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HASKONING NEDERLAND B.V. WATER
IHS INSTITUTE FOR HOUSING AND URBAN DEVELOPMENT STUDIES
DELOITTE&TOUCHE CENTRAL EUROPE

Feasibility Study Vrbas

Waste Water Treatment and Sewage collection

European Agency for Reconstruction
(EAR) in Belgrade

21 November 2007

Final Report

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ABBREVIATIONS

AC	Asbestos Cement
BOT	Built-Operate-Transfer
BOD	Biochemical oxygen demand
CBA	Cost Benefit Analyses
COD	Chemical oxygen demand
CWWTP	Central WasteWater Treatment Plant
DI	Ductile iron pipe
DTD-Canal	Danube-Tisa-Danube Canal
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EPA	Environmental protection agency
EU	European Union (from 1992)
EUR	European Euro
FIDIC	International Federation of Consulting Engineers
GRP	Glass-reinforced-plastic pipe
LEAP	Local Environmental Action Plan
MBR	Membrane Bio-Reactor
MLSS	Mixed Liquor Suspended Solids
NEAP	National Environmental Action Plan
NES	National Environmental Strategy
NIVA	Norwegian Institute for water research
O&M	Operation and Maintenance
PE	Population equivalent
PIP	Project Implementation Plan
PPP	Polluter-pays principle
PRAG	Practical Guide to Contract Procedures financed from the general budget of the EC in the context of external actions
PUC	Public Utility Company
PVC	PolyVinyl Choride
SCADA	Supervisory control and data acquisition
SBR	Sequencing batch reactor
SPS	Sewage Pumping Stations
SS	Suspended solids
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TOD	Total Oxygen Demand

TOR	Terms of reference
TSS	Total Suspended Solids
UF	Ultra filtration
UV	Ultra violet light
UFW	Unaccounted For Water
UWWD	Urban Wastewater Treatment Directive
UWWT	Urban wastewater treatment
VOC	Volatile organic compounds
WFD	Water Framework Directive
WTP	(Drinking) Water Treatment Plant
WPCR	Water Pollution Control Regulation
WWT	Wastewater treatment
WWTP, STP	Wastewater treatment plant

EXECUTIVE SUMMARY

Introduction

Acting upon the request of Vrbas municipality, the EAR commissioned MIASP to conduct a Feasibility Study for the Waste Water Treatment and Sewage Collection Project in February 2007, in order to be enabled to consider the possibility to provide grant funds towards the financing of the Project. The proposed area is comprised of the municipalities of Vrbas and Kula, located in the Vojvodina in the Northern part of Serbia, along the highway between Novi Sad and Subotica and the Hungarian border.

The municipality of Vrbas has for the last several years been active in preparing studies and investing in infrastructure in order to mitigate the adverse effects of the pollution of the "Grand Canal", which flows through the centre of Vrbas and Kula town, drains into the Tisa river and ultimately the Danube river. The pollution is mainly caused by the discharge of untreated industrial and communal waste water into the canal.

The overall objective of the project is to protect and improve the water quality of the Grand Canal and to improve sanitary and health conditions in the municipalities of Vrbas and Kula.

The feasibility study supported defining the project and the operational and institutional arrangements required to secure financing. The study supported the full preparation of the project to the level at which financing can be extended for its implementation

Scope of the Feasibility Study

- A basis for financial project appraisal by the EAR;
- Compose a plan for the institutional, organisational and financial setting of the waste water and sewage collection system in Vrbas municipality;
- Compose a plan for the construction and operation of the new waste water treatment plant and sewage collection system in accordance with Serbia's and EU's legal, regulatory and environmental legislation.

Conclusions and Recommendations

General

1. The project was originally oriented towards the construction of the Central waste water treatment plant (CWWTP) Vrbas only. However, in order to achieve overall project objectives and improve level of communal services, it was deemed necessary to also consider and include the scope with the extension of the sewerage system.
2. The project is in line with the relevant EU directives and also compliant with the requirements set out in the national legislation and regulations.

Extension of the sanitary sewerage collection system

1. The proposed extension of the sanitary sewerage collection system would significantly improved standard of service – in wastewater collection, and would substitute current practice relying on individual septic tanks that represent potential source of pollution of both underground and surface waters, and serious health hazard.
2. The municipality of Vrbas has been heavily engaged in extending the sanitary sewerage collection system. Construction works on extension of the sanitary sewerage collection network are being carried out. Also, based on the recommendations outlined in the corresponding technical study, it has been planned to introduce proper sanitary sewerage collection in all major rural settlements in the municipality, and to transfer collected wastewater to the future central wastewater facility in Vrbas.
3. Therefore, not only the urban area of Vrbas is planned to be fully covered by the sewerage system, but also the villages in the municipality should be provided by a sanitary sewerage system, plus transfer of collected wastewater to the CWWTP, where all collected wastewaters shall be treated before being discharged into the Canal.
4. The total number of population in Vrbas municipality to be provided with wastewater collection and treatment is estimated to reach app. 50.000, i.e. practically the population should be fully covered.
5. Apart from Vrbas municipality, the municipality of Kula has been also considered in the project. It has been established that the current service coverage (in terms of population served) with sanitary sewerage collection in the town of Kula is only 30%. Moreover, identified major industrial polluters do not operate at the moment. Described status of sanitary sewerage services in Kula, with undefined prospects of future development, led to a proposed capacity staging of the project.
6. It is therefore proposed to include in phase I of the project the extension of sewage collection to 5 Vrbas villages, as well as construction of an extension of the main gravity sewer to connect Carnex meat industry to the existing sewage collection network in Vrbas town.
7. Although considered to be technically and financially sub-optimal, the municipal authorities of Vrbas insisted that construction of the main gravity sewer Kula – Vrbas also be included in the first phase of the project implementation. This can be acceptable only provided that financing has been secured for all other elements already included in Phase I. Potential positive effects of this construction are , under current circumstance, very limited in scope (only 6.000 new users) and in duration (WWTP can manage the loading only till 2011-2012). Moreover, development of the main gravity sewer in the first phase brings great risks of impairing planned phasing and proper functioning of the WWTP.

Construction of the CWWTP Vrbas

1. The planned CWWTP Vrbas should treat the complete communal wastewaters from the municipality of Vrbas (urban and rural population and institutions), plus sufficiently pre-treated industrial effluents from a number of industrial polluters (Carnex and Vital industries). In the next stage of project implementation, it is planned to connect the town of Kula and corresponding local major industrial polluters to the CWWTP Vrbas, with adequate extension of the CWWTP capacity.
2. The set design criteria are in accordance with the EU wastewater treatment directive, and also compatible with the requirements set by the competent national authority.

3. The location of the plant has been determined and is situated around the location of the old wastewater treatment plant of Vrbas, south-east of the centre of the town. Discharge of treated water will take place in the channel DTD Bogojevo - Becej.
4. The project period is divided into three phases:
    - Phase I – Construction of the wastewater facilities to cater for wastewater generated in Vrbas town, villages and industries – The operational capacity of this stage shall be approximately 2/3 of the total CWWTP capacity (i.e. 2/3 of 150,000 PE, or approximately 100,000 PE) and the effluent quality shall be as requested in the design conditions set by the national authority.
    - Phase II – Construction of the wastewater facilities to treat, in addition to the abovementioned users (Phase I), also wastewater generated in Kula (population and industries). This phase would include construction of the third treatment line (of the capacity approximately 50,000 PE) with the same treatment technology and removal efficiency as defined in the phase I.
    - Phase III - would include a process upgrade of the CWWTP, for the full design capacity, by means of nitrogen and phosphorous removal, as defined in the set design conditions.
5. The process schemes are technically sustainable and include necessary pre-treatment and post treatment, thus in line with the pursued compliance with adopted effluent quality norms and requirements. Both, water and sludge processing are considered, minimizing the impact on the environment in line with local and EU regulations.

<u>Environmental Impact Assessment</u>

1. The construction of the WWTP in Vrbas will lead to an increase in water quality of the Grand Canal which flows through the town of Vrbas. This will have a positive effect on public health and aquatic ecosystem of the canal. It will improve recreational possibilities.
2. It must be realized that the extent of water quality enhancement in the Grand Canal depends also on the successful improvements of other polluters such as the Pig farm and the sugar cane industry. These are being considered by other financial institutes or local authorities and consultants in order to improve these issues as they have been identified clearly by the NIVA (Norwegian Institute for Water management).
3. The existing EIA is not explicit on waste management during construction phase and operational phase of the WWTP, other than making reference to applicable laws and regulations. The laws and regulations are given by name and published date but it is not elaborated on what this entails for this particular situation. The following needs to be elaborated upon:
4. Waste streams – during construction phase
    - general waste from construction period (domestic waste and construction waste)
    - removal of the old WWTP
5. Waste streams – during operational phase. It needs to be clearly described what will be done with all the following waste streams. Where will they go, what are the best options from an environmental point of view (preferably, first recycling then other options such as landfill):
    - Primary waste from pre-treatment – the first step of treatment is a primary treatment which will take out all the rough waste from the sewage (bottles, plastics, etc.).

- Oily products during primary treatment – this will be scraped of the top of the water during this primary treatment stage.
- Settled sand during primary treatment – Dirty sand will settle at the bottom of the primary treatment and needs to be cleaned out from time to time.
- Sludge – what happens to the sludge, it would be best practice if the sludge can be used for agricultural use. This should be investigated. It is not stated what will happen to the sludge now, most likely it will be dumped on the landfill. It is stated in the project documentation that the quality of sludge shall be established during the CWWTP operation, and thereafter a decision shall be made to use it (in agriculture) or to dispose it to a landfill.
- General waste – from operations (domestic and operational waste from maintenance of machines, etc.)

