

# UKRNII PROGRESS- УКРНИИПРОГРЕСС



EAP Task Force of the OECD

## Ukraine: WATER AND SEWERAGE UTILITIES PERFORMANCE

ANALYTICAL PART – ANALYSIS OF INDICATORS

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**Scientific- Research Institute of the Advanced Technologies in Communal Services**

**(UKRNIIPROGRESS)** is a non-governmental research centre for communal sector reform in Ukraine. It was established to identify, analyse and promote the advanced technology and economic solutions to the water and wastewater services in urban areas of Ukraine. Main goals of the Institute work are: advanced technologies in water network and infrastructure; wastewater treatment and biogas collection, treatment and clean-up of the water and wastewater sludges, solid waste utilisation, water and wastewater economics.

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**EAP Task Force** is a mechanism for co-operation among the OECD countries, international financing institutions, Central and Eastern Europe and Central Europe, the Caucuses and Central Asia that works within the Environment for Europe Process. Its main objective is to assist NIS authorities to reform their environmental policies and help resolve most urgent problems threatening public health in the spirit of sustainable development.

Ministerial Consultations on water management and investment in EECCA held in Almaty, Kazakhstan (October, 2000) within the EAP Task Force framework confirmed urban water sector as a priority area. In Almaty ministers of economy/finance and environment adopted Guiding Principles for Reform of the Urban Water Supply and Sanitation Sector in the NIS. The ministers invited the EAP Task Force “to use the Guiding Principles as a framework for elaborating a focused programme of work to support the NIS in reforming their urban water and sanitation sectors”.

EAP Task Force co-operates with the NIS governments, including water authorities, aiming to strengthen their commitment to the urban water sector reforms. In doing so, the Task Force will promote exchange of lessons learned in donor demonstration projects and in national reform efforts, and will distil and disseminate best practices among all EECCA countries. In order to provide practical inputs in this process, the Task Force will assist donors and IFIs in developing demonstration projects in selected NIS aiming at policy and regulatory reforms and elaborating practical guidelines for the implementation of the key elements of the Guiding Principles.

## CONTENTS

<b>INTRODUCTION .....</b>	<b>4</b>
<b>ANALYSIS OF OPERATIONAL AND FINANCIAL INDICATORS OF UKRAINIAN WATER AND SEWERAGE UTILITIES .....</b>	<b>6</b>
<b>Water and sewerage coverage .....</b>	<b>6</b>
Water coverage .....	6
Sewerage coverage .....	7
Water production .....	8
Water consumption.....	10
Unaccounted-for water .....	12
<b>Metering practices .....</b>	<b>13</b>
<b>Service quality.....</b>	<b>15</b>
Water distribution network malfunctions.....	16
Sewerage malfunctions.....	16
Water and sewerage service quality complaints.....	17
Uninterrupted daily service .....	18
Wastewater treatment .....	18
<b>Analysis of service costs .....</b>	<b>20</b>
Operational costs .....	20
Payroll as a proportion of operational costs .....	21
Staffing .....	22
Proportion of contracted-out services.....	24
Debt service costs .....	26
<b>Analysis of service revenues.....</b>	<b>26</b>
Water service revenues .....	26
Service efficiency .....	27
Accounts receivable analysis.....	28
<b>Tariff policy.....</b>	<b>29</b>
Water supply charges to personal income ratio.....	30
Ratio of industrial to residential charges per cubic meter .....	30
<b>Utility investment policy .....</b>	<b>32</b>
<b>Energy consumption.....</b>	<b>34</b>
<b>Environmental impact of utility operations .....</b>	<b>34</b>
<b>CONCLUSIONS and SUGGESTIONS.....</b>	<b>36</b>

<b>APPENDIX 1. LIST OF UKRAINIAN UTILITIES COVERED BY THE SURVEY .....</b>	<b>38</b>
<b>APPENDIX 2. RESULTS OF INDICATIVE SURVEY OF UKRAINIAN UTILITIES ...</b>	<b>31</b>
<b>APPENDIX 3. RESULTS OF INDICATIVE SURVEY OF UKRAINIAN UTILITIES BY GROUPS.....</b>	<b>0</b>

## INTRODUCTION

The existing statistical reporting forms *I-vodoprovod* (water service), *I-kanalizatsia* (sewerage service) and *I-vodkhoz* (water use and management) do not enable a full comparative analysis of water utilities' results of operations. While the efforts of Ukraine's State Committee for Housing and Utility Infrastructure (*Derzhzhitlokommungosp*) to streamline some of the indicators by region make them comparable at a certain point, no sector-wide analysis of utility operations is performed in Ukraine based on internationally recognized criteria.

Given the dilapidated state of the water and sewerage infrastructure in Ukraine, aggravated by frequent breakages and heavy water losses with the ensuing water service interruptions, and steadily rising operational costs, some water utilities are seeking foreign capital to deal with the challenges. Their experience indicates that when estimating the feasibility of and returns on investments in Ukrainian water utilities, foreign investors first and foremost consider their operational efficiency and financial strength.

Upon the initiative of the World Bank, an integrated set of indicators was designed and formalized, and a minimum list of major parameters developed for the water sector to benchmark the efficiency of utility operational and financial activities.

The data obtained in the course of the survey has been evaluated using a system of indicators that describe the level of availability of water and sewerage service, the technical and financial condition of utilities, and the economic and environmental aspects of water use.

This report summarized the findings of an indicative survey of Ukrainian water and sewerage utilities (hereinafter, the "Survey") which covered 61 enterprises<sup>1</sup> that volunteered for participation, of which 53 are dedicated water and sewerage utilities and only eight represent diversified housing and utility operators. In the city of Kharkiv, water and sewerage services are provided separately by two operators (*Kharkivkommunpromvod* and *Kharkivkommunochistvod*, respectively). The user base served by participating utilities is 3,620.7 thousand persons, or approximately 11.3% of total Ukrainian population with access to centralized water supply.

Pursuant to the work programme under the assignment *Determination of Efficiency of Water Use and Management Systems in Ukraine*, agreed with the OECD as project originator and the *Derzhzhitlokommungosp* of Ukraine with endorsement by heads of regional utility authorities, the Survey covered four Ukrainian regions as shown in Pic. 1:

- Transcarpathian region – 11 utilities.
- Lviv region – 20 utilities.
- Mykolaiv region – 7 utilities.
- Kharkiv – 23 utilities.

Some of the utilities were unable to provide source data for indicator calculations in full or of adequate quality. The questions that gave rise to difficulties in filling out the questionnaires include the following:

- The number of water and sewerage service connections.
- Average monthly per capita income.
- Number of metered connections.
- Proportion of metered water billed.

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<sup>1</sup> The list of Ukrainian utilities covered by the Survey is presented in Appendix 1.

- Number of water and sewerage service complaints.
- Number of water and sewerage network failures.
- Proportion of non-cash utility revenues.

Accordingly, consolidated indicators were computed based on the source data for those utilities that had provided information required for their derivation.

### **The international benchmark**

Anglian water was selected as a benchmark for the study as it is one of the leading providers of water and wastewater services in the UK that participated in the World Bank study in 1996 and later. The World Bank database has Anglian Water performance indicators, which are useful for comparison. Located in the east of England, it serves the needs of over five million industrial, commercial and domestic customers. It has a similar mix of customers as large Russian utilities and its size is comparable with the oblast level provider.

## Analysis of operational and financial indicators of Ukrainian water and sewerage utilities

### Water and sewerage coverage

#### Water coverage

Indicators used:

##### **Indicator 1.1** Water coverage, %

Over the period under review, water coverage in the surveyed Ukrainian communities declined from 84.6% to 81.77%. Indicator values decreased in the Lviv region (by 8.5%) and the Kharkiv region (by 0.7%).

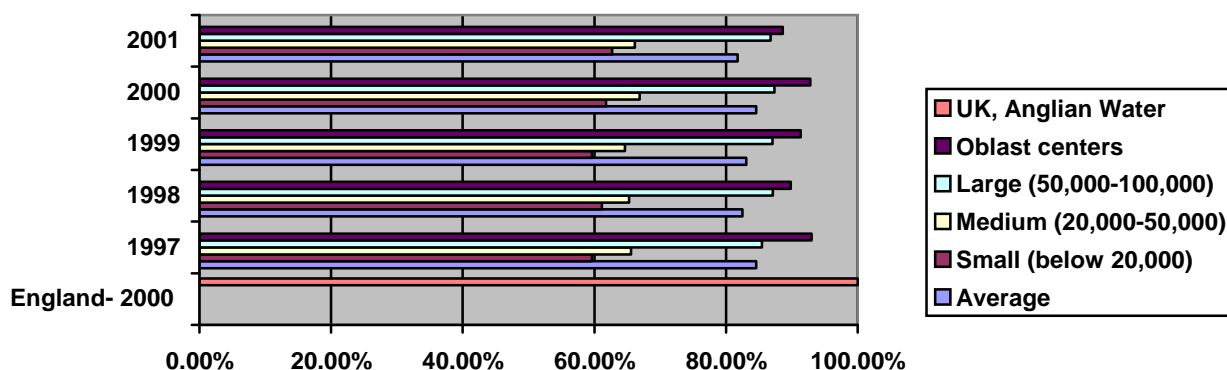
The *Lvivvodokanal* utility, located in the region's capital city of Lviv, and the Zolochiv utility account for the bulk of the dramatic overall drop in the region (with coverage over 1997-2001 going down from 90% to 77% and 90 to 85%, respectively). Other operators exhibited an increase in coverage, albeit an insignificant one. As of the end of 2001, five regional utilities reported 100% water coverage. These include the water utilities of Peremyslyany, Morshin, Zhydachiv, Truskavets and Novoyavoriv. In the areas served by the Staryy Sambir and the Skole water utilities, just slightly over four out of each 10 residents had access to water service.

In the Kharkiv region, water coverage totaled approximately 83%. The capital city utility, *Kharkivkommunpromvod*, showed a rather high indicator value of 93%, with a slight drop to 92% in 2001. Nine regional operators reduced coverage, with the largest declines reported by the Vovchansk water network unit (from 31 to 26% over the analyzed period), and the utilities in Pervomaisky (from 86 to 80%), Lozova (from 81 to 76%) and Nova Vodolaga (from 62.08 to 54.58%).

The highest indicator values (approximately 93%) throughout the period under review were maintained by the Mykolaiv region utilities, a direct result of solid performance by the *Mykolaivvodokanal* (99.94%), the Yuzhnoukrainsk Nuclear Power Plant Utility Service (100%) and the *Gorvodokanal* of Bashtanka (99.59%). Two operators (*Gorsnab* in Voznesensk and the Pervomaysk utility) as of the end of 2001 reported coverage at under 70%.

The lowest water coverage was in the Transcarpathian region. Three Transcarpathian operators (in Volovets, Vinohradov and Svaliava) covered less than half of local residents with water service, while the Mizhghiria utility showed the lowest indicator among all surveyed Ukrainian utilities (28.04% as of the end of 2001). Only the *Gorvodokanal* of Mukacheve and the Uzhhorod utility reported coverage above 90%.

#### Indicator 1.1 Water coverage



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>

## Sewerage coverage

Indicators used:

### **Indicator 2.1** Sewerage coverage, %

Sewerage coverage in the surveyed Ukrainian communities is much lower than their water service performance. As of the end of 2001, coverage averaged 66.21%, an increase of 2% compared to 1997 that can be explained by the inclusion of the *Kharkivkommunochistvod* with 75% in the consolidated calculations for 1999.

Notably, average indicator values for 2001 were virtually identical in all four regions: 64.04% in the Kharkiv region, 65.53% in the Transcarpathian region, and over 68% in the Mykolaiv and the Lviv regions.

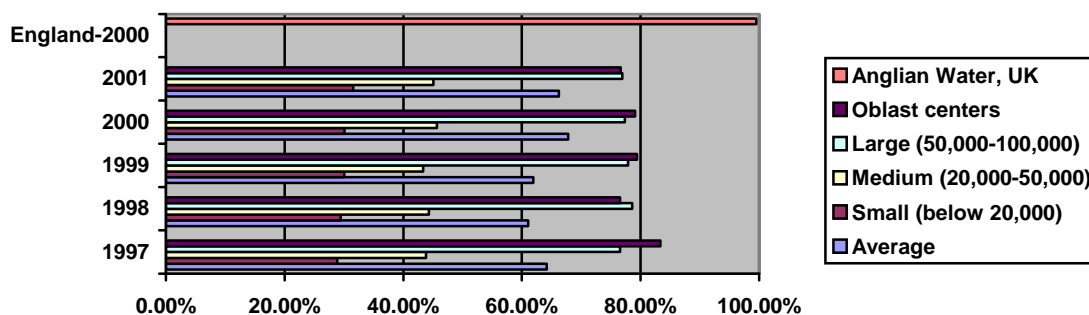
In the Lviv region, sewerage coverage declined by more than 6%, primarily due to the drop at the *Lvivvodokanal* from 83% in 1997 to 75% in 2001. Three other local operators showed a decline of 3%, including the *Drohobychvodokanal* (from 72 to 69%) and the Zolochiv utility (from 70 to 67%). The Peremyslyany utility deserves a separate mention, having managed to increase sewerage coverage by 13% over the period from 1998 to 2001. The *Yavorivvodokanal* does not provide sewerage services. The minimum indicator value over the surveyed period was reported by the *Sokalvodokanal*, with coverage at a mere 3% of local community. The *Brodyvodokanal* and the Skole and Horodok utilities averaged approximately 20% coverage. The highest performance was demonstrated by the water utilities in Morshin and Truskavets (99 and 98%, respectively, in 1997-2001).

Two towns in the Kharkiv region (Kolomak and Vovchansk) have no centralized sewerage service. Sewerage coverage is also extremely low in areas served by the Kharkiv district water authority (3%), the Lyubotyn utility (8%) and the Barvenkovo utility (11%). The Shevchenkovo and the Pervomaisky utilities stand out prominently with 83 and 77%, respectively, or 8% and 2% above the regional capital city. Over the analyzed period, sewerage coverage increased by 10-14% at several utilities. These include Zachepilovka (an increase from 20% in 1997 to 34% in 2001), Krasnohrad (from 38 to 49%), Balaklya (from 30 to 40%) and Nova Vodolaga (from 38 to 45%).

As one of the seven participating Mykolaiv region utilities (the Novyy Bug *Vodoprovod*) provides only water service, while the *Svitanok* utility did not provide any data required for the calculation of this indicator, average indicator values for the region in general remained unaffected by the high performance of the Yuzhnoukrainsk Nuclear Power Plant Utility Service (99.6%) and the *Mykolaivvodokanal* (82.94%). In the towns of Bashtanka and Voznesensk, less than 30% of residents had access to sewerage service over the surveyed period.

In the Transcarpathian region, the *Gorvodokanal* of Mukacheve reported the best sewerage service performance (88.98%) as of the end of 2001, with growth over the surveyed period totalling 13%. Major growth was also shown by the Vinohradov utility (from 23.62% in 1997 to 39.75% in 2001). Other solid performers include the utilities of Uzhhorod (83.56%) and Irshava (80.88%). The lowest sewerage coverage as of the end of 2001 was reported by the Mizhgiria utility (11.7%).

### **Indicator 2.1 Wastewater coverage**



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>



## Water production

Indicators used:

**Indicator 3.1** *Daily water production per consumer, lpcd*

**Indicator 3.2** *Monthly water production per connection, m<sup>3</sup>*

**Indicator 3.3** *Monthly water production per household, m<sup>3</sup>*

Throughout the period under review, water production per consumer across all Ukrainian utilities covered by the Survey decreased by 12%, from 512 lpcd in 1997 to 467 in 2001. Water production per connection declined by 22% (from 190.95 to 147.94 cubic meters per connection) and production per household dropped by 20%, from 44.37 to 35.31 cubic meters per household. A decline in all three indicators could be observed in all regions throughout the period under review.

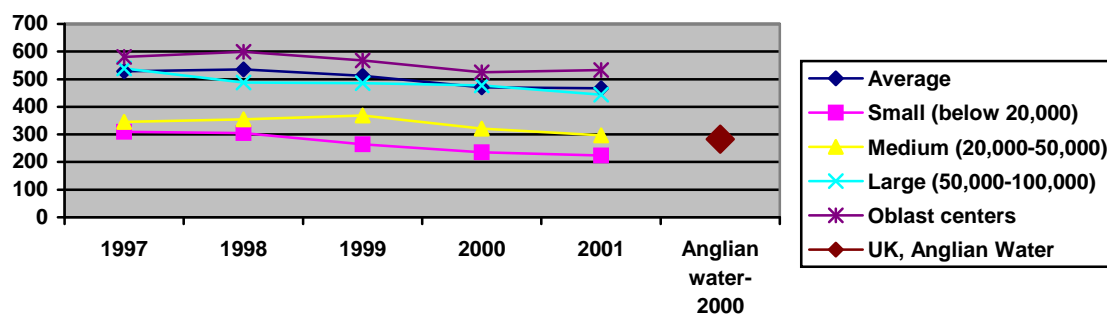
Minimum indicator values were reported by the Transcarpathian region operators (382 lpcd and 323 lpcd over the analyzed period; 46.75 and 40.28 cubic meters per connection; 37.21 and 29.43 cubic meters per household), with all utilities exhibiting a downward trend. The sole exception is the Velyky Bereznii utility that showed a 15% increase in water production per consumer and household and a 14% increase in water production per connection. Nine of the eleven regional utilities reported indicator 3.1 values as of the end of 2001 at 200-250 lpcd. At the *Gorvodokanal* of Mukacheve, water production exceeded 460 lpcd, vs. the Uzhhorod utility with 310 lpcd.

