the framework of the US Agency for International Development) and specialists from the Danish COWI consultants, who have been working in Lviv since the new year and are in the process of equipping their office in the premises of Lviv Vodokanal, described their observations and their take on the problem during a seminar which took place last week in City Hall.

The project that these foreign specialists want to establish is supposed to differ from others primarily by not relying on some imaginary huge sums that aren't and will never be available, but by applying those funds that can realistically be sourced to solve this problem. So, it being a well-known fact that USAID donates assistance outright to many countries, perhaps it will be possible for Ukraine to obtain some, too. About $20-25 million dollars are in the offing, and the new project should just about fit the bill.

According to the presentations at the conference, foreign specialists see the Lviv water supply system as complex and highly specific. The main reason is that the city takes water only from wells, and transports it great distances -- up to 80-100 km. Second, equipment for this arrangement is both out of date and ineffective. And one of the greatest complications is that since about 1950, all water mains in new districts have been built from totally inappropriate materials, so that today they are practically rusted through and falling apart. Moreover, we have a unique situation where the inside of the mains is more deteriorated than the outside (due to our so-called "aggressive" water -- saturated with hydrogen sulfide). These and other factors led the foreign specialists to conclude that the problem cannot be resolved within one or two years; rather, it will take at least a decade.

During the conference, the specific steps that need to be taken were defined in detail. For example, it will be imperative to decrease electric energy consumption, since in today's prices electricity comprises 60% of the value of water supplied (pumps are needlessly working 24 hours per day, and 7 of the pumping stations have unnecessarily powerful engines of 880 kilowatts each).

A second strategy will be to tackle the problem of too much water usage. It seems that in Lviv, average water consumption is as high as in Tallinn or Copenhagen. But the sad fact is that Lviv residents don't even receive this "excess" of water -- out of 400 cubic meters [per capita] sourced from the well fields, only 250 cubic meters reach Lviv, and the rest is lost.

These losses are observable at literally every stage of the water supply system: at the well fields, in the water mains, and even in residential buildings through broken plumbing. The situation is complicated even more by the fact that only 17% of the water is metered. It was ironic to discover that Lviv actually does have some experience in conserving water: back in 1928, the city was able to postpone constructing new well fields for five years thanks to a water savings program.

The foreign specialists also observed that, given the awful quality of our existing plumbing equipment, it would be simply impossible to establish a 24-hour supply of water -- the losses would be colossal.

What's more, the wells in the Lviv environs are old, particularly those in the northern well field which have been in use for over 40 years. Some of them were re-bored, but even this measure did not have the desired effect. And the situation with the water mains is no better. At least the western ones are made of cast iron, so they don't need to be changed, but the new reinforced concrete ones are on their last legs already.

Another "black hole" in the water supply system, sucking in incalculable amounts of water, are the villages and garden plots surrounding Lviv.

As one foreign specialist put it, taking into account all these additional factors, it would be great to be able to wave a magic wand and at least make all the leaks go away. The American side also expressed the opinion that sooner or later it will be necessary to change over to better-performance plastic pipes.

The American and Danish water supply specialists were rather concerned about the reliability of data presented by Lviv Vodokanal. Their reasoning was that since the funds provided for this project would be limited, it was important to know exactly where the most critical need was, in order to apply them effectively. All the Lviv Vodokanal figures were to be reviewed and studied in detail in the near future.

During the seminar, the Voda '98 project was also discussed, and a statement was made by Walter Stottmann, representing the World Bank. After the conclusion of the seminar, the foreign specialists will return to their intensive work. We have no doubt that they will soon submit a project proposal that, judging from accumulated results thus far, will include many interesting and worthwhile ideas.

Halyna MYTS

photos: *EPT Project Leader Alexander Sipivy*
Lea Swanson, representing the US Agency for International Development
photos by Volodymyr DUBAS

Moloda Halychyna (Young Galicia, a thrice-weekly Western Ukrainian newspaper with a press run of @32,000), No. 39, 4 April 1996, p.1

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