6. The EIA does not sufficiently details the requirements for a monitoring plan. A monitoring plan still needs to be composed. Guidelines for such a plan are given in the report.
7. HSE management plan. A general HSE management plan must be put in place. It should elaborate on all the HSE issues, including necessary training of employees.

<u>Financial assessment PUC Standard</u>

1. PUC Standard is operating at 0% profit, like most PUC's in Serbia;
2. The companies' generated cash flow is insufficient to finance investments; most investments are funded directly by the Municipality or are provided for with capital subsidies;
3. PUC Standard currently has billing system combining all communal services. Collection rates are relatively high at 90% during 2006. Although there are no large differences between customer groups, marked differences exist between villages;
4. For the PUC as a whole, current tariffs just cover operating costs, although the level of operational subsidies and the costs which they are supposed to cover is difficult to assess in the absence of a cost centre based financial management system;
5. The water and waste water tariffs are projected to just cover costs during 2007. The cost coverage ratio is, however, declining as a result of costs increases higher than allowed and applied tariff adjustments;
6. Fixed assets are not revaluated regularly. In an inflationary environment, as has been the case in Serbia, this leads to the understatement of the asset base in the balance sheet, but also to the understatement of the depreciation charge and might lead to tariffs being set at below cost recovery levels;
7. The PUC does not make provisions for doubtful debts. Instead, uncollectible debt is written off directly, but also this happens irregularly;
8. There is no tariff setting formula or procedure, since it is currently national policy to cap tariff increase with the estimated inflation for the next year.

<u>Creditworthiness assessment Vrbas municipality</u>

1. The budget of Vrbas municipal is balanced during the period 2004 to 2007. Part of the budget is however financed from external sources (commercial bank loans);
2. Vrbas municipality has a relatively high capital expenditure budget, which is planned to reach 41% of 2007 planned total expenditure. More than half of the 2007 capital budget is planned to be spent on sewage collection infrastructure (RSD 171 million, approximately € 2.1 million);
3. Vrbas municipality intends to finance the 2007 budget with an additional loan of RSD 150 million. The remaining legal borrowing capacity will have been completely used, if this loan is effected;

4. Projections of municipal revenue and costs show that, in addition to the 2007 allocation, the municipality still would have some though limited financial room to finance sewage infrastructure from its budget during the period 2008 to 2010;
5. Because of growth of municipal revenues, some limited additional commercial borrowing is possible during the period 2008 to 2010.

Financial analysis

1. A tariff policy is proposed, consisting of the following elements:
   a. A new waste water treatment tariff to be introduced in the year 2011, amounting to RSD 16/m3 (2007 price) or RSD 20/m3 (2011 price) of drinking water consumed, which only will need to be adjusted for inflation thereafter;
   b. The waste water treatment tariff for large industries to be set 50% higher than the domestic tariff, since the pollution load is also 50% higher;
   c. A sewage collection tariff fixed in real terms until the year 2014 and thereafter set at full cost price level;
   d. A drinking water tariff fixed in real terms until the year 2011 and thereafter in accordance with the full cost price;
   e. A gradual phasing out of cross subsidized tariffs for drinking water and sewage collection, by lowering the business/industrial rate during the period 2012 to 2018.
2. The tariff policy results in a real cumulative increase of the overall water and waste water tariff of approximately 50% by the year 2011 and 90% cumulative by the year 2039;
3. However, it remains within affordability constraints. A maximum of 1.5% of average household income is forecasted to be spend on water & waste water during the years 2011 to 2013, up from 1.2% in 2007.
4. Affordability to large industries is critical: the impact of the new tariff will be approximately the same, if compared to the existing effluent discharge fees. However, costs of pre-treatment have not been taking into account which would certainly drive up the cost for the industries;
5. The proposed tariff policy will generate sufficient cash flow to fully fund large re-investment requirements of the waste water treatment project and is thus financial sustainable at the company level;
6. On the basis of this proposed tariff policy, a financial analysis was conducted. Assuming a macro economic base case scenario the analysis results in a nominal financial internal rate of return on total invested capital (FIRR/C) of 0.3% and a financial net present value (FNPV/C) of € -14,445 thousand;
7. This financial result justifies an grant funding, like EU-IPA. Using the “modified formula”, a grant rate percentage of 76.1% is calculated. Assuming a maximum 75% rate, the project would be eligible for a grant amounting to € 18,560,000;
8. The grant rate determination methodology applicable to ERDF/CF funded projects during the 2007-2013 programming period yields different results. Assuming a 75% grant rate would result in an EU grant of € 12,742,000, while a lower nominal discount rate of 7% would result in an EU grant amounting to € 12,070,000;
9. The project is financially sustainable, since the cumulative project cash flow in each year is positive;
10. The financial rate of return on national invested capital is acceptable at a level slightly higher than the nominal discount rate of 8%. FIRR/K is 9.4% and FNPV/K is € 879 thousand;

11. The sensitivity analysis shows that a variation of +/1% in selected key variables does not cause fluctuations higher than 5% in FNPV/C. There are therefore no critical variables requiring a further risk assessment;
12. The project is most sensitive to variations in the discount rate;
13. The project creates large positive external effects. The quantitative economic analysis shows positive results, even though not all external effects could be monetized: EIRR 13.2%, ENPV of € 14,858 thousand and a B/C ratio of 1.39. the project is therefore feasible from the point of view of society.

Institutional analysis

1. For the purpose of managing a WWTP a new PUC shall be founded. A Founding Act and Statutes shall be drafted by legal advisors of the Municipality and the Management Board once it is established.
2. Capital of the new PUC shall be identified before it is founded. The process shall include transfer of the capital from the municipality and the existing PUC to the new PUC. The Municipality shall define the legal body responsible for the process.
3. Position of a new company shall be strengthened by amendments to the existing Decision of Communal Activities by which all legal and natural entities in the municipality shall be obliged to connect to the sewage and thus to the WWTP.
4. A Contract in between the municipality and a new PUC should be drafted in order to target efficiency issues. Such contract may have the form of a Service Level Agreement (SLA) or a Management Contract.
5. All decisions/documents of the above have to be ratified by the Municipal Parliament.

Operational efficiency

1. It is recommended to set up a separate public utility company, which is to exclusively manage and operate the drinking water, sewage collections and new waste water treatment operations;
2. This new PUC will be comprised of the transfer of existing water & sewage collection staff working in PUC Standard and an additional 26 staff, mostly technical staff for the extended scope of services;
3. Financial systems should be improved. There is especially a need to design and implement a management accounting system that would be linked to the management information system;
4. Furthermore, multi-year long-term financial/investment planning system and an approved and implemented tariff policy needs strengthening;
5. The billing and collection system will need to be adapted to the specific needs of the utility and to improve its efficiency;
6. A management information system needs to be designed, which is standardized and fully integrated with the financial systems;
7. In the field of wastewater: as more operational, technical and process knowledge needs to be acquired staff should be involved in training. Before construction and putting into operation specific training should be offered to the staff at different levels according to the position of staff members. After start-up of the new WWTP, staff should receive regularly training in the fields of efficiency improvement, new techniques, problem solving.
8. Laboratory facilities both in terms of facilities and in human capacity will need strengthening

9. Measures and a program for leakage reduction, both in terms of human resources, management and physical measures (sector metering) are required to reduce physical losses.

Financing and investment

1. The Total investment cost for phase I amounts to € 25,184 thousand;
2. The Ministry of Agriculture, Forestry and Water has committed itself in writing to provide a state grant of between € 3 to 4 million to finance the waste water treatment plant, provided full financing is secured. In line with existing policy, 1/3 of the cost of the waste water treatment plant (€ 3,870 thousand) is assumed to be financed by the Ministry;
3. The total grant contribution (EU-IPA, others) is assumed to be 75% of eligible costs, or € 18,560 thousand. This amount is justified in the financial analysis by using the "modified formula" methodology;
4. The municipal contribution amounts to € 2,753 thousand, out of which approximately € 2,100 thousand has been allocated in the 2007 budget;
5. It is proposed that the major part of the municipal finance will be used during he year 2008, to finance part of the sewage collection network extension in 5 Vrbas villages.