Throughout the period under review, water production in the Kharkiv region was the highest among the four surveyed regions. The best indicator 3.1 performance was reported by the *Kharkivkommunpromvod* at 618 lpcd in 1997, down to 573 lpcd in 2001. The Chuhuyiv and the Lozova utilities produced over 460 lpcd per consumer. However, three local operators (in Zachepilovka, Shevchenkovo and Valki) showed the lowest production among all surveyed utilities, at as little as 100 lpcd. Overall water production in the region decreased by 43 lpcd to 42.98 cubic meters per connection and 5.35 cubic meters per household, with nine utilities showing growth, most visible at the Izyum utility, which reported a 38% increase in water production in 2001 to 380 lpcd.

In the Mykolaiv region, overall monthly water production per consumer dropped 13%, with major declines reported at the *Svitanok* utility in Nova Odesa (more than 100%), the *Novyy Bug Vodoprovod* (by 1.8 times), the *Gorsnab* in Voznesensk (by 1.7 times) and the *Gorvodokanal* of Bashtanka (by 1.5 times). Overall, water production per connection in the Mykolaiv region over the analyzed period decreased from 40.45 cubic meters in 1997 to 33.24 cubic meters in 2001. The major variations in indicator values in 2001, from 9.63 cubic meters at the *Svitanok* to 1,389.3 cubic meters at the Yuzhnoukrainsk Nuclear Power Plant, testify to vast differences in community infrastructure and housing conditions. Over the period from 1997 to 2001, the indicator value for the *Mykolaivvodokanal* went down from 277.57 to 226.26 cubic meters, i.e. by 18.5%. In physical terms, the drop totalled 51.31 cubic meters. Water production per household in the region, despite a slight increase of 8.6% in Pervomaysk, also decreased by 19.58 cubic meters, going down from 40.45 to 32.53 cubic meters a month, and from 47.73 to 38.73 cubic meters (or 20.45%) at the *Mykolaivvodokanal*. The heaviest declines were reported by the *Svitanok* utility (51.89%), the *Novyy Bug* water network (48.5%) and the *Gorsnab* of Voznesensk (73.9%).

In the Lviv region, water production over the five years generally declined. Only the Zhovkva utility was able to increase production, both per consumer (by 50 lpcd) and per household (by 7.74 cubic meters). Major drops were reported by the Zolochiv utility, that in 2001 produced as little as 40% of its 1997 volumes, and the *Yavorivvodokanal*, the Staryy Sambir utility, and the Horodok utility that reduced production by nearly 50%. Two utilities in the Lviv region (*Morshinvodokanal* and *Truskavetsvodokanal*) produced in 2001 more than 650 lpcd.

### Indicator 3.1 Water production (lpcd)



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>

## Water consumption

Indicators used:

**Indicator 4.1** *Monthly water consumption per consumer, lpcd*

**Indicator 4.2** *Monthly water consumption per connection, m<sup>3</sup>*

**Indicator 4.3** *Monthly water consumption per household, m<sup>3</sup>*

Overall, throughout the period under review water consumption per consumer in Ukraine steadily declined, from 385 lpcd in 1997 to 320 as of the end of 2001. The surveyed regions generally followed the downward trend in consumption, and only the Mykolaiv region in the period from 1997 to 1999 reported indicator growth from 290 to 300 lpcd.

In the Transcarpathian region, water consumption per consumer dropped by a hefty 30%, from 330 lpcd in 1997 to 230 lpcd in 2001, and in 2001 was the lowest among all surveyed regions. Six of the eleven utilities exhibited a steady decline pattern, with slight upwards and downwards fluctuations among the remaining five operators. Overall, 2001 indicator values were lower than those in 1997 for all utilities. The Rakhiv utility reported the least consumption per consumer throughout 1997-2001 at 142 lpcd in 1997 and 95 lpcd in 2001, while the *Gorvodokanal* of Mukacheve scored the highest consumption performance with 425 in 1997 and 267 lpcd in 2001.

High indicator values (above national average) were observed in the Kharkiv region (444 and 370 lpcd as of period beginning and period end, respectively) throughout the analyzed years. In Shevchenkovo, Krasnohrad, Chuhuyiv and Balaklya, unit consumption decreased by nearly 50%, while other utilities reported insignificant declines. The *Kharkivkommunpromvod* scored the highest consumption per consumer with 451 lpcd in 2001. Minimum consumption (80 lpcd) was reported at the Barvenkovo utility.

Lviv region utilities showed rather high indicator values in 1997, with nearly half of the operators reporting above 330 lpcd. As of the end of 2001, the number of such utilities dwindled to just three. At the Zolochiv utility, unit consumption declined by 2.6 times. The maximum indicator value in 1997-2001, despite the overall reduction, was reported by the *Morshinvodokanal* (782 lpcd in 1997 and 610 cubic meters in 2001).

Overall unit consumption in the Mykolaiv region over 1997-2001 decreased from 290 cubic meters to 275 lpcd. The only growth case (to 305 lpcd in 2001 from 295 lpcd in 1997) was reported by the *Mykolaivvodokanal*. The *Svitanok* utility (Nova Odesa), that had the lowest indicator value in 1997 at 100 lpcd, slipped down further to 43 cubic meters in 2001 (or by 2.2 times), which is dangerous for public health reasons. The Novyy Bug *Vodoprovod*, the *Gorvodokanal* of Bashtanka and the *Gorsnab* utility (Voznesensk) saw unit consumption reduce by 1.6 times.

The analysis of monthly consumption per connection indicates that its overall change pattern in Ukraine is identical to that of consumption per consumer and is represented by an obvious downward trend. Overall consumption per connection over the surveyed period decreased by 28% against a 17% drop in consumption per consumer.

The decline pattern in consumption per connection subsisted in all four regions throughout the period under review, with only the Mykolaiv region that showed a slight increase from 101.81 to 102.85 cubic meters in 1997-1999. Overall, all utilities in this region exhibited reduced consumption per connection. The maximum indicator value in the region, and in Ukraine in general, was reported by the Yuzhnoukrainsk Nuclear Power Plant at 2,854.86 cubic meters in 1997 and 1,263.24 cubic meters in 2001, exceeding the performance of *Svitanok* (Nova Odesa) by 157.2 and 146.7 times, respectively.

The lowest indicator 4.2 values could be observed in the Transcarpathian region that reported an additional drop of 29% by the end of the surveyed period. The most vivid example is the Vinohradov utility, with the indicator value decreased by nearly three times, from 600.27 cubic meters in 1997 to 212.31 cubic meters in 2001.

The Lviv region demonstrated higher than average consumption per connection. Major declines in the indicator values were reported by the Peremyshlyany utility (a drop of 59%), the *Yavorivvodokanal* (44%),

the Horodok utility (46%), the Zolochiv utility (64%) and the *Stryyvodokanal* (44%), with the highest consumption observed at the *Lvivvodokanal* (873.94 cubic meters per connection in 1997 and 660.16 cubic meters in 2001) and *Truskavetsvodokanal* (473.87 and 344.26 cubic meters).

The highest indicator value was registered in the Kharkiv region and totaled 187.17 cubic meters per connection in 1997 and 134.72 cubic meters in 2001. Two utilities (in Kolomak and Kupyansk) reported growth of 2.3% and 64%, respectively. The highest consumption per connection was at the *Kharkivkommunpromvod* (475.37 cubic meters in 1997 and 354.21 cubic meters in 2001).

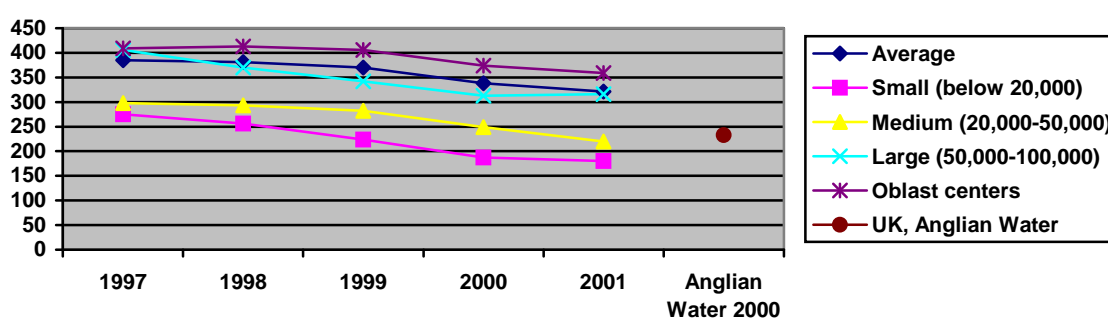
Monthly consumption per household decreased both nation-wide and locally, with the Mykolaiv region being the sole exception again and reporting slight growth from 23.89 to 24.3 cubic meters per household in 1997-1999.

Of the Mykolaiv region utilities, the Yuzhnoukrainsk Nuclear Power Plant Utility Service stands out with nearly three and two times the average regional unit consumption in 1997 and 2001, respectively.

Growth was also reported at the Velyky Berezhniy utility in the Transcarpathian region (from 19.45 cubic meters per household in 1997 to 22.44 cubic meters in 2001) and two utilities in the Kharkiv region, namely Izyum (from 13.36 to 13.84 cubic meters) and Chuhuyiv (100% growth).

The most dramatic reduction in consumption was at the Vinohradov utility in the Transcarpathian region (from 93.46 cubic meters in 1997 to 17.32 cubic meters in 2001, i.e. by 5.4 times). The average indicator value in the Lviv region in 1997 was somewhat lower than overall national performance and the lowest among all regions as of the end of 2001. Two local operators (the *Yavorivvodokanal* and the Zolochiv utility) reported a decline of 52% and 62%, respectively. Maximum consumption per household throughout the period under review was sustained by the Pervomaisky utility in the Kharkiv region (207.29 and 130.51 cubic meters in 1997 and 2001, respectively).

#### Indicator 4.1 Water consumption, lpcd



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>

## Unaccounted-for water

Indicators used:

**Indicator 6.1** *Unaccounted-for water as a proportion of total water produced, %*

**Indicator 6.2** *Unaccounted-for water per km of water distribution network per day, m<sup>3</sup>*

**Indicator 6.3** *Unaccounted-for water per connection per day, m<sup>3</sup>*

Unaccounted-for water as a proportion of total water produced, defined as the difference between produced potable water delivered to the water distribution network and water billed, is the most common water loss indicator used in practice. Total losses at all Ukrainian utilities as of the end of 2001 amounted to 192 million cubic meters, or 31.15% of all water produced. Therefore, over the five years, losses somewhat increased, given that in 1997 only 27.1% of produced water was lost on its way to the consumer.

In the Lviv region, overall indicator **6.1** in the period under review increased by 2%, from 33.4% in 1997 to 35.41% in 2001. Only two operators (the *Drohobychvodokanal* and the Staryy Sambir utility) reported decreased losses (by 7% and 3%, respectively). Three local utilities (*Zhovkva*, *Peremyslyany* and *Truskavetsvodokanal*) as of the end of the last analyzed year were losing more than a third of all water produced. The highest indicator value (above 40% throughout 1997-2001) was reported by the *Lvivvodokanal*. At the *Novoyavorivvodokanal*, the minimal 0.9% in 1997 was followed by 8.2% in 1998 with further growth to 14.7% in 2000, and finally, a drop to 6.5% in 2001.

The Mykolaiv region should be credited with a slight decline in the indicator value (from 40.83% in 1997 to 34.75% in 2001) that was primarily due to decreased water losses at the *Mykolaivvodokanal* (from 46.45% to 37.27%). In 2001, the highest losses were reported by the *Gorsnab* utility in Voznesensk (55.67%) and the Pervomaysk utility (31.91%), with other operators staying within the range from 9.07% (the Yuzhnoukrainsk Nuclear Power Plant Utility Service) to 17.78% (the *Gorvodokanal* of Bashtanka).

The quickest increase in water losses (from 13.42% to 28.92% in 2001) was among the Transcarpathian region utilities, the Berehove utility taking the lead with a 5.5 times growth in 2001, followed by 100% growth at the *Gorvodokanal* of Mukacheve and the Uzhhorod utility.

The maximum indicator value among all Survey participants (60%) as of the end of 2001 was reported by the Chuhuyiv utility in the Kharkiv region, compared to the 24% maximum of 1997. The Shevchenkovo utility scored minimal water losses (1% in 1997, 2% in 1998-2000 and 3% in 2001). In the capital city of Kharkiv, losses at the *Kharkivkommunpromvod* increased by 7% to 28% in 2001.

The analysis of daily water losses per km offers more detailed information on water losses compared to the broad picture provided by the first indicator. Nation-wide, daily losses per km over the analyzed period went down by 4.5 cubic meters totalling 43.5 cubic meters per km in 2001. The highest indicator values were reported by utilities in the capital cities of Kharkiv (88.01 cubic meters), Mykolaiv (79.38 cubic meters) and Lviv (80.35 cubic meters).

Despite a 23% decline over the five years, in the Lviv region the indicator value is the highest among all Survey participants (50.48 cubic meters per km of network), while the water utilities of Drohobych and Lviv can be credited with a major decrease in water losses (by 35 and 18.5 cubic meters, respectively).

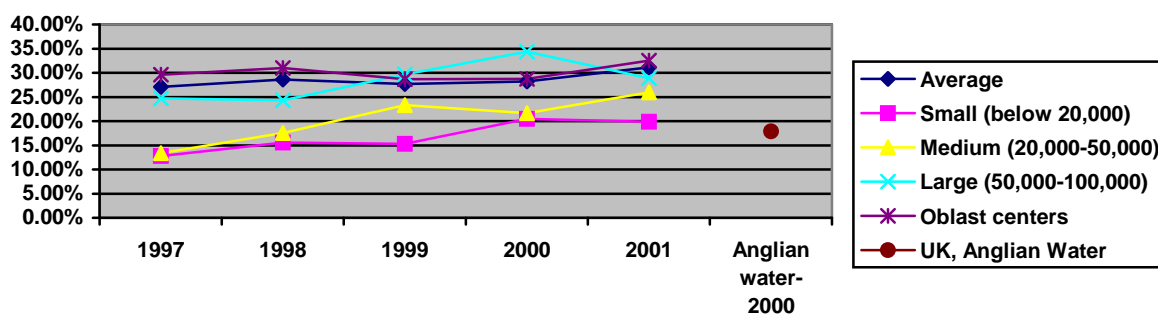
In the Mykolaiv region, overall losses per each km of network decreased by 21.74 cubic meters. At the *Mykolaivvodokanal*, losses declined from 145.78 in 1997 to 79.38 cubic meters in 2001 due to systematic loss minimization efforts. The same applies to the Novyy Bug *Vodoprovod* and the *Gorsnab* (Voznesensk), which reported drops from 3.11 to 0.79 cubic meters and from 21.27 to 13.87 cubic meters, respectively, over 1997-2001. At the same time, two utilities showed increased water losses per km. These include the Pervomaysk utility, with losses increasing by 3.65 times to 10.56 cubic meters in 2001 compared to 2.80 cubic meters in 1997, and the Yuzhnoukrainsk Nuclear Power Plant Utility Service with growth totalling 4.68 times, from 3.55 cubic meters in 1997 to 16.61 cubic meters in 2001.

In the Kharkiv region, water losses over the surveyed period increased by 5.4 cubic meters per km, the major contributors being the *Kharkivkommunpromvod* (an increase of 12.7 cubic meters) and the Chuhuyiv water utility (50 cubic meters). The minimum indicator value (0.52 cubic meters) was reported by the Shevchenkovo utility.

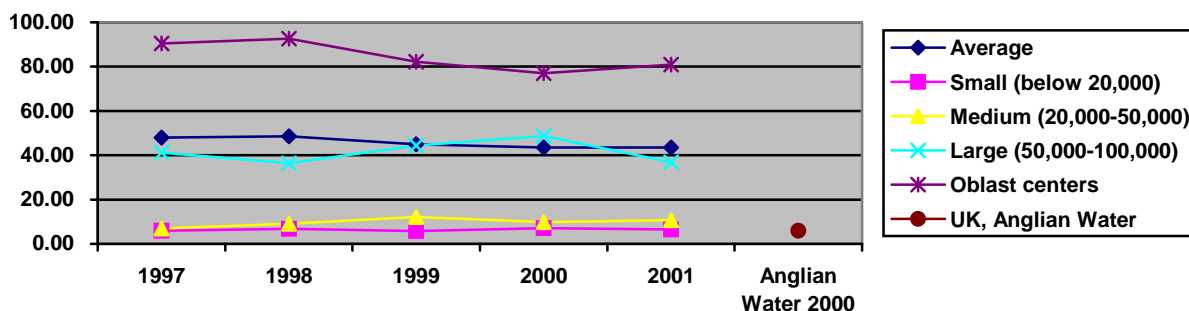
The largest growth of losses per km was registered in the Transcarpathian region, where losses increased from 17.54 cubic meters in 1997 to 33.19 cubic meters in 2001 at all utilities except Irshava and Volovets who reported reduced losses. The Berehove utility stands out with a nearly five-fold surge in water losses, while the maximum indicator value of 95.48 cubic meters was shown by the Rakhiv utility.

In terms of unaccounted-for water per connection a day, losses in Ukraine in general decreased by 0.22 cubic meters, with the pattern of the indicator across the regions and utilities similar to that of the previous indicator.