Table 0-1 Overview investment costs Vrbas-Kula WWTP & sewerage (in € '000)

Description	Phase I (€) 2008-2010	Phase II (€) 2012	Phase III (€) 2022	Total (€)
Investigation works & design	490	-	-	490
Construction works	4,379	1,250	684	6,313
Electro-mechanical equipment	5,312	1,268	1,194	7,774
Additional land acquisition (1,5 ha)	20	-	-	20
Trial run, staff training, operation over 12 moths & construction supervision	300	-	120	420
Contingencies WWTP	1,130	301	214	1,645
Subtotal WWTP	**11,631**	**2,819**	**2,212**	**16,662**
Vrbas main sewers	450	-	-	450
Vrbas villages sewerage extension	11,199	-	-	11,199
Kula main sewers	-	2,350	-	2,350
Subtotal sewage collection network	**11,649**	**2,350**	**-**	**13,999**
Subtotal investments costs	**23,280**	**5,169**	**2,212**	**30,661**
Supervision excluding VAT	1,487	343	167	1,998
VAT	417	992	428	1,837
GROSS TOTAL	**25,184**	**6,504**	**2,808**	**34,496**

Table 0-2 Identified TA elements

Financial and Operational Performance Improvement Plan (FOPIP)	300
EIA supplementary activities	100
Public awareness campaign	100
TOTAL in 1000x€	**500**

Table 0-3 Proposed financing plan phase I

Grants (EU-IPA, other sources)	18,560
Ministry of Agriculture, Forestry and water	3,870
Vrbas municipality	2,753
TOTAL in 1000x€	**25,184**

Risks

1. Public acceptance of waste water treatment. This might cause problems in raising and collecting required tariffs for waste water treatment;
2. Ministry of Agriculture, Forestry and Water fails to allocate budget for the waste water treatment plant. This might lead to delays in project preparation, since alternative financing will need to be secured;
3. Limited management capacity to procure, tender and supervise construction. Adverse effects would be delays in the implementation phase;
4. Setting up of the proposed new public utility company is delayed. This could cause problems in handing over and operation of especially the waste water treatment plant;
5. Large industries fail to invest in pre-treatment facilities. This would have serious consequences, since this would mean that industries cannot connect to the sewage collection system and would endanger the proper operation of the waste water treatment plant;
6. Large industries fail to sign sewage connection contracts or disagree about tariff level. This also would have serious consequences, since a large share of total revenues for the new infrastructure is to be paid by these industries;
7. Continued untreated waste water discharge. This would have adverse effects on the environmental objectives of the project;
8. Inadequate sludge and waste management practices at the waste water treatment plant. This would also have serious consequences, since the envisaged environmental objectives would only partly be met;
9. Inadequate tariff policies and payment discipline. Serious consequences would be an under funding of the PUC operations, causing the deterioration or even discontinuation of especially the waste water plant;
10. Limited waste water treatment management capacity. Improper operation and maintenance of especially the waste water treatment plant might cause serious damage to the plant itself, but also lower effluent quality so that environmental objectives are not met.

1 INTRODUCTION

1.1 Preliminary and background

Acting upon the request of Vrbas municipality, the European Agency for Reconstruction (EAR) commissioned MIASP in February 2007 to conduct a Feasibility Study to investigate and assess the proposed Waste Water Treatment and Sewage Collection Project. This would enable the EAR to consider the possibility to provide grant funds through the European Unions new financing instrument IPA (Instrument for Pre-Accession).

The Project Area area is comprised of the municipalities of Vrbas and Kula, located in the Vojvodina, in the northern part of Serbia. It is located close to the highway between Novi Sad and Subotica & the Hungarian border.

The Vrbas – Kula wastewater project is an integral part of the project called “Revitalization of the DTD Grand Canal through Vrbas”, that has been carried out with support from the Norwegian Institute for Water Research (NIVA) for the last several years and is documented in detail in references in Annex 1.1 (hereinafter called “NIVA studies”)

The main objective of the Revitalisation of the Grand Canal project is to improve life quality and reduce health risks for the people of the Crvenka – Vrbas area by treatment of waste water discharges to the Grand Canal and restoring the Canal to national and international river standards and requirements.

The goals of the revitalization project also include planning, rehabilitation and maintaining the water related environment in the Backa region to ensure the sustainability of the planned area-development and to provide a basis for sound environmental management.

The Danube-Tisa-Danube Canal, shortly called DTD-canal, or Veliki Kanal (Grand Canal), was built in the 18th century, partly for transport and as a source of water supply, but also with the purpose of draining the wet and fertile soils of the Backa district of Vojvodina.

During the 20th century, the area between Crvenka and Vrbas was heavily industrialized. This resulted in increased settlements and population in the small towns along the canal. The canal became more and more polluted, and in the worst stretch around Vrbas, the canal is more or less filled with industrial sludge. Sugar beet processing factories, pig farms, slaughterhouses, edible-oil factories, metal processing factories, etc are the worst polluters in addition to untreated municipal sewage from the towns. In addition to causing local problems, the pollution of the Grand Canal is a problem for the Tisa, and constitutes also a significant pollution source for the Danube. Based on estimated nutrient pollution, 70% of pollution originates from industrial sources, while 20% and 10% are from municipal and agricultural sources.

The pollution of the Grand Canal running through the medium sized city of Vrbas (around 26.000 inhabitants) has been characterized as among “the worst in Europe”. Table 1-1 illustrates the scale of the pollution, compared to other major pollution sources in the vicinity of the project area.

Table 1-1 Comparison of organic pollution and dilution factor in the recipient

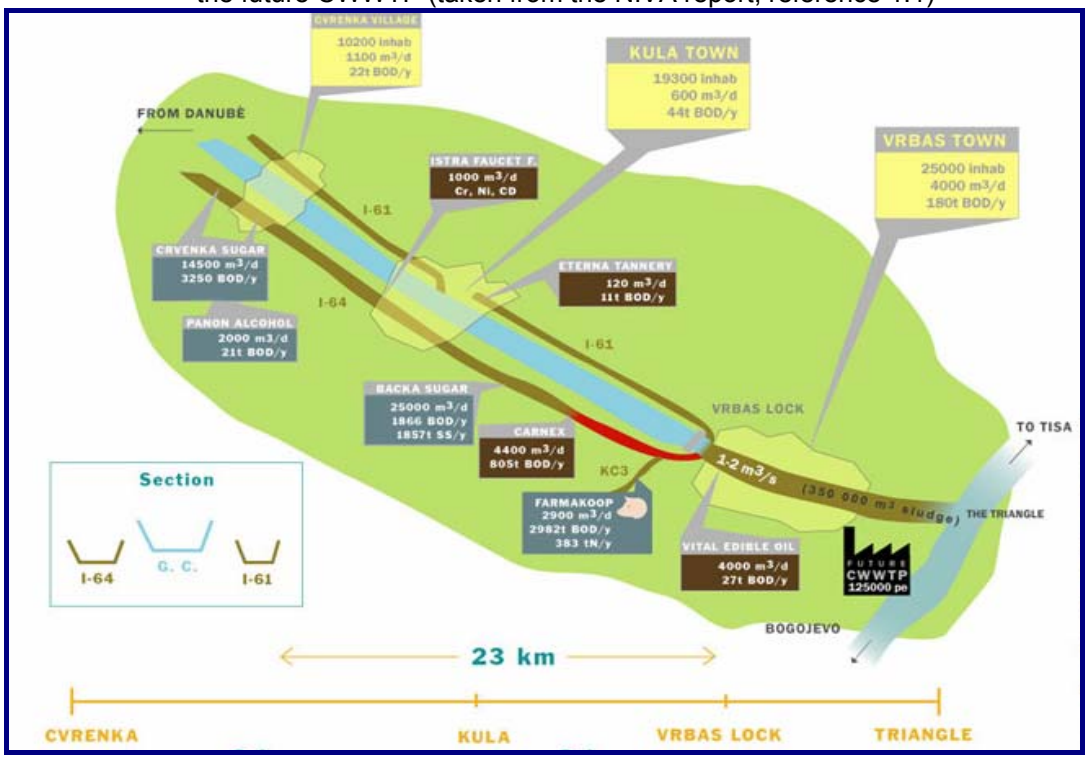
	Belgrade	Novi Sad	Vrbas-Kula
Population	1,600,000	300,000	94,500
Organic matter discharge, BOD t/y	35,000	6,750	10,000
Recipient	Danube, 6,000 m3/s	Danube, 6,000 m3/s	DTD, 1-6 m3/s
Dilution factor	Very high	Very high	Extremely small

Source: Final report of the project *Revitalization of the Grand DTD Canal through Vrbas,* NIVA (June 2006), with corrections

The area of influence starts in Crvenka, a settlement belonging to Kula municipality 17 kilometer to the west of Vrbas, and ends 23 kilometer downstream, at the so called "Triangle", which is a point of confluence between the Grand Canal from the north-west and the Bogojevo canal from the west. From there on, the resulting canal has the name of the Grand Canal and runs for 12 km before entering the Tisa River that flows from Romania and Hungary and enters into the Danube downstream near the city of Titel.

Figure 1-1 illustrates the wider project area and the schematic map of the Grand Canal and the laterals between Crvenka and Vrbas, including waste water discharges from three towns, eight industries and the future CWWTP, as planned in the NIVA studies.

Figure 1-1 Schematic map of the Grand Canal and the laterals between Crvenka and Vrbas, including waste discharges from three towns and eight industries and the future CWWTP (taken from the NIVA report, reference 1.1)



Important activities of the project of Revitalization of the Grand Canal were conducted from 2003 to 2006. Supported by the Government of the Kingdom of Norway through the Norwegian Institute of Water Research (NIVA), Vrbas municipality took part in a range of investigations and other project activities, resulting in the final project reports, dated July 2006. The major parts of the report, include the following:

- NIVA, Revitalization of the DTD Grand Canal Through Vrbas – Final Report
- NIVA, Faculty of Civil Engineering, University of Belgrade, Central Waste Water Treatment Plant (CWWTP) for Vrbas and Kula – General Project Design and Pre-feasibility study
- NIVA, Faculty of Civil Engineering, University of Belgrade, CWWTP for Vrbas and Kula – Draft Tender
- NIVA - Technical proposal for introduction of a sanitary sewerage system in the villages of Vrbas municipality (references 1.8 – 1.10).