**Indicator 6.1 Unaccounted-for-water (%)**



**Indicator 6.2 Unaccounted for water (cub.m/km a day)**



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>



## Metering practices

Indicators used:

**Indicator 7.1** *Proportion of metered connections, %*

**Indicator 8.1** *Proportion of water billed per meter readings, %*

**Indicator 5.1** *Metered monthly water consumption per customer, m<sup>3</sup>*

**Indicator 5.2** *Metered monthly water consumption per connection, m<sup>3</sup>*

**Indicator 5.3** *Metered monthly water consumption per household, m<sup>3</sup>*

Metered water consumption per consumer throughout the period under review showed no steady pattern, moving up and down in 0.3-0.5 cubic meter increments. Most of the participating utilities were unable to provide source data required for the calculation of metered consumption and metering practice indicators.

A steady increase pattern was observed in the Transcarpathian region and the Mykolaiv region. In the former, the value of indicator 5.1 was 5 to 7 times lower than the national average and fluctuated between 0.43 cubic meters in 1997 and 0.54 cubic meters in 2001.

Metered water consumption per consumer in the Mykolaiv region was much higher and, while lower than the national average in the first three years under review, in 2000 and 2001 exceeded it by 1.5 and 1.3 times, respectively. This is the best performance across all of the four regions. The *Mykolaivvodokanal* exhibited a steady growth in metered consumption in 1997-2001, capping at 5.56 cubic meters per consumer by the end of the analyzed period, the maximum indicator value among all surveyed utilities.

The change pattern of metered consumption per connection across Ukraine is similar to the dynamics of the previous indicator, with an upwards trend evolving only in the last two years of the analyzed period.

The lowest indicator values were registered in Transcarpathian region. After major growth (by a factor of 1.5) in 1997-1999, performance slightly dropped in the subsequent two years, totalling 4.38 cubic meters per connection by the end of the analyzed period.

A clear growth trend was observed in the Mykolaiv region, where the value of indicator 5.2 tripled from 17.26 to 51.73 cubic meters, primarily driven by the performance of the *Mykolaivvodokanal* (85.17 cubic meters in 2001 compared to 28.24 cubic meters in 1997).

In the Lviv region, indicator values for 1997 and 1999 were considerably lower than in other years. This is explained by the absence of period data for the *Lvivvodokanal*, which in the following years reported the highest performance both in the region and nation-wide at above 200 cubic meters per connection.

In the Kharkiv region, the value of this indicator is higher than the national average, totalling 66.57 cubic meters in 1997 and 44.02 cubic meters in 2001. The highest growth rate in the region was reported by the Valki utility, where the indicator value increased by 28 times, from 0.11 cubic meters per connection in 1997 to 3.07 cubic meters in 2001.

The change pattern of metered consumption per household across Ukraine is similar to the dynamics of the previous two indicators, with upward and downward fluctuations within the range of 1-1.5 cubic meters.

The values of indicator 5.3 in the Transcarpathian region and the Mykolaiv region exhibit a growth trend, with the Transcarpathian region reporting the lowest metered consumption among the regions covered by the Survey at 1.28 cubic meters per household in 1997 and 1.51 cubic meters in 2001. The Khust utility in the Transcarpathian region stands out among the local operators with growth by a factor of 1.2, to 1.71 cubic meters as of the end of 2001.

In the Mykolaiv region, the average indicator value tripled, totalling 11.83 cubic meters per household as of the end of 2001. This is primarily a result of a triple growth at the *Mykolaivvodokanal*, from 4.83 cubic meters in 1997 to 14.58 cubic meters in 2001, the maximum indicator value among all surveyed Ukrainian utilities as of the end of the period under review.

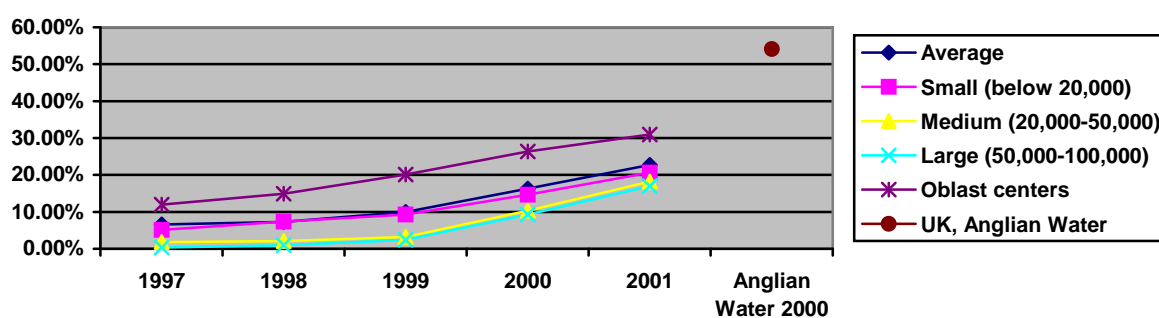
In the Lviv region, the indicator value steadily increased, totalling 6.31 cubic meters as of the end of the surveyed period against 1.89 cubic meters in 1997. The largest growth was observed at the utilities in

Zolochiv (by 16 times) and Horodok (10.2 times). A rather high indicator value as of the end of 2001 was reported by the *Stryyvodokanal* at 12.46 cubic meters per household.

The proportion of metered connections in Ukraine in general steadily increased, totalling 22.75% in 2001, a quadruple growth compared to 1997. However, the pace of growth in metered water billed was much slower, from 26.51% in 1997 to 34.25% in 2001, or by 1.3 times.

Regional performance in terms of the number of metered connections was marked by a universal growth trend, with the Lviv region exhibiting the quickest dynamics, from 0.95% to 27.66%, or by a factor of 29. The Horodok utility deserves a special mention, given that the proportion of metered connections increased over 1997-2001 by 22.9 times to a total of 38.94%. So does the *Stryyvodokanal* with triple-digit growth from 0.5% in 1997 to 50% in 2001. The Svaliava utility in the Transcarpathian region had 14% of connections metered in 2001 against none in 1997. The *Gorvodokanal* of Mukacheve and the Volovets utility in the same region increased metered connections over the analyzed period by 44 and 13 times, respectively, but were unable to provide data on metered water billed. The maximum value of indicator 7.1 was scored by the *Mykolaivvodokanal* with metered connections totalling 60%.

**Indicator 7.1 Proportion of metered connections**



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>



## Service quality

### Water distribution network malfunctions

Indicators used:

**Indicator 9.1** *Pipe breaks per km of network*

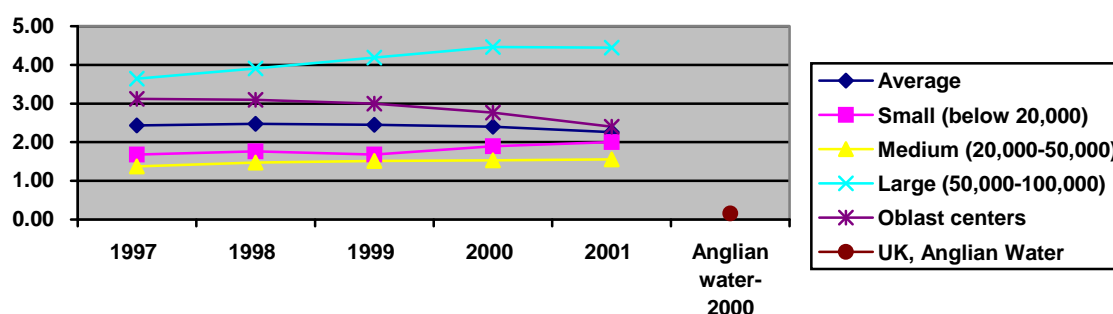
**Indicator 9.2** *Pipe breaks per connection*

Among the Ukrainian utilities in general, the rate of breaks declined both per km (from 2.44 in 1997 to 2.26 in 2001) and per connection (from 0.087 to 0.079). The maximum values of both indicators throughout the period under review were reported by the Lviv region utilities, where nine utilities reported an increase in breaks against a modest overall reduction for the region in general. The highest growth rate (by 2.6 breaks per km) was reported by the *Drohobychvodokanal* where the value of indicator 9.1 as of the end of the analyzed period was among the largest across all utilities (11.42 incidents).

In the Transcarpathian region, the number of breaks increased. The major contributor to failure growth per km was the utility of Rakhiv where the incidence increased by 7.3 breaks per km (from 18.4 in 1997 to 25.7 in 2001, the highest indicator value whatsoever); while the rate of per connection breaks was most significantly affected by the performance of the Vinohradov utility that saw the number of incidents increase from 0.244 in 1997 to 0.327 in 2001.

The *Mykolaivvodokanal* reported a major decline in failure rates, from 8.28 to 4.08 incidents per km, and from 0.24 to 0.14 breaks per connection.

### Indicator 9.1 Pipe-breaks per km of network



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>

## Sewerage malfunctions

Indicators used:

**Indicator 10.1** *Sewerage blockages per km of sewers*

**Indicator 10.2** *Sewerage blockages per connection*

The overall number of sewerage blockages per km in Ukraine is somewhat higher than the failure rate per connection, with an overall decline from 2.64 as of the beginning of the analyzed period to 2.46 by its end. The Mykolaiv region reported the lowest rate (0.847 and 0.786 sewerage blockages per km in 1997-2001).

In the Lviv region, the number of blockages increased from 3.0 in 1997 to 3.2 in 2001, most significantly so at the *Truskavetsvodokanal* (from 2.96 to 4.77 blockages per km) and the Horodok utility (from 0.59 to 2.21 incidents). The *Drohobychvodokanal* reported the maximum number of blockages per km in 2001 at 23.28 incidents.

The highest value of indicator **10.2** was at the Yuzhnoukrainsk Nuclear Power Plant Utility Service, yet over the analyzed period the number of blockages per connection at Yuzhnoukrainsk nearly halved, going down from 1.06 in 1997 to 0.59 in 2001.

## Water and sewerage service quality complaints

Indicators used:

**Indicator 16.1** *Number of complaints per water connection*

**Indicator 16.2** *Number of complaints per sewerage connection*

The average value of indicator **16.1** for the four surveyed regions somewhat declined (from 0.051 to 0.042), while indicator **16.2** remained at a level of 0.003 complaints per connection.

The lowest rates of water and sewerage service complaints were reported, respectively, by the Mykolaiv region (0.008-0.006 complaints) and the Lviv region (0.001). The insignificant values of these indicators and their reduction by late 2001 may indicate either non-provision of reliable information or high service quality.

The largest number of complaints per water connection was reported by the *Lvivvodokanal* at 1.108 in 1997, down to 0.883 in 2001.

## Uninterrupted daily service

Indicators used:

### **Indicator 15.1** Average uninterrupted daily service, hours per day

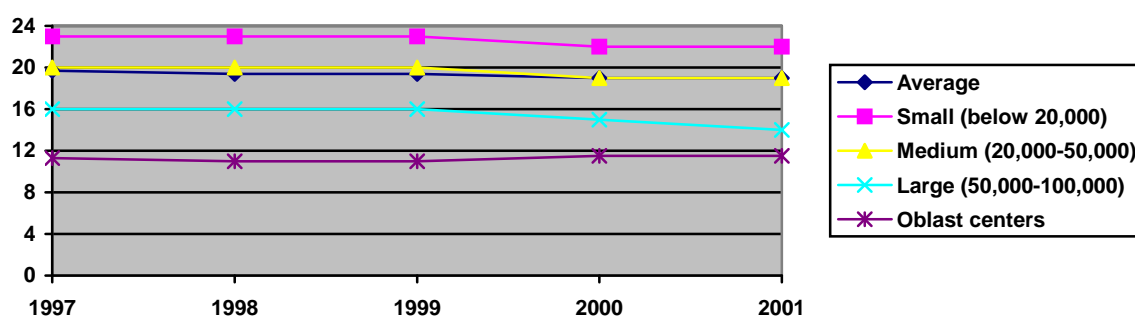
Average uninterrupted water service in Ukraine declined from 19.35 to 18.7 hours a day. The most sizeable contraction, from 22 to 14.9 hours, was reported in the Mykolaiv region, where the Pervomaysk utility, the *Gorsnab* (Voznesensk) and the Novyy Bug *Vodoprovod* went from round-the-clock service in 1997 to 16 hours at the first two utilities and 12 hours in Novyy Bug. The *Svitanok* utility in Nova Odesa and the *Mykolaivvodokanal* reported eight and 10 hours a day, respectively.

The lowest performance, at four and five hours daily, was shown by the two largest operators in the Transcarpathian region, the Uzhhorod utility and the *Gorvodokanal* of Mukacheve, respectively. In Khust and Berehove, daily uninterrupted service totaled 14 and 18 hours, respectively.

In the Lviv region, the *Stryyvodokanal* provides water according to a pre-fixed schedule three times a day for two hours each time. The *Chervonohradvodokanal*, the *Drohobychvodokanal* and the *Lvivvodokanal* reported modest thirteen, nine and eight hours, respectively. The utilities in Staryy Sambir and Kamyanka-Buzka and the *Yavorivvodokanal* reduced service, from 24 to 18 hours, 24 to 23 hours and 23.2 to 22.6 hours, respectively.

The Kharkiv region demonstrated the highest indicator performance. Eight of the 23 operators reported uninterrupted water service of less than 24 hours daily, with the shortest service hours in Shevchenkovo (18 hours), Pervomaisky (18 hours) and Lozova (19 hours).

**Indicator 15.1 Average uninterrupted daily service, hours per day**



## Wastewater treatment

Indicators used:

### **Indicator 17.1** *Wastewater treatment as a proportion of total sewerage services, %*

Overall, wastewater treatment as a proportion of total sewerage services at the Ukrainian utilities covered by the Survey increased by 13% per year compared to the volume in 1997 at the beginning of the surveyed period, totalling 144.12% in 2001.

It should be noted that five operators, including the Novyy Bug *Vodoprovod* in the Mykolaiv region; the Kolomak utility, the Vovchansk water network unit and the *Kharkivkommunpromvod* in the Kharkiv region; and the *Yavorivvodokanal* in the Lviv region, do not provide sewerage services as such.

The *Gorsnab* utility (Voznesensk, Mykolaiv region); the *Truskavetsvodokanal*, the *Sokalvodokanal* and the Sambir utility (Lviv region); and the operators in Nova Vodolaga, Velyky Burluk and Valki (Kharkiv region) do not process discharged wastewater.

Utilities in the Lviv region process the largest volumes of wastewater (169.81% in 1997 and 207.96% in 2001). Three local operators accept wastewater from other enterprises and communities for processing. At the *Drohobychvodokanal* and the *Lvivvodokanal*, treated wastewater exceeds wastewater discharge by more than 100%, while at the *Novoyavorivvodokanal* the indicator value for 2001 totalled 115%. The Staryy Sambir utility reported 92% in 1997, and in subsequent years the percentage of wastewater processed before discharge totaled 100%.

Two operators in the Kharkiv region reported treatment of only a portion of incoming wastewater. At the Zmiev and the Lozova utilities, the indicator value increased from 51.7% in 1997 to 84.1% in 2001, and from 98.6 to 99.5%, respectively. The *Kharkivkommunochistvod* and the Kupyansk utility reported treatment at above 120%.

In the Transcarpathian region, the proportion of treated wastewater significantly exceeds 100% at the Uzhhorod and the Berehove utilities, with both operators showing growth over the analyzed period: by 41.7% (from 198.12% in 1997 to 239.8% in 2001) in Uzhhorod, and by 84% (from 114.64% in 1997 to 198.63% in 2001) in Berehove.

Other utilities covered by the Survey treat all discharged wastewater.

## Analysis of service costs

### Operational costs

Indicators used:

**Indicator 11.1** *Operational costs per cubic meter of water billed, USD/m<sup>3</sup>*

**Indicator 11.2** *Operational costs per cubic meter of water produced, USD/m<sup>3</sup>*

Overall, operational costs at all utilities in the four surveyed Ukrainian regions over 1997-2001 doubled in terms of both indicators, totalling in 2001 UAH 0.82 and UAH 0.56, respectively. However, because of hryvna devaluation, in the dollar equivalent the indicator values as of the end of 2001 equalled 71% (indicator 11a) and 62.5% (indicator 11b) compared to 1997.