One of the key measures proposed by the abovementioned reports is the construction of the Central Waste Water Treatment Plant (CWWTP) in Vrbas. The proposed waste water treatment plant is designed to treat organic loading of approximately 125,000 PE and provision of adequate industrial pre-treatment facilities for those industries connected to the CWWTP, so that influent quality to the CWWTP would be controlled and managed.

This study is only assessing the feasibility of the waste water treatment plant. Although this is a key measure in order to abate the pollution highlighted above, it is important to note that other key measures targeting major polluters (two sugar factories and a pig farm, dredging of the Grand Canal) are not covered by this project. Hence, only part of the overall objectives and expected results of the revitalization project is targeted by this study.

Technical proposals presented in this study are primarily based on the proposals and recommendations included in the abovementioned general project design and pre-feasibility study, however adjusted and modified to suit the latest plans for the project scope extension.

Because of the environmental problems highlighted above, the project has been identified as one of the top environmental priorities of the Serbian National Government in the water sector. It is specifically identified as a priority project in the draft National Environmental Action Plan, to be implemented during the period 2006 – 2010. The project is fully in line with the short term policy objective for the water and water resources sector of the National Environmental Strategy, since it passes the following criterion:

To provide primary and secondary wastewater treatment in agglomerations above 100,000 PE, excluding agglomerations discharging directly to large water bodies (Danube, Sava), where waste water treatment plants will be completed after 2014.

The project is furthermore supported by the Ministry of Agriculture and Water, Directorate-General Water, as well as Vode Vojvodina (Water Works Vojvodina), the organization directly responsible for the maintenance of the DTD network at the level of the Autonomous Province of Vojvodina. Vode Vojvodina is coordinating actions at a regional level to protect and clean up the Grand Canal. It issued an overall action plan to

this effect by the end of the year 2006. The action plan is backed up by bilateral agreements between Vode Vojvodina and the industries and utility companies which currently discharge waste water into the Canal.

1.2 Project Development Plan and Technical Assistance

It is envisaged that the Project will be developed and prepared in two phases. The first phase is this Feasibility Study, and the second phase will be subject to the findings and results of the first phase.

- Phase 1: Feasibility study. An assessment of the project has been made, a detailed project structure has been developed. Based on this study the project will be presented to the municipality.

- Phase 2: Implementation Support. This will be a separate follow-up assignment and financing for this support will be agreed upon during Phase 1. Technical co-operation required during this phase will likely include preparation of the majority of design work, tender documents and assistance in the tender process.

1.3 Project objective

The **overall objective** of the project is to protect and improve the water quality of the Grand Canal and to improve sanitary and health conditions in the municipalities of Vrbas and Kula.

This feasibility study proposes to phase the project as follows:

- **Phase I** comprised of construction of a approximately 2/3 (approximately 100,000 PE) of the total capacity of the waste water treatment plant, extension of the gravity main sewer to connect Carnex meat industry in Vrbas and extension of the sewage collection network to 5 villages with 20,000 inhabitants within Vrbas municipality;
- **Phase II** comprised of extension of the gravity main sewer connecting Kula town with Vrbas municipality and construction of the 1/3 (50,000 PE) of the waste water treatment plant;
- **Phase III** comprised of a process upgrade of the waste water treatment plant, for the full design capacity, by means of nitrogen and phosphorous removal, as defined in the set design conditions.

Phase I is defined as the priority project, targeted for EU-IPA assistance.

Justification for this phasing is that currently in Kula town only 30% is connected to the sewer system (2,000 connections, approximately 6,000 inhabitants), and the two large industries in Kula town are currently operating at a very low level, with unknown prospects when they will start operating normally again. Hence, current waste water discharges originating from Kula are relatively low. In order to prevent costly over dimensioning of the waste water treatment plant, extension of the remaining 1/3 of the total capacity of the waste water treatment plant is made contingent on actual developments in Kula town.

Instead, it is proposed by this study to include in phase I an extension of the sewage collection network to 5 Vrbas villages, connecting an additional 20,000 residents. On the one hand this is proposed in order to build upon ongoing developments in Vrbas municipality: waste water treatment and sewage collection is the top priority of Vrbas municipality as evidenced by large municipal budget allocations. On the other hand this is proposed for technical reasons: the operations of the waste water treatment plant will be more stable with a higher share of residential waste water which has a stable daily pattern and pollution load. After finalisation of phase I, about 50% of total pollution load will originate from two large industries, with the other 50% originating from residents, institutions and small businesses.

Finally, the proposed final stage - process upgrade to remove nitrogen and phosphorous - is in line with the original preliminary design after taking into consideration recommendations made by the Serbian authorities.

Specific objectives for phase I are:

- To provide waste water treatment and disposal for 46,000 residents in Vrbas municipality;
- To collect, transfer, treat and dispose pre-treated industrial effluents for identified major industries in Vrbas, currently discharging into and polluting the DTD Grand Canal and other canals of the DTD systems;
- To extend the sewage collection system to 20,000 residents, institutions and small industries and businesses living in the villages Zmajevo, Bačka Dobro Polje, Ravno Selo, Savino Selo and Kucura of Vrbas municipality;
- To significantly improve the quality of life with many indirect impacts, improved sanitation and reduced risks to public health;
- To radically improve the water quality in a heavily eutrophicated Danube tributary – DTD Grand Canal;
- To provide compliance with short-term policy objectives in accordance with the National Environmental Strategy (NES);
- To ensure implementation of a priority project in accordance with the National Environmental Action Plan (NEAP);
- To trigger pre-treatment activities of the major polluting industries;
- To make a major step towards complying with the EU's Urban Wastewater Treatment Directive;
- To provide relief in serious economic restraint on the development of industry, due to water pollution.

1.4 Scope of Work of the Feasibility Study

- A basis for financial project appraisal by the EAR;
- Compose a plan for the institutional, organisational and financial setting of the waste water and sewage collection system in Vrbas municipality;
- Compose a plan for the construction and operation of the new waste water treatment plant and sewage collection system in accordance with Serbia's and EU's legal, regulatory and environmental legislation.

2 GENERAL SOCIO-ECONOMIC BACKGROUND

2.1 Introduction

This chapter describes the general, social, economic and financial background information of the municipalities of Vrbas and Kula. As elaborated upon further in this study, it is proposed to concentrate the first phase of investments on Vrbas municipality. Therefore, this chapter concentrates on Vrbas municipality and provides background information on Kula municipality.

An assessment of household income is made, as well as a discussion of maximum affordability of water and waste water tariffs.

2.2 Socio-economic structure

2.2.1 Geography

The project area is comprised of the municipalities of Vrbas and Kula, located in the north-west part of Serbia. Both municipalities are in the region of Autonomous Province of Vojvodina and the project area occupies approximately 1% of the total area of Serbia, and 4.2% of the territory of Vojvodina.

Like elsewhere in the Vojvodina, the project area has a high percentage of agricultural land with 95% of the total land used for this purpose. This is above the average of Serbia (66%), and also above that of the Vojvodina (83%).

Table 2-1 Geography

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
Total area in km2	88,361	20,229	857	376	481
Do, as % of total	100%	23%	1.0%	0.4%	0.5%
Agricultural area as % of total	66%	83%	95%	97%	94%

Source: Municipalities of Serbia 2005, Statistical Office of Republic of Serbia March 2006

2.2.2 Demography

The total population of the project area according to official 2004 estimates is 92,949, corresponding to about 1.2% of Serbia's total population and 4.6% of the total population in Vojvodina. This is slightly less than the official census 2002 data, which arrived at a total of 94,205 inhabitants.

The project area's annual population growth trend between the census years 1991 and 2002 is negative at -0.02%, which is above the national average decline rate of -0.09%, but below the Vojvodina average of 0.28% positive average annual growth.

Table 2-2 Demography

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
Population 1991 census	7.576.837	1.970.195	94.362	45.803	48.559
Urban	4.126.728	471.315	44.615	25.610	19.005
Other	3.450.109	1.498.880	49.747	20.193	29.554
Population 2002 census	7.498.001	2.031.992	94.205	45.852	48.353
Urban	4.225.896	531.146	45.208	25.907	19.301
Other	3.272.105	1.500.846	48.997	19.945	29.052
Annual growth 1991-2002	-0,10%	0,28%	-0,02%	0,01%	-0,04%
Urban	0,22%	1,09%	0,12%	0,10%	0,14%
Other	-0,48%	0,01%	-0,14%	-0,11%	-0,16%
Population estimate 30-6-1999	7.540.401	2.033.465	95.607	46.399	49.208
Population estimate 30-6-2004	7.463.157	2.022.257	92.949	45.287	47.662
Annual growth 1999-2004	-0,21%	-0,11%	-0,56%	-0,48%	-0,64%
Population density (2004, in persons/km2)	84	100	108	120	99

Source: Municipalities of Serbia 2005, Population Census 2002, Statistical Office of Republic of Serbia

When analyzing the trend during the period 1999 to 2004, however, both Serbia and Vojvodina show negative growth rates. The project average growth rate was even lower than both those for Serbia and Vojvodina. Some parts of Vojvodina have traditionally low or negative population growth, which can be attributed to transition of the rural population to the major cities. This trend is strongly present in Serbia in general. Reasons for this are usually a reflection of high unemployment rate, and young population of the reproductive age not being ready to form families when future prospects are uncertain.

As elsewhere in Serbia, a clear urbanization trend can be noted for the project area. The urban settlements in the project district grew with an annual average of 0.12%, during the period 1991-2002, at the expense of rural areas with -0.14% annual growth. The rural areas are being depopulated at a high rate (see Table 2-2).

The population density in the project area is 108 persons per km2, well above the country average of 84 km2. According to the 2004 estimate the municipalities of Vrbas and Kula are highly populated districts at 110 and 99 persons per km2.This high population density is the result of the population migrating from the war affected areas (wars 1991 to 1996), and settling in Viojvodina. Traditionally, all the historical population migrations ended up in Vojvodina.

2.2.3 Employment

Table 2-3 Employment and unemployment

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
Active Population age (15-64) - 2002	5.032.805	1.386.031	64.05	31.264	32.787
% of active population in total population	67,1%	68,2%	68,0%	68,2%	67,8%
Unemployed persons 2002	904.494	281.069	14.535	6.873	7.662
(Un) Employed as % in Active population	18,0%	20,3%	22,7%	22,0%	23,4%
Total employed persons (2004 average)	2.050.854	537.146	24.722	14.130	10.592
Do, as % of total population	27,5%	26,6%	26,6%	31,2%	22,2%
Do, as % of labour force	67,9%	71,5%	62,0%	64,6%	58,8%
Total unemployed persons (2004 average)	969.888	214.621	15.164	7.750	7.414
Do, as % of total population	13,0%	10,6%	16,3%	17,1%	15,6%
Do, as % of labour force	32,1%	28,5%	38,0%	35,4%	41,2%
(Un) Employed as % of total population	40,5%	37,2%	42,9%	48,3%	37,8%
# of adult persons receiving social welfare	214.294	35.006	885	436	449
Do, as % of total population	2,9%	1,7%	1,0%	1,0%	0,9%

Source: Municipalities of Serbia 2005, Statistical Office of Republic of Serbia March 2006

The 2004 data show that the number of employed people per 1,000 inhabitants for the project area is 266, which is relatively close to the national average of 275 (see table 2-3). On average, employment in the project area ranges between 222 and 312 per 1,000 inhabitants. The municipality of Vrbas, with 312 employed people per 1,000 inhabitants is above the national average. On the other hand, Kula municipality with 222 people employed per 1,000 inhabitants differs significantly from Vrbas and is well below national and provincial averages.

Vrbas municipality is the largest agricultural centre in Serbia, and the high employment average can be attributed to the fact that a large number of factories in the food industry are fully operational, such as:

- Carnex - meat processing factory currently employing 1,500 people;
- Vital - edible oil production currently employing 900 people;
- Backa sugar industry;

Most of these industries have been privatised, restructured and are currently operational. The difference with Kula is rather striking: some large industries in this

municipality like Istra (faucet producer) and Eterna (tannery) which are targeted to be connected to the central water treatment plant, are still in pre-privatisation stage and currently operate at a low level.

On the other hand, unemployment in the project area is higher than the national and Vojvodina average, both measured as the share of unemployed persons in active population (aged 15-64) and labour force (employed + unemployed persons). These data should be interpreted with some caution. It is well known that a significant share of officially registered unemployed have unofficial employment in especially the agricultural sector or informal economy.

Another way to assess the socio-economic situation is to analyze data on social welfare recipients. Here, we can conclude that both Vrbas and Kula have a lower than average percentage of social welfare recipients with respectively 1.0% and 0.9% of the total population. This is an indication that the socio-economic situation in the project area is relatively better than in other parts of Serbia.

When analyzing the employment number by economic sector, the most striking feature is the relative large employment created by the manufacturing/processing and entrepreneurs & sole proprietors sectors, compared to national and Vojvodina averages. Especially, the manufacturing/processing industry in Vrbas is large with 37% of total employment versus a national average for 25%. This can be explained by the large agricultural related processing industries active in the municipality.

Table 2-4 Employment by sector

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
Agriculture. Fisheries & forestry	70.073	42.270	1.982	723	1.259
Do, as % of total	3,4%	7,9%	8,0%	5,1%	11,9%
Manufacturing/processing industry	515.774	136.516	8.591	5.261	3.330
Do, as % of total	25,1%	25,4%	34,8%	37,2%	31,4%
Energy & other utilities	46.470	9.094	476	342	134
Do, as % of total	2,3%	1,7%	1,9%	2,4%	1,3%
Construction	88.274	20.378	422	305	117
Do, as % of total	4,3%	3,8%	1,7%	2,2%	1,1%
Trade	208.279	46.358	1.253	672	581
Do, as % of total	10,2%	8,6%	5,1%	4,8%	5,5%
Tourism	27.869	3.919	296	136	160
Do, as % of total	1,4%	0,7%	1,2%	1,0%	1,5%
Logistics	119.028	27.031	948	463	485
Do, as % of total	5,8%	5,0%	3,8%	3,3%	4,6%
Commercial services	88.276	18.488	466	208	258
Do, as % of total	4,3%	3,4%	1,9%	1,5%	2,4%
Public administration & social sector	416.097	103.428	3.576	2.137	1.439
Do, as % of total	20,3%	19,3%	14,5%	15,1%	13,6%
Entrepreneurs & sole proprietors	470.714	129.664	6.712	3.883	2.829
Do, as % of total	23,0%	24,1%	27,1%	27,5%	26,7%
Total	2.050.854	537.146	24.722	14.130	10.592
Do, as % of total	100%	100%	100%	100%	100%

Source: Municipalities of Serbia 2005, Statistical Office of Republic of Serbia March 2006

Participation of the entrepreneurs & sole proprietors in the region of Vojvodina is rather high, with the share of employees in this sector accounting to 24% of total employment. In the project area this is even higher at 27% of total employment, which exceeds the national average of 23%. This structure is the result of the tax reduction policy for the entrepreneurs and proprietors in Vojvodina during the 1980's. Since the region of Vojvodina is almost entirely agricultural, the economic policy of the 1980's was to encourage other forms of economic activities, and by decreasing taxes on starting small businesses, and reducing taxes on import of the equipment (mainly second hand equipment from Western Europe), it attracted entrepreneurs from the surrounding regions, and cities. Many small- and medium sized companies (SME's) from Belgrade shifted their businesses to Indjija, Stara Pazova, Vrbas, and other municipalities in Vojvodina. These companies have also absorbed and still employ emigrants from war affected regions of former Yugoslavia.

Also striking is the low share of construction and commercial services of the district compared to the national average. Tourism, on a national level is the industry that employs only 1.4% of the total population. This sector has opportunities to develop, and improving communal infrastructure on a national level would also mean attracting tourists and increasing need for the employment in this sector. The municipalities of Vrbas and Kula are however attractive locations for venison hunting, and thus their share is 1.2% of the employment total, higher than the Vojvodina share of 0.7%

2.2.4 National income

The 2004 national income in the project area is 1.5% of Serbia's total national income, whereas Vojvodina accounted for some 30% of the total Serbian national income. On a per capita basis, it can be concluded that Vrbas is well above Vojvodina and national averages, while Kula municipality is at Vojvodina average (see Table 2-5).

Table 2-5 National income (2004)

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
National income (in '000 CSD, nominal)	887.723.556	268.201.268	13.020.710	6.752.974	6.267.736
Do, as % of total	100,0%	30,2%	1,5%	0,8%	0,7%
Do, as % of total project area			100,0%	51,9%	48,1%
National income per capita	118.947	132.625	140.084	149.115	131.504

Source: Municipalities of Serbia 2005, Statistical Office of Republic of Serbia March 2006

The national income by sector data confirm the employment patterns: the manufacturing/processing sector contributes the largest share to the total income of the project area with 46%, as compared to the national share of 29%. Second largest sector is agriculture with 24%, substantially higher than the national average of 17%. It can thus be concluded that the project area's economy is dominated by the manufacturing/processing industry, but also has an important agricultural basis.

Table 2-6 National income by sector

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
Agriculture. Fisheries & forestry	153.909.290	62.061.020	3.098.843	1.409.570	1.689.273
Do, as % of total	17,3%	23,1%	23,8%	20,9%	27,0%
Manufacturing/ processing industry	259.152.928	102.504.283	5.983.494	3.328.462	2.655.032
Do, as % of total	29,2%	38,2%	46,0%	49,3%	42,4%
Energy & other utilities	43.053.993	9.805.888	899.016	572.462	326.554
Do, as % of total	4,8%	3,7%	6,9%	8,5%	5,2%
Construction	62.426.798	11.993.196	167.106	70.818	96.288
Do, as % of total	7,0%	4,5%	1,3%	1,0%	1,5%
Trade	219.635.212	51.075.785	2.010.749	953.704	1.057.045
Do, as % of total	24,7%	19,0%	15,4%	14,1%	16,9%
Tourism	16.709.320	3.573.180	155.197	52.920	102.277
Do, as % of total	1,9%	1,3%	1,2%	0,8%	1,6%
Logistics	91.612.237	18.501.377	435.727	222.897	212.830
Do, as % of total	10,3%	6,9%	3,3%	3,3%	3,4%
Commercial services	38.068.609	7.858.033	247.160	134.303	112.857
Do, as % of total	4,3%	2,9%	1,9%	2,0%	1,8%
Public administration & social sector	3.455.169	828.506	23.418	7.838	15.580
Do, as % of total	0,4%	0,3%	0,2%	0,1%	0,2%
Total	888.023.556	268.201.268	13.020.710	6.752.974	6.267.736
	100,0%	100,0%	100,0%	100,0%	100,0%

2.2.5 Vrbas urban plan 2022

Based on Article 54, Law on planning and constructing (Official Gazette of the Republic of Serbia no.47/2003) and the Article 100 of the Statute of the Vrbas Municipality, the General Urban Plan (GUP) for the city of Vrbas was issued on September 22nd 2003, covering the period until the year 2022.