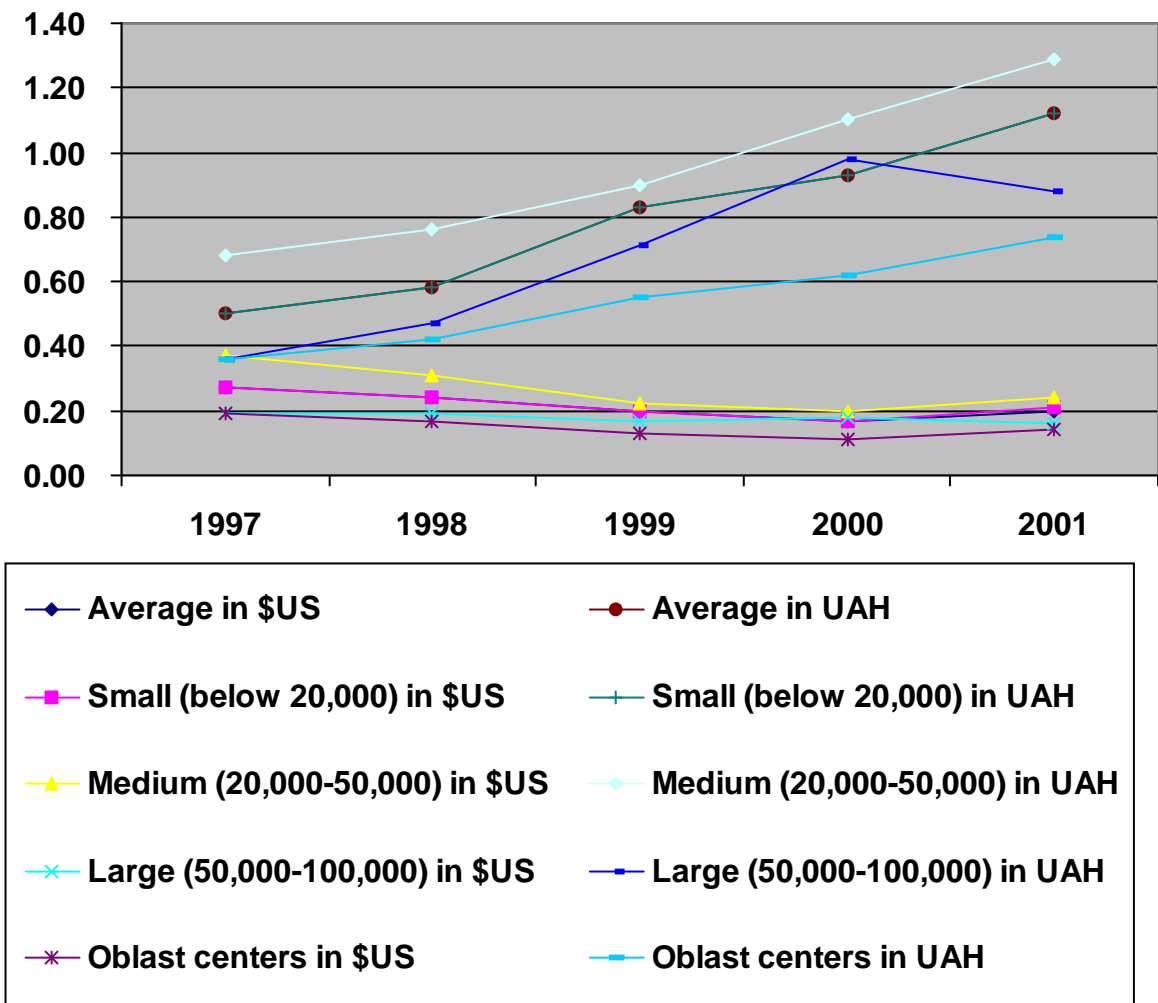
The largest indicator values are observed in the Mykolaiv region (UAH 0.94 per cubic meter of water billed and UAH 0.61 per cubic meter of water produced). The *Svitanok* utility (Nova Odesa) stands out with the highest (by a factor of 2.4) growth in operational costs, from UAH 0.93 in 1997 to UAH 2.23 in 2001 per cubic meter of water billed and from UAH 0.87 in 1997 to UAH 2 in 2001 per cubic meter of water produced. At the Yuzhnoukrainsk Nuclear Power Plant Utility Service, costs in 2001 totalled over UAH 2 per cubic meter of water billed, yet showed the least significant growth given that the indicator value at Yuzhnoukrainsk was the highest from the very beginning of the surveyed period (UAH 1.37). At the *Mykolaivvodokanal*, the level of operational costs was much lower, standing at UAH 0.41 (0.22 USD) in 1997 and UAH 0.73 (USD 0.14) in 2001 per cubic meter of water billed, and UAH 0.22 (USD 0.12) / UAH 0.46 (USD 0.08) per cubic meter of water produced.

In the Lviv region, the highest level of operational costs was reported by the Skole utility: UAH 2.37 (0.435 USD) in 2000 and UAH 3.17 (0.59 USD) in 2001 per cubic meter of water billed; UAH 1.93 (0.355 USD) and UAH 2.58 (0.481 USD), respectively, per cubic meter of water produced). The value of indicator **11.1** more than tripled at the *Brodyvodokanal* (from UAH 0.34 to UAH 1.09), the *Novoyavorivvodokanal* (from UAH 0.28 to UAH 0.89) and the *Chervonohradvodokanal* (from UAH 0.24 to UAH 0.78). Two operators in the Lviv region in 2001 managed to bring down operational costs compared to the previous year: these include the *Stryyvodokanal* (a reduction of UAH 0.02 per cubic meter of water billed, from UAH 0.59 in 2000 to UAH 0.57 in 2001) and the *Drohobychvodokanal* (a reduction of UAH 0.06, from UAH 0.64 to UAH 0.58).

The lowest operational costs throughout the period under review were reported by the Svaliava utility in the Transcarpathian region at UAH 0.149 (USD 0.08) in 1997 and UAH 0.326 (USD 0.061) in 2001. Another case that deserves a special mention is that of the Velyky Berezhny utility where operational costs over the five years increased by a modest 27%.

In the Kharkiv region, the lowest indicator values in 2001 were registered at the *Kharkivkommunpromvod*: UAH 0.54 (USD 0.1) per cubic meter of water billed and UAH 0.39 (USD 0.07) per cubic meter of water produced.

Indicator 11.1 Operational costs per cubic meter of water billed, *USD and UAH per m<sup>3</sup>*



## Payroll as a proportion of operational costs

Indicators used:

### **Indicator 13.1** *Labour costs as a proportion of operational costs, %*

In analyzing labour costs as a proportion of operational costs, it is useful to know that until 2000 this indicator exhibited a downward trend both locally and nation-wide, yet in 2000-2001 first regained its initial 1997 value and then surpassed it by 12% on the national scale.

The highest proportion of payroll in operational costs throughout the period under review was in the Transcarpathian region (24.06% in 1997 and 24.61% in 2001). In 1997, the indicator value in this region exceeded the national average by 42%, going down to 29% in 2001. Five of the eleven Transcarpathian utilities covered by the Survey reported a drop in this indicator's value. The highest labour to operational costs ratio in the Transcarpathian region was at the Volovets and the Berehove utilities, totalling in 2001 41.6% and 48.03%, respectively.

In the Mykolaiv region, the value of this indicator followed the common change pattern in Ukraine and was lower than the national average. All local utilities exhibited indicator growth as of the end of 2001.

In the Lviv region, the proportion of payroll in operational costs was the lowest in Ukraine throughout the period under review, totalling 12.01% in 1997 and 16.08% in 2001. The lowest ratio in 1997 and 2001 was reported, respectively, by the *Lvivvodokanal* (7.43%) and the *Truskavetsvodokanal* (9.03%).

In the Kharkiv region, only four of the 23 utilities had the value of this indicator at below 20% by the end of 2001. This region also yielded the highest individual indicator value for 2001, totalling 55.4% (Velyky Burluk utility).

## Staffing

Indicators used:

### **Indicator 12.1** *Staff per thousand water connections*

### **Indicator 12.2** *Staff per thousand water and sewerage connections*

### **Indicator 12.3** *Staff per thousand water service population*

### **Indicator 12.4** *Staff per thousand water and sewerage service populations*

Average staff per thousand water connections (indicator **12.1**) in Ukraine over the period under review totalled 48-49 persons and exhibited a downward trend in the last two of the analyzed years.

The lowest indicator values were observed in the Transcarpathian region, although in the five years since 1997 it reported an additional two persons per thousand connections. The Vinohradov utility stands out among the regional operators with nearly 700 persons per thousand connections in 1997 and 314 persons in 2001. The high ratio is due to the fact that the number of connections throughout the period ranged from 123 to 306, i.e. was less than 1,000. A similar situation may be observed at the Berehove utility. Almost all utilities exhibit a downward trend in personnel per thousand water connections, with the quickest decline (by 100%) in Vinohradov and Mizhgoria. The Khust and Rakhiv utilities reported indicator growth, in the case of the latter at a quicker pace and reaching 100%.

Indicator values in the Mykolaiv region were lower than the national average and exhibited an evident downward trend throughout the period under review. The highest indicator value throughout Ukraine was reported by the Yuzhnoukrainsk Nuclear Power Plant Utility Service (Mykolaiv region), where the number of personnel per thousand water connections exceeded 1,000 persons in all of the five years due to the small number of connections (less than 500). All Mykolaiv region operators reported a decline in indicator values, with the sole exception of the *Mykolaivvodokanal* that showed growth to a tune of 2 persons.

In the Lviv region, indicator values exhibited an equally smooth decline throughout the period but remained higher than the national average. Sizeable drops were reported by the Zolochiv utility (by 41%)

and the *Stryyvodokanal* (by 36%), with growth observed at *Lvivvodokanal* (by 15%), the *Brodyvodokanal* (by 21%) and the *Radehivvodokanal* (by 23%).

In the Kharkiv region, staffing per thousand water connections over 1997-2001 exceeded the national average by approximately 109 persons. Of the surveyed utilities, Kupyansk stands out with growth of 1.9 times. At other utilities, indicator values changed insignificantly. The highest value was reported by the Borovaya utility at 267.2 persons in 1997 and 194.0 persons in 2001.

Indicator **12.2** across Ukraine in 1997-1999 varied from the initial 100 persons down to 92.02 in 1998 and then back to 100 in 1999, finally stabilizing at 97 persons in the subsequent two years.

The lowest indicator values, with a pronounced downward trend, were observed in the Transcarpathian region. As in the case of the previous indicator, two utilities (in Vinohradov and Berehove) stand out with excessive staffing as of the end of the surveyed period (627.45 and 780.00 persons, respectively, per thousand water and sewerage connections). At the Rakhiv utility, the staffing ratio doubled from 9.2 to 18.0 persons.

Indicator values for the Mykolaiv region are the highest across all regions and exceed the national average nearly two-fold. Throughout 1997-2001, staffing per thousand water and sewerage connections in this region decreased by ten persons, going down to 161.8 employees in 2001. The maximum indicator value in the region was reported by the Yuzhnoukrainsk Nuclear Power Plant Utility Service, while the *Gorsnab* utility in Voznesensk averaged approximately 1,000 persons per thousand connections.

In the Lviv region, staffing per thousand water and sewerage connections remained unchanged at 61-62 persons. The *Lvivvodokanal* stands out with 216.45 persons in 1997, increasing to 244.63 by the end of 2001.

In the Kharkiv region, staffing dropped by a sharp 42% in 1998, increasing 63% by the end of the surveyed period compared to 1997. The highest indicator value, both in the region and nation-wide, was reported by the Krasnohrad utility at 2,366.7 persons as of the end of 2001 and is underpinned by an extremely low sewerage coverage.

Throughout Ukraine, average staffing per thousand water service population (indicator **12.3**) over 1997-2001 increased by 1 person, totalling 5 persons as of the end of 2001.

In the Transcarpathian region, the indicator value changed only in decimal values, remaining at six persons, just above the national average. Two operators stand out with higher indicator values. These include the Volovets utility where staffing totalled 17.86 persons in 1997 and 15.70 persons in 2001, and the Berehove utility with 20.85 and 19.35 persons per thousand water service population in 1999 and 2001, respectively. Staffing at the Rakhiv utility doubled from 2.3 persons in 1997 to 4.5 persons in 2001.

In the Mykolaiv region, the indicator values throughout the period under review remained at a level of 4 persons. The highest indicator was reported by the Yuzhnoukrainsk Nuclear Power Plant Utility Service at 11.7 persons in 1997 and 12.24 persons in 2001. A significant reduction in staffing (by 100%) was observed at the *Svitanok* utility, where it dropped from 8.02 persons in 1997 to 3.91 persons in 2001, or by 100%.

Staffing per thousand water service population in the Lviv region over the analyzed period increased by 1 person to 4 employees as of the end of 2001. Excessive staff numbers were reported by the Staryy Sambir utility (24.03 persons in 1997) and *Morshinvodokanal* (24.44 persons in 1997). By the end of 2001, staffing in Staryy Sambir declined by 2 persons, while remaining unchanged at *Morshinvodokanal*.

The analysis of indicator performance in the Kharkiv region would be incomplete without reference to an obvious growth trend: since 1997, staffing smoothly increased from 4.21 to 4.87 persons in 2001. Growth was observed at nearly all regional operators, with the exception of the Krasnokutsk utility, which reported a reduction from 9.8 persons in 1997 to 7.9 persons in 2001, and the Balaklya utility, where the indicator decreased from 14.7 to 12.3 persons over the same period. The Nova Vodolaga utility in the Kharkiv region scored the highest indicator value across all Ukraine, with staffing up from 28.0 persons per thousand water service population in 1997 to 32.8 persons in 2001.

Indicator **12.4** across Ukraine over the analyzed period exhibited smooth growth from 8.31 to 9.13 persons per thousand water and sewerage service populations.



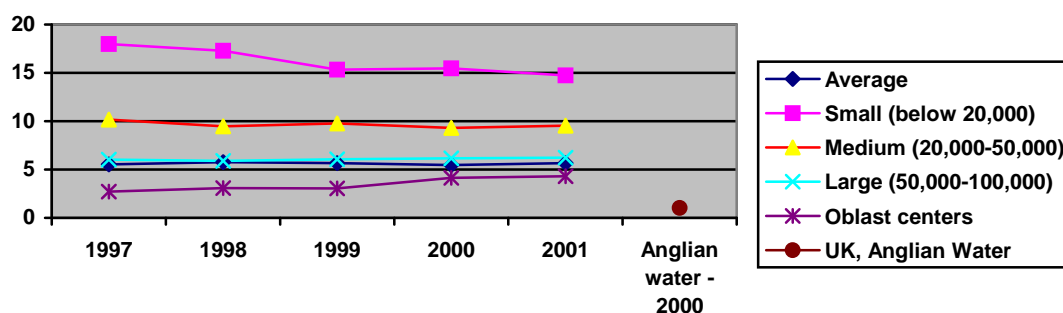
In the Transcarpathian region, the indicator value over 1997-2001 declined from 7.78 to 6.97 persons, with growth observed only at the Rakhiv utility, where staffing increased from 3.83 persons in 1997 to 7.5 persons in 2001. The highest indicator value in the region was reported by the Berehove utility at 23.51 and 21.88 persons per thousand water and sewerage service populations in 1999 and 2001, respectively.

In the Mykolaiv region, the indicator value smoothly declined from 5.13 to 5.047 persons until 2000, only to exceed the initial 1997 level by 0.16 persons in the following year. Dramatic drops in staffing were observed at the *Gorvodokanal* of Bashtanka (by 24%) and the *Gorsnab* utility in Voznesensk (by 29%).

Average staffing per thousand water and sewerage service populations in the Lviv region over the analyzed period showed minor fluctuations and growth, yet remained below the average national performance. The highest indicator value was reported by the *Sokalvodokanal*, where staffing increased from 153.58 persons in 1997 to 157.62 in 2001.

In the Kharkiv region, staffing gradually increased, from 10.58 persons to 10.89 persons in 1999, followed by a decline to 6.29 persons per thousand water and sewerage service populations in 2001. The highest indicator values across Ukraine were observed in the city of Kharkiv in 2000 and 2001 (397.3 and 384.2 persons, respectively).

### Indicator 12.4 Staffing per 1000 customers



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>

## Proportion of contracted-out services

Indicators used:

### **Indicator 14.1** *Proportion of contracted-out services, %*

The average proportion of contracted-out services in Ukraine in 1997-2001 gradually declined from 12.54% in 1997 to 8.33% as of the end of 2001.

The lowest indicator values were observed in the Transcarpathian region, yet over the analyzed period they exhibited a 50% increase from 2.4% in 1997 to 3.76% in 2001. Most regional utilities do not outsource contractors. The only exceptions are the utilities in Mizhgiria (44.64% in 2001), Berehove (23.01% in 2001) and Khust (19.8% in 2001).

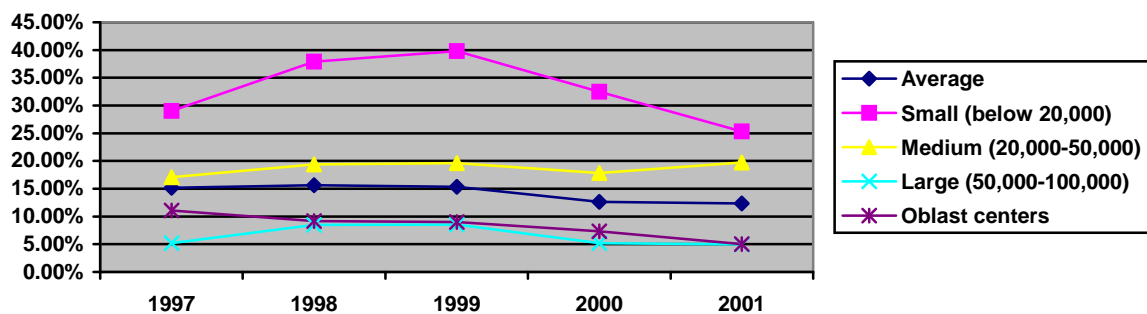
The highest indicator value across the four surveyed regions was reported in the Mykolaiv region, although in 1997-2001 it dropped by over 100%, capping 16.57% as of the end of 2001 compared to 33.76% in the first surveyed year. The drop is due to a dramatic reduction in the proportion of contracted-out services at the *Mykolaivvodokanal* (from 53.87% in 1997 to 16.76% in 2001).

In the Lviv region, the indicator increased in the first two years, followed by a drop 11% below the initial level in the subsequent three years. Lower indicator values were reported by eleven local operators, of which two (the *Drohobychvodokanal* and the *Brodyvodokanal*) decreased contracted services by 1.7 times and another two (the *Yavorivvodokanal* and the *Kamyanka-Buzka* utility) - by 2.7 times. A more than three-fold surge in the indicator value was observed in Sambir (58.15% as of the end of 2001 against 17.76% in the first surveyed year).

In the Kharkiv region, the proportion of contracted-out services varied, increasing in 1998 and 2001 and going down in the other years. Overall, the indicator value in 2001 was 12% below that in 1997. Major indicator growth on the order of 100% was reported by the Kharkiv district water authority, where the proportion of contracted-out services increased from 42.9% in 1997 to 85.6% in 2001, the highest indicator value in 2001 among all surveyed Ukrainian utilities.