The GUP is made in the form of a Project Report, by the PK ”Urbanizam”, Novi Sad, and is supported by project plans. The Plan sets out a strategy for spatial development and building regions and zones in a rather global format, giving global outlines to be followed on regional planning of the local infrastructure and determines the position of the city of Vrbas in relation to the other settlements.

2.2.6 Vrbas Medium Term Plan 2006-2010

On a regional level, the municipality of Vrbas developed a medium term infrastructure development plan for the period 2006 to 2010. Within this plan, total investments for the period are assessed at RSD 2.7 billion or € 33.7 million. Within this strategic plan, the investment for the sewerage network is assessed at RSD 466 million or € 5.8 million, the water treatment plant at RSD 1.4 billion or € 17.5 million, and drinking water supply at RSD 830 million or € 10.3 million.

Table 2-7 Vrbas investments plan 2006-2010

Projects	**RSD m**	**%**
Sewerage network	466	17%
WWTP	1,400	52%
Water supply	830	31%
Total	**2,696**	**100%**

Source: Municipality of Vrbas

2.2.7 Memorandum on 2007 Budget

Based on the Law on Budget system, each year the Government adopts a Memorandum on the Budget. The Memorandum on the 2007 Budget states that local communities are entitled to a share of 1.7% of the GDP, in the form of non-categorical transfers. For 2007, these non categorical transfer amount to RSD 29.7 billion, apportioned as follows:

- RSD 18.5 billion is apportioned to 141 municipalities
- RSD 10.2 billion is apportioned to 4 cities (Belgrade, Novi Sad, Nis, Kragujevac)

Local communities are also entitled to a share of RSD 2.0 billion of categorical transfers for the financing of investments in healthcare and operation of tax authorities.

Based on the above provisions, the share of non-categorical transfers for the municipalities of Vrbas and Kula for the year 2007 amounted to respectively RSD 152 million (€ 1.9 million), and RSD 142 million (€ 1.8 million). This constituted a large increase over transfers realized during the year 2006, as elaborate upon in Table 2-8. On the other hand, however, this was to compensate for lower shared revenues from income taxes as a result of lower income tax rates (reduced from 14% to 12%) and introduction of a non taxable part of income of RSD 5,000/month.

Table 2-8 Budget Transfers (RDS '000)

Municipality **1**	**2006** **2**	**2007** **3**	**Index** **4(3/2)**
Vrbas	34,646	151,998	439.0
Kula	49,304	142,405	288.8

Source: Serbian Bureau of Statistics

2.3 Maximum affordability water & wastewater tariffs

A wealth of information is available on the issue of affordability of water and wastewater tariffs. Most studies indicate an affordability ratio of 3% to 5% of average household income. For the purposes of this report, we use a maximum affordable level of 4% of *average* household income or expenditure, a figure which is used in assessing maximum affordability of a number of EU-ISPA financed water and wastewater management projects in Romania. This maximum affordable level is still relatively low in comparison to other utility charges, like electricity and (district) heating, although higher than commonly charged for waste collection services. A recent study[1] sets the maximum affordability of all utility services *combined* at 25% of average household income/expenditure with the following break down per service:

- Electricity: 10 percent of household expenditures;
- Heating: 10 percent of household expenditures;
- Water and waste water: 5 percent of household expenditures

Table 2-1 summarises affordability levels used by various institutes or governments.

Table 2-9 Benchmarks maximum affordability utility services (in %)

Source	Electricity	Heating	Water	All utility bills
Wold Bank (2002)	10-15		3-5	
WHO (2004)	10			
IPA Energy (2003)	10	20		
UN/ECE		15		
UK government		10	3	
USA government		6	2.5	
Asian Development Bank			5	
Ukraine government				20

Source: Can poor consumers pay for energy and water? Samuel Frankhauser, Tatjana Tepic (2005)

To assess the maximum affordable level of the combined water and waste water tariff in the project area, an estimate of the average household income is required. Since 2003, the Statistical Office of the Republic of Serbia publishes data on household income and expenditure, based on a survey of more than 4,000 households. The latest available data refer to the year 2006, which will be the basis of household income estimate for the project area in this study.

The household survey shows that total average monthly household income for Serbia during the year 2006 was CSD 35,263 (€ 446) with expenditure slightly lower at CSD 33,910 (€ 429). These data are further broken down in Central Serbia without Belgrade, Belgrade and Vojvodina, with the following results:

[1] *Can poor consumers pay for energy and water?, Samuel Frankhauser, Tatjana Tepic (2005)*

Table 2-10 Household income and expenditure in Serbia (2006)

Description	Republic of Serbia	Central Serbia			Vojvodina
		Total	Excluding Belgrade	Belgrade	
Income	35,263	35,771	32,422	43,102	33,939
Expenditure	33,910	34,191	32,432	38,039	33,175

Source: Communication No. 72, Statistical Office of the Republic of Serbia 30/3/2007

Largest component of income consists of salaries and wages (45%), followed by cash transfers from government organisations (state pensions, social welfare) with 24%. 94% of the income is received in cash. The remaining 6% is received in kind and mainly consists of natural consumption, mainly comprised of self consumed agricultural production.

Expenditures are dominated by food & non-alcoholic beverages with 39%, with the next largest item spent on dwelling and utility services (16%). The latter can be compared with the maximum 25% affordability level for utility services, although it includes expenditure on housing like rent and interest.

Unfortunately, no further breakdown of these data is available for municipalities, nor are data available showing income distribution patterns. There is however a breakdown between urban and rural population available, which shows that rural population income is 91% and urban 106% of average total income. The expenditure is even less skewed: the urban population spends 102% of the average expenditure, whereas the rural population spends 97% of the average. This would indicate that income distribution is not very skewed, assuming that the rural population would have relatively more people with lower income than urban population.

To estimate the household income for Vrbas and Kula municipalities, the available 2006 household survey data are adjusted for salary level differences, which are known for individual municipalities. The table below summarizes gross and net salaries actually paid during the years 2005 and 2006:

Table 2-11 Nominal salaries

Indicator	Serbia	Vojvodina	Project area	Vrbas	Kula
Jan - Dec 2005					
Gross salaries	25,514	26,440	25,880	28,813	21,967
Nett salaries	17,442	18,076	17,665	19,665	14,996
Jan - Dec 2006					
Gross salaries	31,745	32,392	29,516	32,743	25,212
Nett salaries	21,707	22,110	20,135	22,338	17,197
Growth rate					
Gross salaries	24%	23%	14%	14%	15%
Nett salaries	24%	22%	14%	14%	15%

Source: Communication no. 11, Statistical Office of Republic of Serbia, 23 January 2007

From Table 2-11 it can be concluded that the average 2006 net salary of Vrbas is a little higher than both Serbia and Vojvodina averages. To the contrary, 2006 net salary in Kula, is more than 20% below both Serbia and Vojvodina averages. Growth rate of nominal net salaries over the period 2005 to 2006 in both municipalities is almost the same at 14-15%, but markedly below the Serbia and Vojvodina growth rates of respectively 24% and 22%. It can thus be concluded that a rather large difference in socio-economic circumstances exists between the two municipalities.

The following approach is used to adjust the household income:

- Basis is the 2006 household income data for Serbia;
- For both municipalities the household income data will be used. It is acknowledged that actual expenditure data will likely be the best proxy for total available income, since people in general are reluctant/underestimate their real sources of income. However, since the difference between income and expenditure is very small, this study will be based on income data (cash and in kind);
- The salary component of the household income data, including pensions, is recalculated by multiplying it with the ratio between the net salary in both Vrbas and Kula and Serbia;
- The non salary components are assumed to be the same as the average in Serbia.

For the years 2007 and later, the household income data are estimated by escalating the data with the assumed inflation rate and real wage increase (see also chapter 5 – financial and economic analysis).

The table below sums up the result of the adjustments:

Table 2-12 Household income estimates Vrbas and Kula municipalities

	2005 CSD	2006 CSD	2007 CSD	2005 €	2006 €	2007 €
Serbia	26,952	35,263	39,045	317	446	469
Vojvodina	25,913	33,939	37,579	305	430	451
Project Area	27,214	33,486	37,077	320	424	445
Vrbas	29,571	35,976	39,835	348	455	478
Kula	24,070	30,164	33,399	283	382	401

Thus, *average* household income in the project area is estimated to amount to RSD 37,077/€ 445 during the year 2007.

The next step is to calculate the maximum affordable tariff. Using the 4.0% threshold, the maximum combined water and waste water tariff for the project can be estimated at **RSD 1,483 per month for the year 2007**. Details per municipality vary between RSD 1,336 and 1,592 as set out in the table below.

Table 2-13 Maximum affordable water/wastewater tariffs (2007)

Municipality	HH income	Max. affordable W/WW tariff	
	RSD/month	RSD /1	% affordability
Vrbas	39,835	1,593	4.0%
Kula	33,399	1,336	4.0%
Total	**37,077**	**1,483**	**4.0%**

/1 including 8% VAT

The 2007 actual household expenditure on the combined water and wastewater services is estimated at CSD 433 per month (including VAT), or 1.2% of monthly household income, as set out in the table below. This estimate is only for households which make use of both water supply and sewerage services.

The current tariffs would leave considerable room for tariff adjustments. One should, however, remember that the affordability ration is an average indicator and does not necessarily reflect the affordability of water/waste water tariffs to low income groups.

Table 2-14 2007 tariffs and affordability domestic users

Municipality	liter per capita p. day	HH size /2	HH usage (m3/month)	Tariff/m3 (incl. VAT)	HH charge per month /1	HH income	
						RSD/month	% affordability
Vrbas	135	3.03	12.44	37.63	468	39,835	1.2%
Kula	150	2.89	13.16	27.00	355	33,399	1.1%
Total					**412**	**37,077**	**1.1%**

/1 including 8% VAT

/2 population census 2002 extrapolated to 2007

The estimated monthly charge is based on average billed monthly consumption for Vrbas municipality, based on data provided by the utility, and an estimate of consumption in the case of Kula municipality. Household composition data are taken from official census 2002 data.

3 TECHNICAL ANALYSIS

3.1 Current Level of Service Delivery and Demand projection

3.1.1 Assessment of Operational Efficiency

This section presents an assessment of some (mainly technical) indicators of operational efficiency.

An overview of the existing sewerage system
The municipality of Vrbas includes one urban settlement (population around 26.000) and five rural villages (with a total population of around 20.000).

The latest overview of pipe materials, diameters and corresponding lengths of sewers in the sewerage system is presented in the following table. It should be noted that at the moment only the urban area (the town of Vrbas) is currently served by a sanitary sewerage, of which the service coverage in 2006 was 52%. The population in the villages uses individual septic tanks for discharging domestic wastewater, which is inevitably associated with poor sanitation, increased risks to public health and pollution of ground and surface waters.

Table 3-1 Length of sewerage network in Vrbas, per diameter and pipe material

	PIPE MATERIAL														Total
	CONCRETE			A C		DI		PVC					GRP		length
Year/DN	1.200	600	500	250	500	300	400	125	160	200	250	300	500	1.200	(m)
2003	3.865	659	582	825	795	2.122	2.352	375	293	1.850	30.038	958	0	0	**44.714**
2004	3.865	659	582	825	795	2.122	2.352	375	293	1.850	30.038	958	0	0	**44.714**
2005	3.865	659	582	825	795	2.122	2.352	375	293	1.850	31.174	958	1.000	2.000	**48.850**
2006	3.865	659	582	825	795	2.122	2.352	375	293	1.850	35.955	958	1.800	2.304	**54.735**
2007	3.865	659	582	825	795	2.122	2.352	375	293	1.850	46.856	958	1.800	2.304	**65.636**

It should be noted, however, that the municipality has been heavily engaged in extending the current sewerage system, so as to practically provide 100% service coverage till 2010.

The sewerage collection network is drained towards the main gravity sewer ending at the location of the CWWTP (existing and planned). From there, collected sewage is pumped via the SPS5 (sewage pumping station No. 5) to the canal Bečej – Bogojevo.

The existing sewerage system in Vrbas has been predominantly implemented in accordance with the so called separate concept (separate networks for wastewater and stormwater discharges), although a part of it (25 – 30 ha) operates as a combined sewerage scheme – accepting stormwater discharge, as well.

Given the flat topography of the area, the sewerage system includes several sewage pumping stations.

It is important to note that the major industrial polluters, including Vital and Carnex industries, are not connected to the existing sewerage system. Therefore, in terms of hydraulic and pollutant loading, rather than in terms of a number of population covered, the actual, realistic service coverage is less than 50%. In fact, as it is shown later in the report, hydraulic and pollutant loading from the abovementioned industries surpass

wastewater pollutant loading from domestic consumers assuming their full connection to the system.

In brief, the overall service coverage with sanitary sewerage collection in the municipality is rather low, and even critically low taking into account hydraulic and pollutant loadings from industries.

Furthermore, communal wastewater treatment is non-existent, and domestic and industrial wastewaters are discharged into the canals of the DTD system on a continuous basis.

From the abovementioned overview, it is quite clear that there is a strong demand for extension of the sewerage collection system to include the complete population and major industries. The effective gap in that regard is very substantial. However, if appropriate wastewater treatment is not introduced concurrently it would continue to discharge untreated wastewater into the canal.

Therefore, in parallel with the planned extension of the sanitary sewerage system, to achieve the overall main objective of the revitalization of the Grand Canal, it is necessary to install adequate wastewater treatment facilities compliant with the required effluent standards.

Some of the major technical performance indicators related to operation of water supply and sewerage systems in the municipality of Vrbas are shown in the following table.

Table 3-2 An overview of major technical performance indicators

Performance indicator	Vrbas - Town	Vrbas – Municipality
Drinking water service coverage (%)	> 95	> 95
Sanitary sewerage coverage (%) – No of population	52	Approximately 30
Wastewater Treatment (%)	0	0
Non revenue drinking water (%)	33	28
Residential water consumption (l/cap/d)	135	135

From the abovementioned overview the following conclusions can be drawn:

- Service coverage in terms of sewage collection is very low, and the current status is even more critical if industrial loadings are taken into account;
- Wastewater treatment is and shall remain a high priority because at the moment all collected wastewater is discharged without any treatment into the Canal;
- The percentage of non-revenue water is high, especially in the town of Vrbas and can be reduced by means of appropriate technical and administrative measures;
- Recorded average residential consumption of 135 l/cap/day can be assessed as reasonable;

An overview – main operational features of the existing water supply system

The central public water supply system has been in operation since 1972 when population, institutions and small industries were connected to the central supply. Since then the system has been extended and upgraded on several occasions.

The major industries have been dominantly using their own water sources, and thus are not connected to the municipal drinking water supply network.

In the town of Vrbas, at the moment there are 10 operational wells used as water source, 6 drilled in a deep aquifer and 4 in a shallow aquifer. Water from shallower wells is treated at the water treatment plant (WTP) since water quality in the shallow aquifer is not fit for human consumption, unless treated. The shallow wells must be used because the capacity of the deep wells is not sufficient to meet demand. Therefore provision of adequate water quality is one of the major operational issues that needs to be resolved in the public water supply system.

The maximum overall operational capacity of the water source is 106 l/s (44 l/s from the deep wells and 62 l/s from the shallow wells).

The operational capacity of the WTP is 50l/s, meaning that it can not treat all water originating from the upper (shallow) aquifer, although necessary.

Treated water tanks include a reinforced concrete tank of 1.250 m^3, and a steel storage tank of 1.000 m^3, while the capacity of the treated water pumping station is 250 l/s.

The WTP is of 50 l/s capacity, and it has been designed to reduce concentrations of Fe, Mn, but also of CO_2 and H_2S. Chlorination is carried out in the treated water tanks.

The total length of the distribution network is around 103 km, with majority of pipes (around 76%) being of asbestos-cement (the rest are PVC pipes).

Other operational problems include insufficient working pressures in the network, excessive maintenance and pipe malfunction due to the high age of the distribution network and inadequate pipe materials.

Critical issues related to operational efficiency of the public water supply system can be summarized as follows:

- Insufficient capacity of the water source with adequate water quality (deep aquifer);
- Inadequate water quality of water in the upper aquifer – treatment compulsory;
- Inadequate operational pressures – level of service, associated with frequent pipe malfunctions, and excessive water losses;

Water supply of villages in Vrbas municipality has been centralized as well. A similar concept has been applied in all villages: water source with a few wells, pumping station with pneumatic vessel, chlorination and distribution network.

Main problems are of similar character, as described for the town of Vrbas: water quality, operational pressure and age of the network.

3.1.2 Description of the service area and current level of service delivery

The service area considered in this project includes the following settlements, also shown on the enclosed layout map:

- Municipality of Vrbas
  - Town of Vrbas
  - Villages
    - Kucura
    - Savino Selo
    - Ravno Selo
    - Zmajevo
    - Bačko Dobro Polje
- Municipality of Kula
  - Town of Kula

3.1.2.1 Service area

The municipality of Vrbas, and all its urban and rural settlements, belongs to the South Bačka District. Virtually all major settlements in the municipality are included in the scope of the project. The town of **Vrbas**, with its current population of around 26.000 (Census 2002 data), represents by far the largest agglomeration in the municipality. The existing sanitary sewerage services are mostly developed and concentrated in the urban area of Vrbas town, with rapidly increasing number of service connections. Based on the information by the local PUC, the system serves mostly the urban population, local administration and other institutions, smaller private companies, trade companies, etc., while identified major industries are still not connected to the sanitary sewerage system.

Based on the specific request by Vrbas municipality, the scope of the project was extended also to include all other major rural settlements, i.e. the abovementioned villages. Namely, apart from the pressing need to introduce proper sanitary sewerage system in these settlements, the findings of the technical study commissioned by the municipality and environmental considerations made the municipality decide to arrange not only wastewater collection in the villages, but also wastewater transfer and treatment at the planned CWWTP Vrbas.

As shall be elaborated further on in the report, the connection of practically all rural population of the Vrbas municipality to the future central WWTP shall result in a corresponding increase of the plant design loading, with an additional 20.000 population equivalent.

The original scope of the project (as defined in the references 1.1 to 1.7) actually covers the area and population served by the future central WWTP, is extended with the population of the smaller villages of Vrbas municipality.

Zmajevo is located in the mid part of the south Backa region. With regard to Vrbas municipality, Zmajevo is located in its southern part, at a distance of 14 km from Vrbas and approximately 30 km from Novi Sad. The number of population in Zmajevo is 4,361 according to the census 2002.