The decline in contracting-out can be explained by very tough cost-monitoring actions undertaken by the national government in 1999 – 2000 during the election cycle in Ukraine. Many utilities reduced outsourcing in order to avoid complications with authorities.

### **Indicator 14.1** Proportion of contracted-out services



## Debt service costs

### Indicator 25.1 *Debt service costs to total water and sewerage service billings*

No calculations were made for indicator 25.1 as none of the utilities covered by the Survey had any debt service costs throughout the period under review. This also means that the utilities have no access to the credit resources for investment.

## Analysis of service revenues

### Water service revenues

Indicators used:

Indicator 18.1 *Actual revenue per billed cubic meter*

Indicator 18.2 *Actual revenue per connection*

Indicator 18.3 *Actual revenue per household*

The highest revenue per cubic meter of water billed in 2001 was collected by the Lviv region utilities. The water operators of Yavoriv and Truskavets as of the end of 2001 reported the maximum indicator values of UAH 1.347 and UAH 1.395, respectively (approximately 0.25 USD). The Sambir utility saw its revenues per cubic meter grow almost five-fold (from UAH 0.12 in 1997 to UAH 0.6 in 2001), while revenues at *Sokalvodokanal* over the same period increased by a factor of four, totalling UAH 0.4 per cubic meter as of the end of 2001. Eleven utilities in the Lviv region exhibited indicator **18.1** growth until 2000, followed by a drop. For example, at the *Stryyvodokanal* revenues halved in the last year of the Survey (from UAH 0.41 per cubic meter in 2000 to UAH 0.21 in 2001). The highest revenue per household (UAH 1,000) among all utilities covered by the Survey was reported by the *Truskavetsvodokanal*.

In the Mykolaiv region, average revenue per cubic meter of water billed throughout the analyzed period gradually increased from UAH 0.16 to UAH 0.34 per cubic meter. This trend was apparent among all utilities, with the exception of the *Gorvodokanal* of Bashtanka, where the indicator value in 2000 slightly declined, and the Novyy Bug *Vodoprovod*, with revenue down by UAH 0.04 per cubic meter in 2001 compared to 2000. At the *Mykolaivvodokanal*, revenue per cubic meter of water billed over 1997-2001 tripled, increasing two-fold in the last year alone, to a total of UAH 0.24 per cubic meter. As for indicator 18b, only two local operators exhibited any growth. These include the *Mykolaivvodokanal* (an increase from UAH 142.65 to UAH 400.41) and the *Gorvodokanal* of Bashtanka (from UAH 155.74 to UAH 160.24). Other utilities showed growth until 1999, followed by a steady decline in the next two years. The only exception is the Novyy Bug *Vodoprovod*, which reported a consistent reduction from UAH 170.38 per connection in 1997 to UAH 100.52 in 2001.

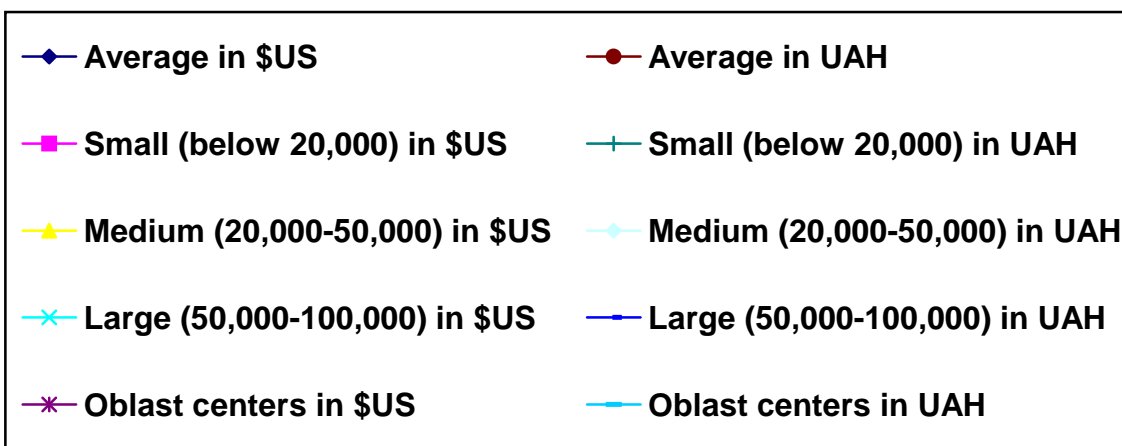
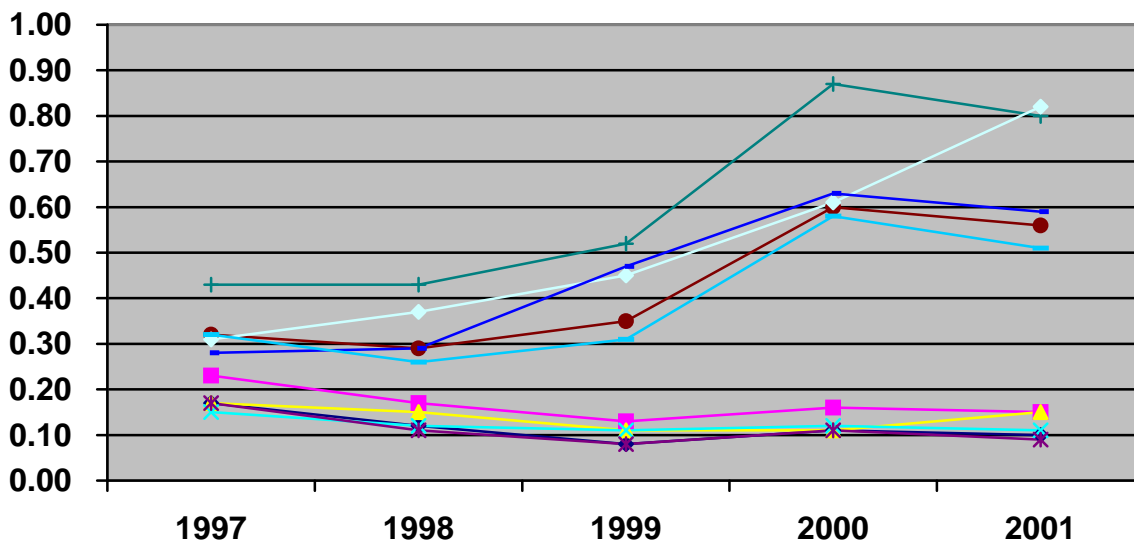
In the Kharkiv region, actual revenue per cubic meter of water billed is slightly lower than the national average, while indicator values per connection and household are the highest. Only three local operators (in Barvenkovo, Lyubotyn and Balaklya) reported revenues of UAH 1 per cubic meter of water in the last surveyed year. At the *Kharkivkommunpromvod*, the value of indicator **18.1** was the lowest among regional operators at UAH 0.48 (USD 0.09) per cubic meter, yet in terms of revenue per connection *Kharkivkommunpromvod* scored best in the region with UAH 2,044.18 (USD 380.67).

In the Transcarpathian region, the highest revenue was collected by the Volovets utility (UAH 0.77 or USD 0.14 per cubic meter and UAH 166.6 or USD 31.2 per household). The Khust utility reported a nearly triple growth in indicator **18.1**, from UAH 0.22 in 1997 to UAH 0.62 in 2001.

On average, actual utility revenue in the four surveyed Ukrainian regions increased by 1.75 times per cubic meter of water billed, by 1.2 times per connection and by 1.3 times per household. However, in dollar equivalent, revenues dwindled due to the devaluation of the hryvna. Overall, in 2001 Ukrainian

utilities collected the equivalent of only 59% (indicator 18.1), 41.5% (indicator 18.2) and 45% (indicator 18.3) of their 1997 revenues.

### Indicator 18.1 Tariff per cubic meter



## Service efficiency

Indicators used:

### **Indicator 24.1** *Operational costs to billings, %*

The analysis of operational costs to billings on a nation-wide scale shows that the provision of water and sewerage services in Ukraine was a profitable business throughout the period under review. 2000 was the best year with costs at 82.93% of total billings, against 92.54% in 1997, the least profitable year. As of the end of 2001, the ratio averaged 87.71%.

The Transcarpathian region in 1997-2001 exhibited rising costs, going up from 73.48% in 1997 to 91.56% in 2001, with the 2001 indicator value 5.6% lower than the local 1999 maximum. Several operators in the Transcarpathian region in the period from 1997 to 2001 made a turnaround from losses to profits and vice versa. Those hit hardest include the utilities in Berehove (134.16% in 1999 and 201.64% in 2001) and Irshava (164.11% in 1997 and 166.42% in 2001). The Khust utility became a loss-making operation over the period, reporting costs to billings at 103.44% in 2001 against 72.98% in 1997. By contrast, the Velyky Berezhniy utility transformed into a profitable business with 76.60% in 2001 compared to 117.08% in 1997. The most profitable operator both in the region and across Ukraine is the Svaliava utility that boasted costs to billings at 33.70% and 34.49% in 1997 and 2001, respectively.

In the Mykolaiv region, the situation somewhat improved, with the indicator value going down from 105.54% in late 1997 to 94.76% as of the end of 2001. However, the number of loss-making utilities over the surveyed period doubled, increasing from two to four. The Novyy Bug *Vodoprovod* deserves a special mention, reporting 202.82% as of the end of 2001 against 97.7% in 1997. The *Mykolaivvodokanal* over the same period turned into a profit-making operation, improving performance from 132.7% in 1997 to 91.82% in 2001.

In the Lviv region, the ratio of costs to billings declined from 88.8% in 1997 to 83.46% in 2001, with two operators falling below the breakeven point. These include the *Radehivvodokanal* and the *Stryyvodokanal*, both reporting costs at 101.4% of billings as of the end of 2001.

In the Kharkiv region, the indicator value over 1997-2001 increased from 76.36% to 87.49%. Where in 1997 eight of the 23 surveyed utilities generated losses, in 2001 their number increased to eleven. Only one operator, the Velyky Burluk utility, managed to eliminate losses, reporting 77.5% in 2001. The highest costs were registered at the Kupyansk utility, totalling 321.3% in 1997 and 273.5% in 2001.

## Accounts receivable analysis

Indicators used:

### **Indicator 23.1** *Collection, receivables in months*

Over 1997-2001 the value of this indicator for Ukraine increased in 1999 from 10.09 to 16.92 months, sliding down to 11.89 months in 2000 and rising back to 14.2 months in the last surveyed year.

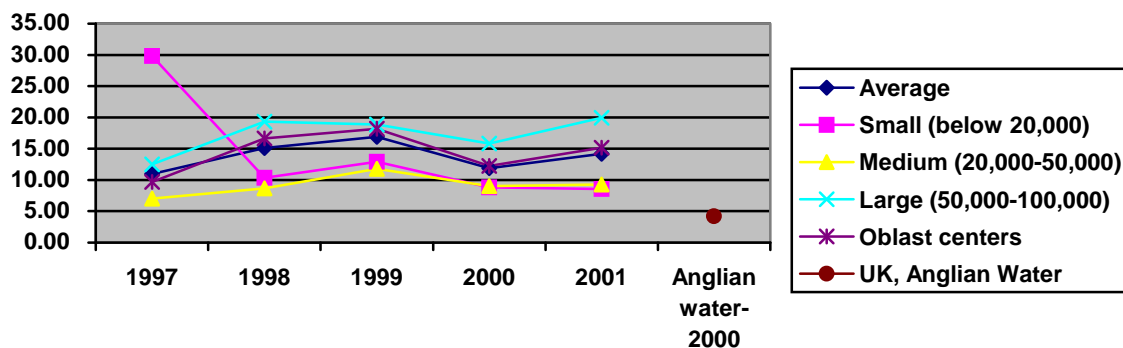
In the Lviv and the Kharkiv regions, indicator movements followed the nation-wide pattern. In the Kharkiv region, the indicator value exceeded the national average starting from 1998 and until the end of the surveyed period. Collection time in the Kharkiv region by the end of 1999 increased 50% to 25.04 months, followed by a 100% reduction to 12.48 months in 2000 and a subsequent increase to 24.08 months. The dramatic increase vis-à-vis the beginning of the surveyed period may be attributed to indicator growth at the utilities in Sakhnovshina (from 6.1 months in 1997 to 29.9 months in 2001), Chuhuyiv (from 28.4 months in 1997 to 60.2 months in 2001), Lozova (from 25.6 months in 1997 to 57.1 months in 2001) and the city of Kharkiv (from 10.1 months in 1997 to 25.3 months in 2001).

In the Lviv region, collection time decreased by 1.3 months over 1997-2001.

In the Transcarpathian region, the best performers include the utilities in Volovets (with a reduction from 82.22 months to 13.36 months), Irshava (from 24.24 to 2.67 months) and Khust (from 14.64 to 2.40 months). Sharp increases in collection time were reported by the Rakhiv utility (from 0.08 months in 1997 to 23.46 months in 2001) and the *Gorvodokanal* of Mukacheve (from 7.27 months to 20.91 months, respectively).

Collection time in the Mykolaiv region by the end of 2000 totalled 19.32 months against 12.52 months in 1997. In the last surveyed year collection improved significantly, with the indicator going down to 9.85 months, due to better collection performance by the Novyy Bug *Vodoprovod* and the *Mykolaivvodokanal*.

### Indicator 23.1 Collection period in months



Source for UK data: <http://www.wrcplc.co.uk/worldbank/>

## Tariff policy

### Water supply charges to personal income ratio

**Indicator 19.1** *Water charges as a proportion of monthly per capita income, %*

**Indicator 20.1** *Fixed connection charge per 1 cubic meter of billed water, USD per connection*

**Indicator 22.1** *Connection charges as a proportion of per capita income, %*

The analysis of water charges as a proportion of monthly per capita income (indicator **19.1**) in Ukraine reveals their volatility and no pronounced change patterns. In the first two years, the ratio increased from 1.82% to 1.94%, followed by a decrease to 1.78% in 1999 and a surge to 2.37% in 2000 with a subsequent drop to 1.77% next year. It is rather difficult to draw any conclusions as only a handful of utilities provided data on per capita income.

Indicator changes by region reveal no consistent pattern, either.

Of the eleven operators in the Transcarpathian region, only two provided data for the calculation of this indicator, namely the Rakhiv utility that reported water charges per capita increasing in 2000 more than two-fold (from 0.76% to 1.68%) and going down to 1.25% in the last year, and Velyky Berezhnyy with 0.78% in 2001.

Of the seven surveyed Mykolaiv region operators, only four provided the data required for indicator calculations. Three reported a drop in the ratio, one by a factor of five (the *Svitanok* utility, 0.5% in 2001) and another one by 23%, from 1.24% in 1997 to 0.96% in 2001 (the *Gorvodokanal* of Bashtanka).

It is rather difficult to summarize the situation in the Lviv region since only five out of the twenty utilities submitted the required data, and only three did so for the whole period. The data provided shows that two operators (in Peremyshlyany and Skole) in 2001 had rather high indicator values of 7.1% and 6.5%, respectively. The Peremyshlyany utility also had the highest indicator value among all surveyed Ukrainian operators.

Average water charges as a proportion of per capita income in the Kharkiv region are equally inconsistent. Only six of the twenty three surveyed operators provided the required data. Of these, the Izyum and the Shevchenkovo utilities reported a sharp increase in the indicator value in 1997-2001 (from 43.9% to 5.4%, or by 1.5 times at Izyum and from 0.6% to 1.3%, or by 2.1 times in Shevchenkovo). In Krasnohrad, the indicator value dropped by more than 2.5 times, from 7.2% in 1997 to 2.6% in 2001.

Since all utilities use single-rate tariffs in settlements with consumers, with no segregation of connection charges, no calculations were performed to derive indicators **20.1** and **22.1**.

### Ratio of industrial to residential charges per cubic meter

Indicators used:

**Indicator 21.1** *Cross-subsidy ratio, times industrial tariffs over consumer tariffs*

The ratio of industrial to residential charges per cubic meter of water in Ukraine over 1997-1999 more than doubled (from 7.37 to 15.88, respectively), followed by a drop to 6.79 in 2000 and another increase to 6.94 in 2001.

Ratio changes in the surveyed regions exhibit an erratic pattern.

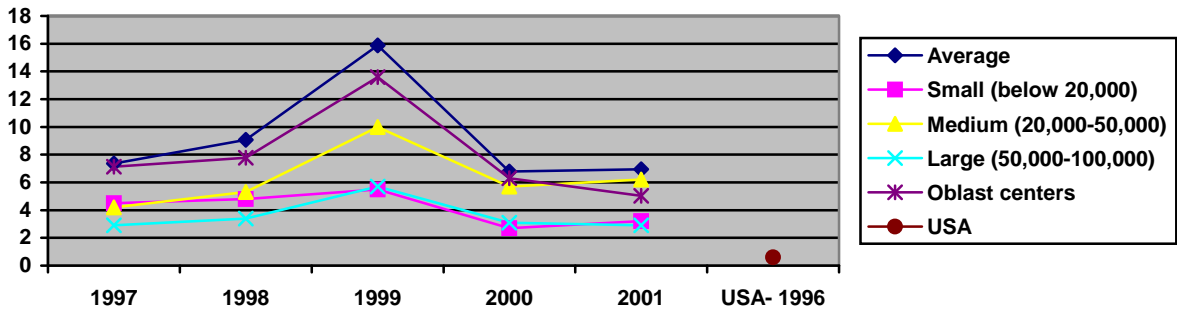
In the Transcarpathian region, the Khust utility exhibited the most prominent indicator dynamics with 3.71 in 1997 and 2.37 in 2001. Major growth, from 1.04 in 1997 to 2.26 in 2001, was also reported by the *Gorvodokanal* of Mukacheve.

In the Mykolaiv region, the ratio of industrial to residential charges per cubic meter changed from 3.47 in 1998 to 2.14 in 2001. Dramatic declines over the surveyed period were reported by the *Gorvodokanal* of Bashtanka (by 1.8 times), the Novyy Bug *Vodoprovod* (two-fold) and the Pervomaysk utility (three-fold). The *Mykolaivvodokanal* showed 50% growth from 4.6 in 1997 to 7.15 in 2001.

The indicator dynamics in the Lviv region follow the pattern of changes in the average indicator value for Ukraine. Declines occurred at the Kamyanka-Buzka utility (by 2.2 times) the *Yavorivvodokanal* (by 1.7 times), the *Novoyavorivvodokanal* (by 2.1 times) and the *Stryyvodokanal* (by 27 times), while in Zhovkva the ratio of industrial to residential charges per cubic meter increased by a factor of 3.7 totalling 15.77 as of the end of 2001.

The highest ratios were registered in the Kharkiv region, where the values tripled in the first three of the surveyed years. The maximum indicator value among all surveyed operators was reported by the Kharkiv district water authority at 36.31 as of the end of 2001.

### Indicator 21.1 Cross-subsidy ratio



Source for US data: <http://www.worldbank.org/watsan/topics/bench/usnode.html>



## Utility investment policy

Indicators used:

**Indicator 26.1** *Total capital investment to billings, %*

**Indicator 26.2** *Total capital investments per capita, USD per person*

**Indicator 26.3** *Total depreciation charges to billings, %*

**Indicator 26.4** *Total depreciation charges per capita, USD per person*

**Indicator 27.1** *Fixed assets per capita served, USD per person*

Only 15 utilities provided information on capital investments over the analyzed period, while the rest had no investments during the period from 1997 to 2001. Average indicator values across Ukraine were modest, fluctuating within the range of 4.41% in 2001 to 7.8% in 2000 (indicator **26.1**) and USD 1.82 in 1997 to USD 0.74 in 2001 (indicator **26.2**).

Utilities in the Kharkiv region were the most active investors. Data for indicator calculations were provided by six operators. The *Kharkivkommunochistvod* maintained the highest investment-to-billings ratio throughout the period under review (27.5% in 1997, 24.6% in 1998, 28.1% in 1999, 33.9% in 2000 and 15.5% in 2001). Total capital investments per capita in the city of Kharkiv (with *Kharkivkommunpromvod*'s investments) capped USD 4.72 in 1997 and USD 1.72 in 2001. New fixed assets were the largest investment caption in 1999-2000. For example, utilities in Kupyansk, Zmiev and Vovchansk reported 22.8% and 17.0%, 19.7 and 12.2%, and 9.7% and 11.8% in 1999 and 2000, respectively.

In the Lviv region, average capital investments in the last surveyed year totaled 1.97% of billings and USD 0.29 per capita. Eight regional utilities invested in business development in various years within the analyzed period. The largest investments were made by the *Drohobychvodokanal* in 2000, when they totaled 26.87% of billings and UAH 4.67 per capita. The *Truskavetsvodokanal* reported indicator **26.1** at 18.97% in 2000 and 10% in 2001; and indicator 26b at 10.86% and UAH 5.46, respectively. The Zhovkva utility, the *Zhydachivvodokanal*, the *Brodyvodokanal*, the Horodok utility and the *Lvivvodokanal* all reported investments at less than 6% of billings.

In the Mykolaiv and the Transcarpathian regions, utilities can hardly be credited with any investment policy whatsoever, with only one operator in each region providing information on capital investments, namely the *Gorvodokanal* of Mukacheve which reported indicator **26.1** at 22.14% in 2000, 4.13% in 2001 and below that in the preceding years; and the *Mykolaivvodokanal* with the ratio at or under 4% throughout the period under review.

Average depreciation-to-billings ratio among utilities in the four regions covered by the Survey decreased from 17.9% in 1997 to 13.8% in 2000, with a modest increase to 16% in 2001. Depreciation per capita steadily declined, reaching USD 2.68 per capita as of the end of the surveyed period.

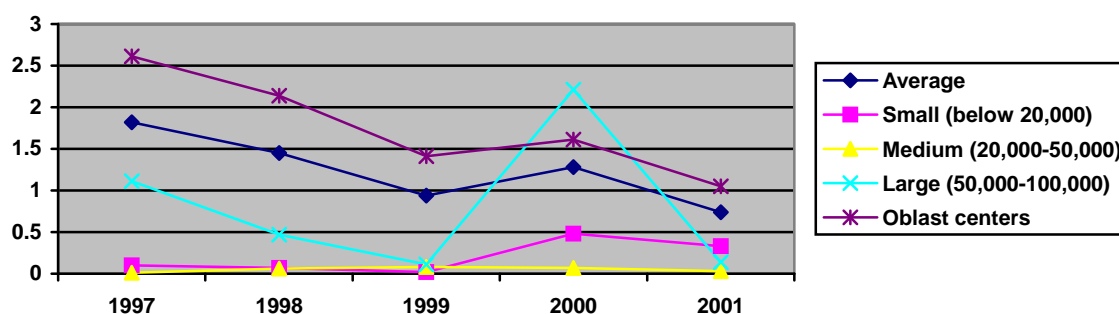
The Mykolaiv region showed the highest indicator **26.3** in 2001, totalling 22.75%. The Novyy Bug *Vodoprovod* reported significant growth to 58.06% in 2001, due to decline in billings by 1.7 times and a 50% increase in depreciation charges. Modest indicator values as of the end of 2001 were observed at the *Svitanok* utility in Nova Odesa (8.96%) and the *Gorvodokanal* of Bashtanka (7.37%), compared to 25.21% and 19.35%, respectively, in the beginning of the analyzed period. Such a dramatic drop is due to a 2.5 times decline in accrued depreciation, while at all other utilities depreciation in absolute terms over 1997-2001 was on the rise.

In the Lviv region, average depreciation to billings dropped from 26.8% in 1997 to 12.1% in 2001. At the *Lvivvodokanal*, the indicator value declined by 23%, totalling 12.5% as of the end of 2001. At the *Truskavetsvodokanal* and the Sambir utility, the ratio remained at approximately 2% throughout the period under review. The highest indicator value in the region was reported by the Kamyanka-Buzka utility at 46.3% in 2001 and 65.3% in 1999, while maximum investments per capita of USD 6.46 were registered at the *Morshinvodokanal* in 2001.

In the Kharkiv region, the Sakhnovshina utility stands out with indicator **26.3** in 1999 totalling 84.6%, going down to 56.1% in 2001. Indicator **26.4** at Sakhnovshina declined from USD 6.42 in 1997 to USD 3.75 in 2001.

Average fixed assets per capita at Ukrainian utilities decreased from USD 231.46 (UAH 318.36) in 1997 to USD 60.45 (UAH 245.65) in 2000, followed by a slight increase in 2001 to USD 103.77 (UAH 415.92). The growth resulted from fixed asset revaluation at the *Lvivvodokanal*, with the value of fixed assets increasing nearly six-fold, while depreciation charged remained unchanged. The *Lvivvodokanal* showed the highest value of indicator **27.1** in 2001 at USD 240.86 per capita. The lowest indicator values (of about USD 5 per capita) were reported by the Berehove utility (Transcarpathian region) and the Vovchansk water network unit (Kharkiv region).

**Indicator 26.2 Total capital investments per capita, USD per person**



## Energy consumption

Indicators used:

**Indicator 28.1** *Total energy consumption per cubic meter of produced water, kWh/m<sup>3</sup>*

**Indicator 28.2** *Total energy consumption per cubic meter of discharged water, kWh/m<sup>3</sup>*

Average total energy consumption at Ukrainian utilities over the period under review remained at a level of 1.46-1.47 kWh per cubic meter of water produced, while energy consumption per cubic meter of discharged water increased from 2.14 kWh in 1997 to 2.21 kWh in 2001.

Indicator **28.1** at all utilities in the Transcarpathian region rose from 1.56 kWh per cubic meter in 1997 to 1.86 kWh in 2001, and in the Mykolaiv region from 1.05 to 1.28 kWh. Growth over the analyzed period was observed at seven operators in the Transcarpathian region and four utilities in the Mykolaiv region. The highest growth, by 3.25 kWh per cubic meter, was reported by the *Svitanok* utility (Nova Odesa, Mykolaiv region), where energy consumption per cubic meter increased from 4.5 in 1997 to 7.75 kWh in 2001. Another operator showing heavy energy input is the Novyy Bug *Vodoprovod* in the Mykolaiv region with 4.74 kWh per cubic meter of water produced as of the end of 2001. The Mizhgiria utility in the Transcarpathian region, where total energy consumption was a modest 0.12 kWh in the beginning of the analyzed period, by 2001 managed to trim it down further to 0.02 kWh per cubic meter, the all-time low among all surveyed utilities.

Energy consumption in the Lviv region was lower than average national performance, standing at 1.34–1.29 kWh per cubic meter of water produced. The *Lvivvodokanal* steadily reduced energy consumption, from 1.38 kWh per cubic meter in 1997 to 1.27 kWh in 2001. At the Zhovkva utility, unit energy consumption increased by over 100%, totalling 1.21 kWh as of the end of the period under review.

In the Kharkiv region, the Shevchenkovo utility stands out with the quickest consumption growth rate over 1997-2001, from 0.95 to 2.99 kWh per cubic meter, or more than three-fold.

Indicator **28.2** increased in the Transcarpathian and the Mykolaiv regions, in the latter case being the highest among all surveyed regions at 2.33 kWh per cubic meter in 2001. The *Gorvodokanal* of Bashtanka in the Mykolaiv region reported the maximum indicator values as of the beginning and the end of the analyzed period (7.6 and 6.13 kWh, respectively, per cubic meter of discharged water). In Uzhhorod, unit energy consumption increased from 1.67 kWh in 1997 to 2.35 kWh in 2001, i.e. by 40%.

## Environmental impact of utility operations

Indicators used:

**Indicator 31.1** *Discharge BOD following full-cycle treatment, grams per cubic meter*

**Indicator 31.2** *Average phosphorus content in treated wastewater, grams per cubic meter*

**Indicator 31.3** *Average nitrogen content in treated wastewater, grams per cubic meter*

**Indicator 31.4** *Average suspended solids in treated wastewater, grams per cubic meter*

At the Mykolaiv region utilities, average BOD per cubic meter of treated wastewater in 2001 was three times the allowable maximum at 60.59 grams per cubic meter against the statutory 19.5 grams. In other regions, treated wastewater BOD was generally within the allowable limits. Excessive concentrations were registered at the Uzhhorod utility in the Transcarpathian region (27.6 grams per cubic meter), and at the *Radehivvodokanal*, the *Stryyvodokanal* and the *Chervonohradvodokanal* in the Lviv region (20.41-82.52 grams per cubic meter).

Nitrogen content was the highest in the Mykolaiv region where it totalled 7.07 grams per cubic meter in 2001 and 11.97 grams in 1998 against the maximum permissible 2.0 grams. At the *Mykolaivvodokanal*, nitrogen content went down from 14.94 grams per cubic meter in 1998 to 8.45 grams in 2001. In the

Transcarpathian region, excessive concentrations were registered at the utilities of Uzhhorod and Svaliava that reported 5.68 and 4.49 grams per cubic meter, respectively, as of the end of 2001. Kharkiv region utilities taken together demonstrated an overall stable performance, with the allowable limits exceeded only in 1997, when concentration peaked at 3.3 grams per cubic meter. However, individual utilities (in Krasnokutsk, Shevchenkovo and Pervomaisky) did exceed allowable concentrations, with nitrogen content totalling 6.1-21.2 grams per cubic meter in 2001. In the Lviv region, limits were exceeded by the *Stryvodokanal* (7.55 grams per cubic meter) and the *Morshinvodokanal* (5.12 grams).

Phosphorus content in processed wastewater in general across the four surveyed Ukrainian regions varied from 2.06 grams per cubic meter in 1997 to 2.47 grams in 2001. Transcarpathian region utilities showed the widest range of indicator values, from 6.0 grams in 1997 to 0.28 in 1999, 4.26 in 2000 and 0.24 in 2001. Statutory limits for phosphorus content in discharged wastewater were exceeded by the Uzhhorod utility (4.8 grams per cubic meter in 2000 and 8.0 grams in 2001) and the *Gorvodokanal* of Mukacheve (3.62 and 5.26 grams per cubic meter, respectively) in the Transcarpathian region; the water operators in Horodok (8.4 grams) and Kamyanka-Buzka (5.29 grams per cubic meter) in the Lviv region; and the Zachepilovka utility in the Kharkiv region (22.64 grams per cubic meter). The highest indicator value was reported by the Zmiev utility in the Kharkiv region at 55.17 grams per cubic meter in 2001.

In the Mykolaiv region, suspended solid concentrations steadily exceeded allowable limits, increasing from 48.25 grams per cubic meter in 1997 to 61.31 grams in 2001, the major contributor being the *Mykolaivvodokanal*, which reported 73.43 grams per cubic meter in 2001. Above-norm suspended solid concentrations were also shown by the utilities of Uzhhorod and Velyky Berezniy (Transcarpathian region) at 20.12 and 28.15 grams per cubic meter, respectively. In addition, wastewater discharge with above-allowable concentrations was registered at the *Morshinvodokanal*, the *Radehivvodokanal*, the Kamyanka-Buzka utility and the *Stryvodokanal* in the Lviv region, and the utilities of Sakhnovshina, Shevchenkovo and Pervomaisky in the Kharkiv region.

## CONCLUSIONS

1. Water and wastewater coverage in Ukraine is relatively high, however there are alarming symptoms of the reduction of wastewater and specifically water coverage. At the same time, nominal coverage in some places does not mean uninterrupted water supply. The nominal connection does not mean uninterrupted service: it is to about eight hours a day in Lviv, nine hours in Uzhgorod and Mukacheve and 10 hours in Mykolaiv.
2. Consumption and production continues to be excessive in all regions. Consumption above 300 lpcd is common in all oblasts, even where water supply is only a few hours a day. Water metering, as a demand management tool is rarely used, however some progress reported on that too. For now, metering is rather poor (33% in Kharkiv, 36.62% in Lviv and 16.68% in Uzhhorod) in the surveyed regions, with the sole exception of Mykolaiv.
3. Water networks are in very difficult condition throughout all of utilities in Ukraine. Unaccounted for water in per cent and physical volumes is 3-10 times higher than in Western utilities. The most difficult situation is observed in Lviv and Mykolaiv, where leaks total 42.73% and 37.27%, respectively, and breakdown rate per km of networks constitutes 2.88 incidents in Lviv and 4.08 occurrences in Mykolaiv. The condition of water supply networks also affects monthly consumption per consumer. Consumption per consumer in Lviv stands at 8.99 m<sup>3</sup> (or 300 litres) per person daily, and in Mykolaiv at 9.27 m<sup>3</sup> (309 litres) per person a day, further aggravated by a curtailed schedule of daily water service.
4. The water utility of Mukacheve (Transcarpathian region) deserves a separate mention here, even though Mukacheve is not a regional administrative centre. In addition to being prone to all "ailments" that afflict water operators in the central regional cities, this utility is a singular case requiring special attention, given the city's geographical location and reduced economic opportunities. Of particular concern is the condition of water and sewerage networks in Mukacheve, with 3.23 and 7.36 breakdowns per km of water and sewerage networks, respectively, water losses at 42.2%, and reduced water service schedule (five hours per day) on top of that.
5. Tariffs are low and as a rule do not cover even operating costs. Cross-subsidies are well practiced, however they do not bring expected cost-recovery (see indicators 11.1 and 18.1). As water tariffs is a sensitive political question, the worst situation is in oblast centres where, perhaps, regional leaders avoid difficult decisions in water reforms.
6. According to the billed water data, all water utilities in central regional cities are profitable (indicator 24.1 *Operational costs to billings*). However a comparative analysis of indicator 23.1 *Collection in months* reveals the true magnitude of the efforts Ukrainian utilities have to apply to simply continue operations, let alone make a profit, given that collection time stands at a hefty 17.74 months in Kharkiv, 13.19 months in Lviv, 12.0 months in Mykolaiv and 20.86 months in Uzhhorod. This is due to several reasons, both organizational and economic, including the absence of community awareness programmes on radio and television and contractual relations between the service providers and consumers, and the existence of low-income social groups. The situation is aggravated by relatively low tariffs for water services and permanent pressure vis-à-vis tariff revision at the regional and national level, with economic necessity apparently overshadowed by politics.
7. Staffing is excessive in all regions probably reflecting social policy. Outsourcing is being reduced as a practice. Poor financial status of the water sector does not attract private entrepreneurs to cooperate with the water sector.
8. Investment rate is below \$3 on average for Ukraine and literally zero in medium and small towns. The water networks in Lviv, Mykolaiv and Mukacheve demand the investment the most. Sewerage treatment facilities in Mykolaiv and Uzhhorod are in extremely poor condition, but their location on the international waters demands a special attention from both the Ministry of Environment and State Committee for Communal Services (Derzhzhitlokommungosp).
9. Energy conservation actions as a part of cost-reduction strategy do not exist in many utilities. In order to trim down power consumption in all central regional cities, clean-water reservoirs must be built to

10. The efficiency of treatment facilities can be assessed based on the qualitative composition of outlet wastewater (analysis of pollutant concentrations in grams per cubic meter of wastewater). The most problematic situation is in Mykolaiv where wastewater is discharged with above-allowable concentrations across all indicators considered by the Survey (BOD at 73.74 g/m<sup>3</sup>, nitrogen – 5.45 g/m<sup>3</sup>, suspended solids – 73.43 g/m<sup>3</sup>, phosphorus – 2.87 g/m<sup>3</sup>). Treatment plants in Uzhhorod also fail to comply with the statutory limits, with concentration totalling 27.6 g/m<sup>3</sup> for BOD, 5.68 g/m<sup>3</sup> for nitrogen, 20.12 g/m<sup>3</sup> for suspended solids and 8.0 g/m<sup>3</sup> for phosphorus.

**APPENDIX 1. List of Ukrainian utilities covered by the Survey**

<b>Kharkiv region</b>
Kolomak Housing and Utility Administration
Nova Vodolaga Utility
Velyky Burluk Utility
Zachepilovka Water Utility
Krasnokutsk Water Utility
Borovaya Water Utility
Sakhnovshina Water Utility
Vovchansk Water Network Unit
Barvenkovo Water Utility
Shevchenkovo Housing and Utility Administration
Valki Water Utility
Lyubotyn Water Utility
Zmiev Water Utility
Krasnohrad Water Authority
Chuhuyiv Water Authority
Balaklya Water Authority
Pervomaisky Water Authority
Kharkiv District Water Authority
Izyum Water Utility
Kupyansk Water Authority
Lozova Water Utility
Production Association Kharkivkommunpromvod
State Utility Enterprise Kharkivkommunochistvod
<b>Lviv region</b>
State Utility Enterprise Staryy Sambir Water Utility
State Utility Enterprise Skole Water Utility
Utility Enterprise Morshinvodokanal
State Utility Enterprise Radehivvodokanal
Zhovkva Water Authority
State Utility Enterprise Peremyshlyany Water Utility
State Utility Enterprise Kamyanka-Buzka Water Utility
State Utility Enterprise Zhydachivvodokanal
State Utility Enterprise Brodyvodokanal
State Utility Enterprise Yavorivvodokanal
State Utility Enterprise Horodok Water Utility
Zolochiv Water Authority
Utility Enterprise Truskavetsvodokanal
State Utility Enterprise Novoyavorivvodokanal
District Utility Enterprise Sokalvodokanal
Sambir Water Authority
State Utility Enterprise Stryyvodokanal
Utility Enterprise Chervonohradvodokanal
Utility Enterprise Drohobychvodokanal
Lvivvodokanal

<b>Transcarpathian region</b>
Volovets Housing and Utility Administration
Mizhgiria Housing and Utility Administration
Velyky Berezhnyy Housing and Utility Administration
Irshava Water Utility
Rakhiv Housing and Utility Administration
Berehove Housing and Utility Administration
Vinogradov Housing and Utility Administration
Svaliava Water Authority
Khust Water Authority
The Mukacheve City Water Utility (Gorvodokanal)
Uzhhorod Water Authority
<b>Mykolaiv region</b>
Utility Enterprise Svitanok
Utility Enterprise Gorvodokanal, Bashtanka
Utility Enterprise Novy Bug Vodoprovod
Utility Enterprise Gorsnab, Voznesensk
Yuzhnoukrainsk Nuclear Power Plant Utility Service
Water Authority of Pervomaysk
State Utility Enterprise Mykolaivvodokanal



## APPENDIX 2. Results of indicative survey of Ukrainian utilities

No.	Indicator	Unit of measure	1997	1998	1999	2000	2001	
1.1	Water coverage	%	84.60%	82.51%	83.09%	84.56%	81.77%	
2.1	Sewerage coverage	%	64.21%	61.08%	61.92%	67.81%	66.21%	
3	Monthly water production:							
3.1	- per consumer	m <sup>3</sup> per person	16.07	16.27	15.57	14.31	14.19	
3.2	- per connection	m <sup>3</sup> per connection	190.95	184.99	176.53	158.08	147.94	
3.3	- per household	m <sup>3</sup> per household	44.37	43.95	42.07	38.50	35.31	
4	Monthly water consumption:							
4.1	- per consumer	m <sup>3</sup> per person	11.72	11.60	11.26	10.27	9.77	
4.2	- per connection	m <sup>3</sup> per connection	140.45	131.90	127.57	113.41	101.79	
4.3	- per household	m <sup>3</sup> per household	32.41	31.36	30.41	27.62	24.31	
5	Metered water consumption:							
5.1	- per consumer	m <sup>3</sup> per person	3.35	2.94	3.28	2.95	3.47	
5.2	- per connection	m <sup>3</sup> per connection	39.07	39.88	36.65	38.48	42.18	
5.3	- per household	m <sup>3</sup> per household	9.04	7.84	8.71	7.86	8.49	
6	Unaccounted-for water (difference between water produced and water billed)		m <sup>3</sup>	196,171,457	204,673,510	191,209,395	181,656,705	192,095,425
6.1	- as a proportion of total water produced	%	27.10%	28.60%	27.68%	28.23%	31.15%	
6.2	- per km of water distribution network per day	m <sup>3</sup> per km	48.02	48.57	44.97	42.35	43.51	

6.3	- per connection per day	m <sup>3</sup> per connection	1.73	1.75	1.61	1.47	1.52
7.1	Proportion of metered connections	%	5.68%	7.24%	9.96%	16.32%	22.75%
8.1	Proportion of water billed per meter readings	%	26.51%	24.68%	27.22%	27.87%	34.25%
9	Pipe breaks:						
9.1	- per km of network	breaks per km	2.437	2.475	2.447	2.402	2.259
9.2	- per connection	breaks per connection	0.087	0.089	0.088	0.084	0.079
10	Sewerage blockages:						
10.1	- per km of sewers	blockages per km	2.64	2.42	2.46	2.22	2.46
10.2	- per connection	blockages per connection	0.007	0.008	0.008	0.008	0.008
11	Operational costs:						
11.1	- per cubic meter of water billed	USD per m <sup>3</sup> billed	0.21	0.19	0.15	0.13	0.15
11.1*	- per cubic meter of water billed	UAH per m <sup>3</sup> billed	0.40	0.47	0.61	0.71	0.82
11.2	- per cubic meter of water produced	USD per m <sup>3</sup> produced	0.16	0.14	0.11	0.09	0.10
11.2*	- per cubic meter of water produced	UAH per m <sup>3</sup> produced	0.29	0.34	0.44	0.51	0.56
12	Staffing:						
12.1	- per thousand water connections	persons	47.56	48.26	49.09	48.26	47.50
12.2	- per thousand water and sewerage connections	persons	68.29	61.58	65.58	91.24	90.07
12.3	- per thousand water service population	persons	4.02	4.26	4.35	4.39	4.58
12.4	- per thousand water and sewerage service populations	persons	5.52	5.77	5.66	5.47	5.65
13.1	Labour costs as a proportion of operational costs	%	16.98%	16.81%	14.82%	16.01%	19.02%

14.1	Proportion of contracted-out services	%	15.19%	15.62%	15.34%	12.66%	12.34%
15.1	Average uninterrupted daily service	hours per day	19.7	19.4	19.4	19.0	19.0
16	Number of complaints per connection:						
16.1	- water connections		0.051	0.050	0.047	0.043	0.042
16.2	- sewerage connections		0.003	0.003	0.004	0.004	0.004
17.1	Wastewater treatment as a proportion of total sewerage services	%	131.56%	134.06%	135.69%	142.77%	144.12%
18	Actual revenue:						
18.1	- per billed cubic meter, USD	USD per m <sup>3</sup> billed	0.17	0.12	0.08	0.11	0.10
18.1*	- per billed cubic meter, USD	UAH per m <sup>3</sup> billed	0.32	0.29	0.35	0.60	0.56
18.2	- per connection	USD per connection	306.19	186.10	129.21	150.22	127.10
18.2*	- per connection	UAH per connection	569.5	455.9	533.6	817.2	682.5
18.3	- per household	USD per household	67.39	44.05	30.82	36.60	30.34
18.3*	- per household	UAH per household	125.3	107.9	127.3	199.1	162.9
19.1	Water charges as a proportion of monthly per capita income	%	1.82%	1.94%	1.78%	2.37%	1.77%
20.1	Connection charges as a proportion of total water service charges per capita	%	n/a	n/a	n/a	n/a	n/a
21.1	Ratio of industrial to residential charges per cubic meter	%	737.44%	907.72%	1587.51%	679.47%	694.20%
22.1	Connection charges as a proportion of average per capita income, %	%	n/a	n/a	n/a	n/a	n/a
23.1	Collection	months	10.99	15.14	16.92	11.89	14.20
24.1	Costs to billings	%	83.9%	89.6%	92.5%	82.9%	87.7%

25.1	Debt service costs to total water and sewerage service billings	%	n/a	n/a	n/a	n/a	n/a
26	Investments:						
26.1	- total capital investment to billings	%	6.01%	5.92%	5.29%	7.80%	4.41%
26.2	- total capital investments per capita	USD	1.82	1.45	0.94	1.28	0.74
26.3	- depreciation charges to billings	%	17.91%	14.31%	15.71%	13.79%	16.00%
26.4	- depreciation per capita	USD	5.48	3.50	2.81	2.25	2.68
27.1	Value of fixed assets per capita	USD	231.46	137.56	80.06	60.45	103.77
27.1*	Value of fixed assets per capita	UAH	430.52	337.02	330.63	328.84	557.25
28	Energy consumption:		0.87	0.85	0.85	0.85	0.88
28.1	Total energy consumption per cubic meter of produced water	kWh/m <sup>3</sup>	1.46	1.43	1.44	1.42	1.47
28.2	Total energy consumption per cubic meter of discharged water	kWh/m <sup>3</sup>	2.14	2.06	2.09	2.11	2.21
31.1	Average discharge BOD following full-cycle treatment	grams per m <sup>3</sup>	19.21	18.30	18.45	18.26	16.90
31.2	Average phosphorus content in treated wastewater	grams per m <sup>3</sup>	2.06	2.52	2.16	2.62	2.47
31.3	Average nitrogen content in treated wastewater	grams per m <sup>3</sup>	3.65	2.89	2.78	2.61	2.29
31.4	Average suspended solids in treated wastewater	grams per m <sup>3</sup>	14.22	16.52	16.98	16.39	16.39

### APPENDIX 3. Results of indicative survey of Ukrainian utilities by groups

#### *Water utilities serving up to 20,000 consumers*

No.	Indicator	Unit of measure	1997	1998	1999	2000	2001
1.1	Water coverage	%	59.62%	61.15%	59.65%	61.79%	62.71%
2.1	Sewerage coverage	%	28.85%	29.46%	30.04%	30.11%	31.54%
3	Monthly water production:						
3.1	- per consumer	m <sup>3</sup> per person	9.40	9.27	8.04	7.14	6.81
3.2	- per connection	m <sup>3</sup> per connection	48.15	48.33	42.63	37.60	35.39
3.3	- per household	m <sup>3</sup> per household	26.55	26.44	22.63	20.24	18.54
4	Monthly water consumption:						
4.1	- per consumer	m <sup>3</sup> per person	8.36	7.79	6.80	5.68	5.46
4.2	- per connection	m <sup>3</sup> per connection	43.74	40.40	35.93	29.80	28.14
4.3	- per household	m <sup>3</sup> per household	24.11	22.21	19.14	16.07	14.84
5	Metered water consumption:						
5.1	- per consumer	m <sup>3</sup> per person	0.27	0.35	0.43	0.66	1.07
5.2	- per connection	m <sup>3</sup> per connection	1.39	1.73	2.17	3.37	5.24
5.3	- per household	m <sup>3</sup> per household	0.73	0.92	1.11	1.74	2.73
6	Unaccounted-for water (difference between water produced and water billed)		m <sup>3</sup>				
6.1	- as a proportion of total water produced	%	12.79%	15.54%	15.27%	20.46%	19.86%
6.2	- per km of water distribution network per day	m <sup>3</sup> per km	5.86	6.74	5.75	7.13	6.44
6.3	- per connection per day	m <sup>3</sup> per connection	0.23	0.26	0.22	0.26	0.24
7.1	Proportion of metered connections	%	5.15%	7.39%	9.30%	14.66%	20.66%
8.1	Proportion of water billed per meter readings	%	2.78%	4.09%	5.99%	11.05%	18.49%
9	Pipe breaks:						
9.1	- per km of network	breaks per km	1.679	1.767	1.684	1.898	2.001
9.2	- per connection	breaks per connection	0.067	0.071	0.069	0.074	0.077
10	Sewerage blockages:						
10.1	- per km of sewers	blockages per km	2.46	2.34	2.27	2.23	2.55
10.2	- per connection	blockages per connection	0.001	0.001	0.001	0.001	0.002

11	Unit operational costs:						
11.1	- per annual water billed	USD per m <sup>3</sup> billed	0.27	0.24	0.20	0.17	0.21
11.1*	- per annual water billed	UAH per m <sup>3</sup> billed	0.50	0.58	0.83	0.93	1.12
11.2	- per annual water produced	USD per m <sup>3</sup> produced	0.24	0.20	0.17	0.14	0.17
11.2*	- per annual water produced	UAH per m <sup>3</sup> produced	0.44	0.49	0.71	0.75	0.91
12	Staffing:						
12.1	- per thousand water connections	persons	40.01	39.42	41.05	39.88	38.41
12.2	- per thousand water and sewerage connections	persons	89.38	87.06	81.75	78.70	75.29
12.3	- per thousand water service population	persons	7.78	7.54	7.72	7.53	7.41
12.4	- per thousand water and sewerage service populations	persons	17.98	17.30	15.33	15.45	14.74
13.1	Labour costs as a proportion of operational costs	%	22.66%	23.05%	20.61%	23.45%	26.02%
14.1	Proportion of contracted-out services	%	29.04%	37.90%	39.78%	32.46%	25.35%
15.1	Average uninterrupted daily service	hours per day	23.0	23.0	23.0	22.0	22.0
16	Number of complaints per connection:						
16.1	- water connections		0.029	0.030	0.032	0.030	0.029
16.2	- sewerage connections		0.001	0.001	0.001	0.001	0.001
17.1	Wastewater treatment as a proportion of total sewerage services	%	71.55%	71.02%	69.84%	77.79%	77.29%
18	Actual annual revenue:						
18.1	- per billed cubic meter	USD	0.23	0.17	0.13	0.16	0.15
18.1*	- per billed cubic meter	UAH	0.43	0.43	0.52	0.87	0.80
18.2	- per connection	USD	118.78	85.72	55.41	58.00	50.91
18.2*	- per connection	UAH	220.9	210.0	228.8	315.5	273.4
18.3	- per household	USD	64.71	47.45	29.35	30.99	26.52
18.3*	- per household	UAH	120.4	116.3	121.2	168.6	142.4
19.1	Water charges as a proportion of monthly per capita income	%	2.10%	2.55%	2.64%	4.38%	2.85%
20.1	Connection charges as a proportion of total water service charges per capita	%					
21.1	Ratio of industrial to residential charges per cubic meter		4.5	4.8	5.5	2.7	3.2
22.1	Connection charges as a proportion of average per capita income, %	%	0.00%	0.00%	0.00%	0.00%	0.00%
23.1	Collection (accounts receivable to revenue expressed in months)	months	29.80	10.36	12.93	8.82	8.55
24.1	Operating costs to billings	%	78.4%	80.8%	88.7%	82.2%	89.4%
25.1	Debt service costs to total water and sewerage service billings	%	0.63%	0.18%	0.17%	0.67%	0.09%
26	Investments:						
26.1	- total capital investment to billings	%	0.69%	0.59%	0.56%	5.68%	3.60%
26.2	- total capital investments per capita in utility service area	USD	0.10	0.07	0.02	0.48	0.33

26.3	- depreciation charges to billings	%	15.68%	14.42%	15.94%	14.02%	15.39%
26.4	- depreciation per capita in utility service area	USD	3.19	2.42	1.77	1.23	1.47
27.1	Value of fixed assets per capita	USD	132.29	99.11	55.48	41.91	54.34
27.1*	Value of fixed assets per capita	UAH	246.07	242.81	229.13	227.99	291.83
28	Energy consumption:		0.86	0.85	0.90	0.97	0.93
28.1	Total energy consumption per cubic meter of produced water	kWh/m <sup>3</sup>	1.09	1.10	1.22	1.26	1.22
28.2	Total energy consumption per cubic meter of discharged water	kWh/m <sup>3</sup>	0.48	0.49	0.51	0.45	0.52

### ***Water utilities serving 20,000-50,000 consumers***

No.	Indicator	Unit of measure	1997	1998	1999	2000	2001
1.1	Water coverage	%	65.56%	65.26%	64.65%	66.90%	66.13%
2.1	Sewerage coverage	%	43.87%	44.33%	43.37%	45.67%	45.08%
3	Monthly water production:						
3.1	- per consumer	m <sup>3</sup> per person	10.50	10.80	11.18	9.76	9.02
3.2	- per connection	m <sup>3</sup> per connection	57.83	59.61	60.69	52.94	48.23
3.3	- per household	m <sup>3</sup> per household	28.84	29.53	29.68	26.55	23.76
4	Monthly water consumption:						
4.1	- per consumer	m <sup>3</sup> per person	9.06	8.91	8.57	7.65	6.68
4.2	- per connection	m <sup>3</sup> per connection	49.91	49.13	46.53	41.49	35.73
4.3	- per household	m <sup>3</sup> per household	24.88	24.34	22.76	20.81	17.60
5	Metered water consumption:						
5.1	- per consumer	m <sup>3</sup> per person	0.31	0.34	0.39	1.17	1.26
5.2	- per connection	m <sup>3</sup> per connection	1.42	1.60	1.78	5.32	5.62
5.3	- per household	m <sup>3</sup> per household	0.86	0.93	1.06	3.29	3.39
6	Unaccounted-for water (difference between water produced and water billed)	m <sup>3</sup>					
6.1	- as a proportion of total water produced	%	13.39%	17.58%	23.33%	21.63%	25.93%
6.2	- per km of water distribution network per day	m <sup>3</sup> per km	6.97	9.17	12.12	9.86	10.72
6.3	- per connection per day	m <sup>3</sup> per connection	0.26	0.34	0.47	0.38	0.41
7.1	Proportion of metered connections	%	1.81%	2.10%	3.17%	10.31%	18.17%
8.1	Proportion of water billed per meter readings	%	3.70%	4.24%	5.08%	17.20%	21.04%
9	Pipe breaks:						
9.1	- per km of network	breaks per km	1.375	1.471	1.511	1.529	1.556

9.2	- per connection	breaks per connection	0.049	0.055	0.058	0.058	0.060
10	Sewerage blockages:						
10.1	- per km of sewers	blockages per km	0.93	0.99	1.02	1.04	1.17
10.2	- per connection	blockages per connection	0.027	0.028	0.029	0.003	0.004
11	Unit operational costs:						
11.1	- per annual water billed	USD per m <sup>3</sup> billed	0.37	0.31	0.22	0.20	0.24
11.1*	- per annual water billed	UAH per m <sup>3</sup> billed	0.68	0.76	0.90	1.10	1.29
11.2	- per annual water produced	USD per m <sup>3</sup> produced	0.33	0.26	0.17	0.16	0.18
11.2*	- per annual water produced	UAH per m <sup>3</sup> produced	0.61	0.65	0.71	0.86	0.96
12	Staffing:						
12.1	- per thousand water connections	persons	36.41	35.51	35.51	34.53	34.77
12.2	- per thousand water and sewerage connections	persons	97.41	91.36	94.64	92.31	95.84
12.3	- per thousand water service population	persons	6.61	6.44	6.54	6.37	6.51
12.4	- per thousand water and sewerage service populations	persons	10.15	9.48	9.76	9.32	9.54
13.1	Labour costs as a proportion of operational costs	%	19.69%	19.12%	16.98%	19.06%	22.82%
14.1	Proportion of contracted-out services	%	17.09%	19.41%	19.63%	17.82%	19.73%
15.1	Average uninterrupted daily service	hours per day	20.0	20.0	20.0	19.0	19.0
16	Number of complaints per connection:						
16.1	- water connections		0.005	0.004	0.004	0.009	0.012
16.2	- sewerage connections		0.009	0.006	0.007	0.002	0.004
17.1	Wastewater treatment as a proportion of total sewerage services	%	92.60%	92.21%	92.75%	92.55%	92.53%
18	Actual annual revenue:						
18.1	- per billed cubic meter	USD	0.17	0.15	0.11	0.11	0.15
18.1*	- per billed cubic meter	UAH	0.31	0.37	0.45	0.61	0.82
18.2	- per connection	USD	117.09	89.84	61.34	55.46	65.40
18.2*	- per connection	UAH	217.8	220.1	253.3	301.7	351.2
18.3	- per household	USD	49.02	45.01	30.00	27.82	32.21
18.3*	- per household	UAH	91.2	110.3	123.9	151.3	173.0
19.1	Water charges as a proportion of monthly per capita income	%	0.87%	0.72%	0.76%	1.33%	0.94%
20.1	Connection charges as a proportion of total water service charges per capita	%					
21.1	Ratio of industrial to residential charges per cubic meter		4,2	5.3	10.0	5.7	6.2
22.1	Connection charges as a proportion of average per capita income, %	%	0.00%	0.00%	0.00%	0.00%	0.00%
23.1	Collection (accounts receivable to revenue expressed in months)	months	7.04	8.68	11.80	9.00	9.29
24.1	Operating costs to billings	%	88.5%	91.3%	91.8%	93.8%	101.0%



25.1	Debt service costs to total water and sewerage service billings	%	0.00%	0.00%	0.00%	0.00%	0.00%
26	Investments:						
26.1	- total capital investment to billings	%	0.03%	0.24%	0.50%	0.50%	0.20%
26.2	- total capital investments per capita in utility service area	USD	0.01	0.06	0.08	0.07	0.03
26.3	- depreciation charges to billings	%	12.53%	12.23%	15.67%	15.82%	17.34%
26.4	- depreciation per capita in utility service area	USD	3.99	2.82	2.43	2.09	2.28
27.1	Value of fixed assets per capita	USD	169.92	121.21	69.27	54.32	50.38
27.1*	Value of fixed assets per capita	UAH	316.05	296.97	286.09	295.48	270.52
28	Energy consumption:		1.02	0.93	0.99	1.00	1.02
28.1	Total energy consumption per cubic meter of produced water	kWh/m <sup>3</sup>	1.13	1.04	1.07	1.06	1.01
28.2	Total energy consumption per cubic meter of discharged water	kWh/m <sup>3</sup>	0.88	0.78	0.86	0.90	1.04

***Water utilities serving up to 50,000-100,000 consumers***

No.	Indicator	Unit of measure	1997	1998	1999	2000	2001
1.1	Water coverage	%	85.47%	87.13%	87.04%	87.34%	86.76%
2.1	Sewerage coverage	%	76.54%	78.59%	77.87%	77.33%	76.91%
3	Monthly water production:						
3.1	- per consumer	m <sup>3</sup> per person	16.38	14.85	14.78	14.50	13.50
3.2	- per connection	m <sup>3</sup> per connection	72.52	65.05	62.94	57.02	50.96
3.3	- per household	m <sup>3</sup> per household	46.56	41.63	40.44	38.97	35.23
4	Monthly water consumption:						
4.1	- per consumer	m <sup>3</sup> per person	12.34	11.24	10.39	9.51	9.60
4.2	- per connection	m <sup>3</sup> per connection	54.62	49.24	44.27	37.41	36.23
4.3	- per household	m <sup>3</sup> per household	35.07	31.51	28.44	25.57	25.05
5	Metered water consumption:						
5.1	- per consumer	m <sup>3</sup> per person	0.76	0.83	0.94	0.99	1.19
5.2	- per connection	m <sup>3</sup> per connection	3.43	3.66	3.94	3.76	4.35
5.3	- per household	m <sup>3</sup> per household	2.17	2.33	2.55	2.64	3.09
6	Unaccounted-for water (difference between water produced and water billed)	m <sup>3</sup>					
6.1	- as a proportion of total water produced	%	24.69%	24.31%	29.67%	34.38%	28.89%
6.2	- per km of water distribution network per day	m <sup>3</sup> per km	41.14	36.48	44.42	48.77	36.90
6.3	- per connection per day	m <sup>3</sup> per	0.59	0.52	0.61	0.64	0.48

		connection					
7.1	Proportion of metered connections	%	0.39%	0.99%	2.47%	9.30%	17.00%
8.1	Proportion of water billed per meter readings	%	6.24%	7.34%	8.77%	10.16%	11.90%
9	Pipe breaks:						
9.1	- per km of network	breaks per km	3.642	3.908	4.190	4.458	4.447
9.2	- per connection	breaks per connection	0.052	0.056	0.058	0.059	0.058
10	Sewerage blockages:						
10.1	- per km of sewers	blockages per km	8.62	6.90	7.27	6.82	8.02
10.2	- per connection	blockages per connection	0.091	0.033	0.092	0.071	0.079
11	Unit operational costs:						
11.1	- per annual water billed	USD per m <sup>3</sup> billed	0.19	0.19	0.17	0.18	0.16
11.1*	- per annual water billed	UAH per m <sup>3</sup> billed	0.36	0.47	0.71	0.98	0.88
11.2	- per annual water produced	USD per m <sup>3</sup> produced	0.15	0.14	0.12	0.12	0.12
11.2*	- per annual water produced	UAH per m <sup>3</sup> produced	0.27	0.35	0.50	0.64	0.63
12	Staffing:						
12.1	- per thousand water connections	persons	23.85	23.29	23.06	21.42	20.88
12.2	- per thousand water and sewerage connections	persons	30.89	23.82	29.58	27.29	26.75
12.3	- per thousand water service population	persons	5.39	5.32	5.41	5.45	5.53
12.4	- per thousand water and sewerage service populations	persons	6.02	5.90	6.05	6.15	6.24
13.1	Labour costs as a proportion of operational costs	%	20.81%	18.69%	15.18%	14.30%	19.31%
14.1	Proportion of contracted-out services	%	5.21%	8.47%	8.56%	5.20%	4.97%
15.1	Average uninterrupted daily service	hours per day	16.0	16.0	16.0	15.0	14.0
16	Number of complaints per connection:						
16.1	- water connections		0.015	0.016	0.013	0.011	0.012
16.2	- sewerage connections		0.001	0.000	0.001	0.001	0.001
17.1	Wastewater treatment as a proportion of total sewerage services	%	130.28%	138.88%	147.71%	157.83%	166.00%
18	Actual annual revenue:						
18.1	- per billed cubic meter	USD	0.15	0.12	0.11	0.12	0.11
18.1*	- per billed cubic meter	UAH	0.28	0.29	0.47	0.63	0.59
18.2	- per connection	USD	99.34	70.67	60.76	51.64	48.15
18.2*	- per connection	UAH	184.8	173.1	251.0	280.9	258.6
18.3	- per household	USD	63.79	45.22	39.04	35.29	33.29
18.3*	- per household	UAH	118.6	110.8	161.2	192.0	178.8
19.1	Water charges as a proportion of monthly per capita income	%	0.98%	1.20%	1.44%	1.09%	0.61%
20.1	Connection charges as a proportion of total water service charges per capita	%					
21.1	Ratio of industrial to residential charges per cubic meter		2,9	3.4	5.7	3.1	2.9

22.1	Connection charges as a proportion of average per capita income, %	%	0.00%	0.00%	0.00%	0.00%	0.00%
23.1	Collection (accounts receivable to revenue expressed in months)	months	12.52	19.31	18.86	15.82	19.91
24.1	Operating costs to billings	%	79.7%	82.7%	85.3%	95.8%	86.8%
25.1	Debt service costs to total water and sewerage service billings	%	0.00%	0.00%	0.00%	0.00%	0.00%
26	Investments:						
26.1	- total capital investment to billings	%	3.59%	1.75%	0.49%	11.86%	0.74%
26.2	- total capital investments per capita in utility service area	USD	1.11	0.47	0.11	2.21	0.14
26.3	- depreciation charges to billings	%	11.54%	10.36%	9.42%	8.37%	9.99%
26.4	- depreciation per capita in utility service area	USD	3.57	2.80	2.06	1.56	1.89
27.1	Value of fixed assets per capita	USD	196.02	152.72	91.42	70.72	76.37
27.1*	Value of fixed assets per capita	UAH	364.59	374.15	377.56	384.71	410.09
28	Energy consumption:						
28.1	Total energy consumption per cubic meter of produced water	kWh/m <sup>3</sup>	0.88	0.98	1.00	0.90	0.86
28.2	Total energy consumption per cubic meter of discharged water	kWh/m <sup>3</sup>	0.52	0.56	0.61	0.59	0.61

### *Water utilities serving central regional cities*

No.	Indicator	Unit of measure	1997	1998	1999	2000	2001
1.1	Water coverage	%	93.02%	89.82%	91.35%	92.79%	88.62%
2.1	Sewerage coverage	%	83.34%	76.56%	79.42%	79.06%	76.64%
3	Monthly water production:						
3.1	- per consumer	m <sup>3</sup> per person	17.66	18.21	17.29	15.98	16.20
3.2	- per connection	m <sup>3</sup> per connection	420.51	412.18	392.61	359.96	337.27
3.3	- per household	m <sup>3</sup> per household	48.53	48.60	46.57	42.62	39.22
4	Monthly water consumption:						
4.1	- per consumer	m <sup>3</sup> per person	12.43	12.56	12.34	11.38	10.93
4.2	- per connection	m <sup>3</sup> per connection	296.11	284.47	280.10	256.39	227.58
4.3	- per household	m <sup>3</sup> per household	34.17	33.54	33.22	30.35	26.47
5	Metered water consumption:						
5.1	- per consumer	m <sup>3</sup> per person	4.41	3.66	4.34	3.54	4.19
5.2	- per connection	m <sup>3</sup> per connection	114.83	112.77	110.66	109.60	118.75
5.3	- per household	m <sup>3</sup> per household	11.77	9.67	11.44	9.37	10.02
6	Unaccounted-for water (difference between water produced and water billed)	m <sup>3</sup>	169 906 500	175 844 000	156 472 000	146 437 400	160 068 500
6.1	- as a proportion of total water produced	%	29.58%	30.98%	28.66%	28.77%	32.52%

6.2	- per km of water distribution network per day	m <sup>3</sup> per km	90.49	92.68	82.21	76.68	80.90
6.3	- per connection per day	m <sup>3</sup> per connection	4.09	4.20	3.70	3.41	3.61
7.1	Proportion of metered connections	%	12.00%	14.94%	20.10%	26.36%	30.95%
8.1	Proportion of water billed per meter readings	%	32.64%	28.81%	32.34%	30.71%	37.75%
9	Pipe breaks:						
9.1	- per km of network	breaks per km	3.125	3.095	2.997	2.769	2.404
9.2	- per connection	breaks per connection	0.141	0.140	0.135	0.123	0.107
10	Sewerage blockages:						
10.1	- per km of sewers	blockages per km	0.90	1.28	1.20	1.01	0.91
10.2	- per connection	blockages per connection	0.024	0.033	0.031	0.026	0.024
11	Unit operational costs:						
11.1	- per annual water billed	USD per m <sup>3</sup> billed	0.19	0.17	0.13	0.11	0.14
11.1*	- per annual water billed	UAH per m <sup>3</sup> billed	0.36	0.42	0.55	0.62	0.74
11.2	- per annual water produced	USD per m <sup>3</sup> produced	0.14	0.12	0.10	0.08	0.09
11.2*	- per annual water produced	UAH per m <sup>3</sup> produced	0.25	0.29	0.39	0.44	0.50
12	Staffing:						
12.1	- per thousand water connections	persons	72.74	76.48	78.45	79.58	77.86
12.2	- per thousand water and sewerage connections	persons	69.68	71.02	71.69	150.32	148.33
12.3	- per thousand water service population	persons	3.05	3.38	3.46	3.53	3.74
12.4	- per thousand water and sewerage service populations	persons	2.72	3.08	3.05	4.15	4.32
13.1	Labour costs as a proportion of operational costs	%	15.41%	15.52%	13.81%	14.94%	17.55%
14.1	Proportion of contracted-out services	%	11.09%	9.19%	9.02%	7.33%	5.03%
15.1	Average uninterrupted daily service	hours per day	11.3	11.0	11.0	11.5	11.5
16	Number of complaints per connection:						
16.1	- water connections		0.147	0.146	0.135	0.126	0.117
16.2	- sewerage connections		0.039	0.046	0.045	0.043	0.038
17.1	Wastewater treatment as a proportion of total sewerage services	%	139.34%	141.40%	142.01%	149.28%	149.97%
18	Actual annual revenue:						
18.1	- per billed cubic meter	USD	0.17	0.11	0.08	0.11	0.09
18.1*	- per billed cubic meter	UAH	0.32	0.26	0.31	0.58	0.51
18.2	- per connection	USD	614.60	368.22	254.82	328.88	259.18
18.2*	- per connection	UAH	1 143.2	902.1	1 052.4	1 789.1	1 391.8
18.3	- per household	USD	70.92	43.42	30.23	38.94	30.14
18.3*	- per household	UAH	131.9	106.4	124.8	211.8	161.9
19.1	Water charges as a proportion of monthly per capita income	%	1.36%	1.41%	1.32%	1.38%	1.17%
20.1	Connection charges as a proportion of total water service charges per capita	%	n/a	n/a	n/a	n/a	n/a

21.1	Ratio of industrial to residential charges per cubic meter	%	714.29%	778.31%	1360.98%	631.48%	502.09%
22.1	Connection charges as a proportion of average per capita income, %	%	n/a	n/a	n/a	n/a	n/a
23.1	Collection (accounts receivable to revenue expressed in months)	months	9.68	16.66	18.18	12.24	15.19
24.1	Operating costs to billings	%	83.8%	90.9%	94.0%	79.5%	85.4%
25.1	Debt service costs to total water and sewerage service billings	%	n/a	n/a	n/a	n/a	n/a
26	Investments:						
26.1	- total capital investment to billings	%	2.95%	3.36%	2.09%	2.88%	2.60%
26.2	- total capital investments per capita in utility service area	USD	2.61	2.14	1.41	1.61	1.05
26.3	- depreciation charges to billings	%	20.08%	15.26%	16.53%	14.04%	16.53%
26.4	- depreciation per capita in utility service area	USD	6.40	3.93	3.17	2.55	3.09
27.1	Value of fixed assets per capita	USD	265.05	146.16	85.68	64.13	128.65
27.1*	Value of fixed assets per capita	UAH	492.99	358.09	353.87	348.87	690.88
28	Energy consumption:						
28.1	Total energy consumption per cubic meter of produced water	kWh/m <sup>3</sup>	1.44	1.41	1.41	1.40	1.46
28.2	Total energy consumption per cubic meter of discharged water	kWh/m <sup>3</sup>	2.19	2.09	2.06	2.09	2.20