Bačko Dobro Polje is located in the south part of Vrbas municipality, between Vrbas in the north (9 km) and Zmajevo in the south (5 km). Geographical coordinates of Bačko Dobro Polje are 45°30' north latitude and 19°42' east longitude, with a dominant altitude of around 85 m. The number of population in Bačko Dobro Polje is 3,929 (Census 2002).

Ravno Selo is located in the central part of south Bačka, on the banks of the river Jegrička. Its coordinates are 45°27' north latitude and 19°36' east longitude and the dominant altitude is approximately 85 m. In accordance with the Census 2002 data, the population of Ravno Selo is 3,478.

Savino Selo is located on the Backa löss terrace, in the west part of Vrbas municipality, 13 km from Vrbas, and 49 km from Novi Sad. Its coordinates are: 45°31' north latitude and 19 °30' east longitude. The altitude of the village is 85 m above sea level, and the population is 3,351.

Kucura coordinates are 45°32' north latitude and 19°33' east longitude, at a distance of 7.5 km from Vrbas. Its altitude is 85 m. The highest altitude terrain is in the central part of the village, with general slopes both to the north and to the south. The number of population in Kucura is 4,663.

The town of **Kula** is located 7 km to the north-east of Vrbas town. The municipality of Kula belongs to the District of West Bačka. The Grand Canal passes through the town, and in accordance with the Census 2002 data the total population of the town of Kula equals 19,301. In accordance with the adopted concept of the Revitalisation of the Grand Canal Project, the town of Kula and some of major local industries are to be connected to the inter-municipal (regional) sanitary sewerage scheme transferring wastewater to the future CWWTP in Vrbas.

3.1.3.2 Current level of service delivery

With regard to the assessment of the current service delivery, reference shall also be made to the potable water supply in the project area, as being highly relevant to the wastewater production, and due to the fact that the current water supply is much better documented and supported by relevant and measured data.

The following table indicates the current level of service delivery in Vrbas and Kula with regard to water supply provided from a public water supply system and population connected to a sanitary sewerage system. The information for Vrbas is based on the comprehensive questionnaire filled in by the municipality, and the assessment for Kula is based on the statement by the representative of the local water supply company.

Table 3-3 An overview of the current service delivery in the project area (population)

Year	2002	No of households	Average size of household	No of households served by public water supply	Coverage of population by public water supply system (%)	No of households connected to sanitary sewerage system	Coverage of population connected to sanitary sewerage system (%) - 2006
Vrbas-town	25.907	8.415	3,08	7.811	92,8	4.378	52,0
Bačko Dobro Polje	3.929	1.162	3,38	1.113	95,8	0	0,0
Zmajevo	4.361	1.398	3,12	1.376	98,4	0	0,0
Kucura	4.663	1.647	2,83	1.568	95,2	0	0,0
Ravno Selo	3.478	1.143	3,04	1.143	100,0	0	0,0
Savino Selo	3.351	1.074	3,12	978	91,1	0	0,0
Total villages	19.782	6.424	3,08	6.178	96,2	0	0,0
*Vrbas municipality - total - **	*45.689*	*14.839*	3,08	*13.989*	94,3	*4.378*	29,5
Kula-town - **	19.301	6.675	2,89	-	-	2.000	30,0

* - based on the comprehensive questionnaire filled in by the PUC Standard – Vrbas
** - based on the statement made by the representative of the water supply company Kula

The Public Utility Company (PUC) Standard Vrbas, in charge of providing a range of communal services in Vrbas, also submitted detailed information on billed water supplied via the existing public water supply system. From the information on water consumption it could be concluded that the percentage of the consumption that can be attributed to different companies, trades and small industries in the town is around 7% to 8% of the total (or 3 - 4 l/s on average). Furthermore, major industries in Vrbas, including Carnex and Vital industries are not supplied from the public water supply system, but instead use their own sources (water wells). Actual average water consumption of Carnex and Vital is of the order of magnitude of the overall billed water supplied by the public water supply system.

Therefore, it can be concluded that the service delivery from the centralized public water supply system to industrial consumers is very low, certainly below 10%, and most likely even below 5% in terms of their total water demand. Similarly, the abovementioned major industries are not connected to the existing sanitary sewerage system (either because the sewerage system has not yet been extended to their premises, or they do not meet wastewater discharge conditions set by the local PUC). Therefore, sewerage service collected from industrial consumers, in terms of industrial wastewater discharges and respective pollutant loadings is very low, most likely below 5%.

However, based on the statements by Vrbas municipality representatives, the works on reaching full service coverage, i.e. connecting all population in the town to the sanitary sewerage is well under way. Actually, it is planned to finalize the complete secondary and primary sanitary sewerage network in Vrbas by mid 2007. Therefore, all residents would have basic technical prerequisites to connect to the sewerage. It is estimated by the municipality representatives that the rate of connection of the population to the sewerage collection network would rise rather rapidly:

- To 70% by the end of 2007;
- To 85% by the end of 2008;
- To 100% by the end of 2009;

With regard to the villages, the municipality is planning to start implementation of the secondary sewage network in all five villages at the same time. The municipality estimated that the following implementation schedule can be accomplished:

Table 3-4 Planned schedule of collection network construction and service delivery in 5 villages of Vrbas municipality – as defined by the municipality of Vrbas

Description	2007	2008	2009	2010
Physical construction	33%	33%	33%	
Households connected		30%	30%	40%

The abovementioned rates of service delivery are adopted for further demand analysis in this study.

Figure 3-1 Current status of Kula sewerage system – major polluters and outlets

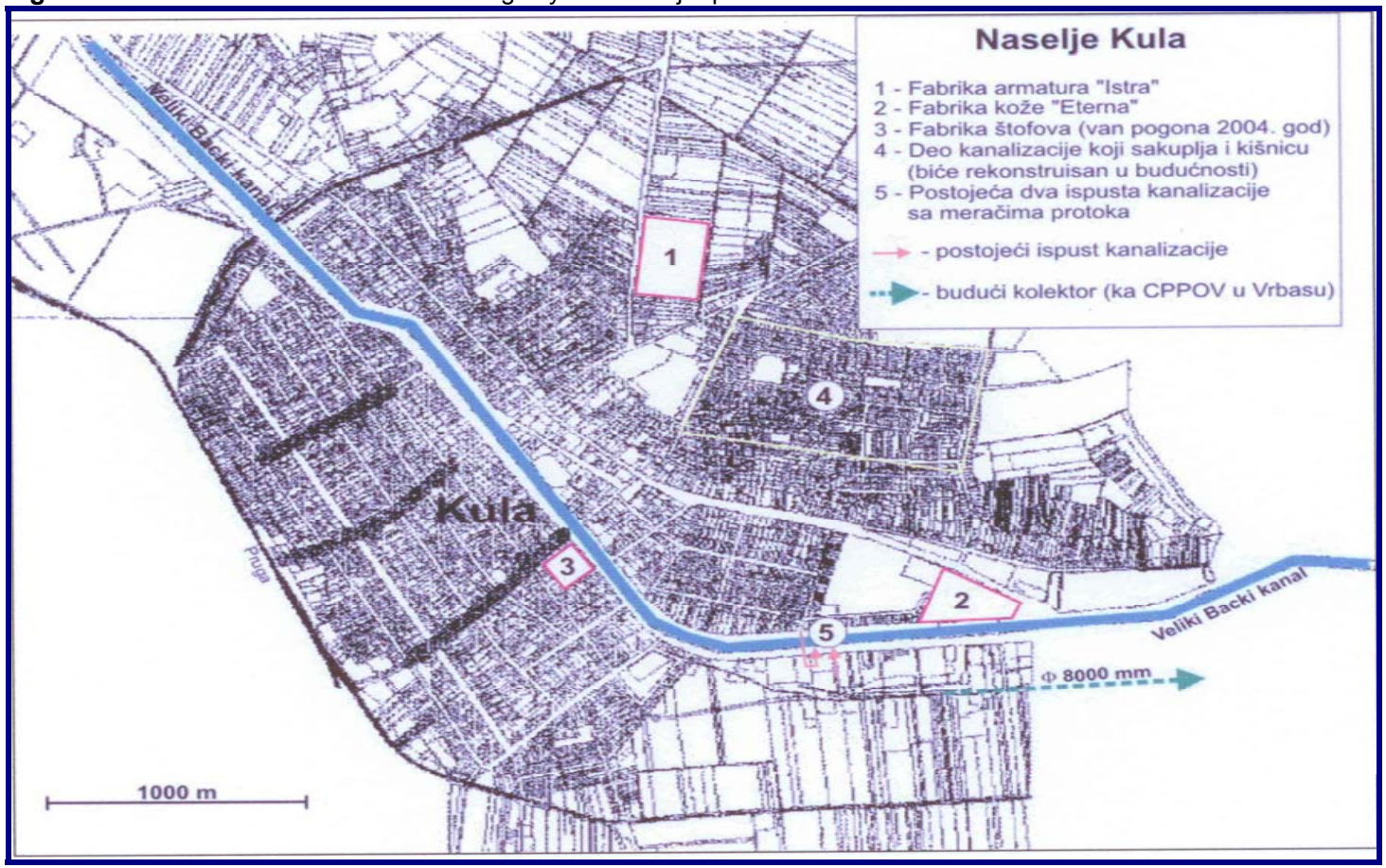
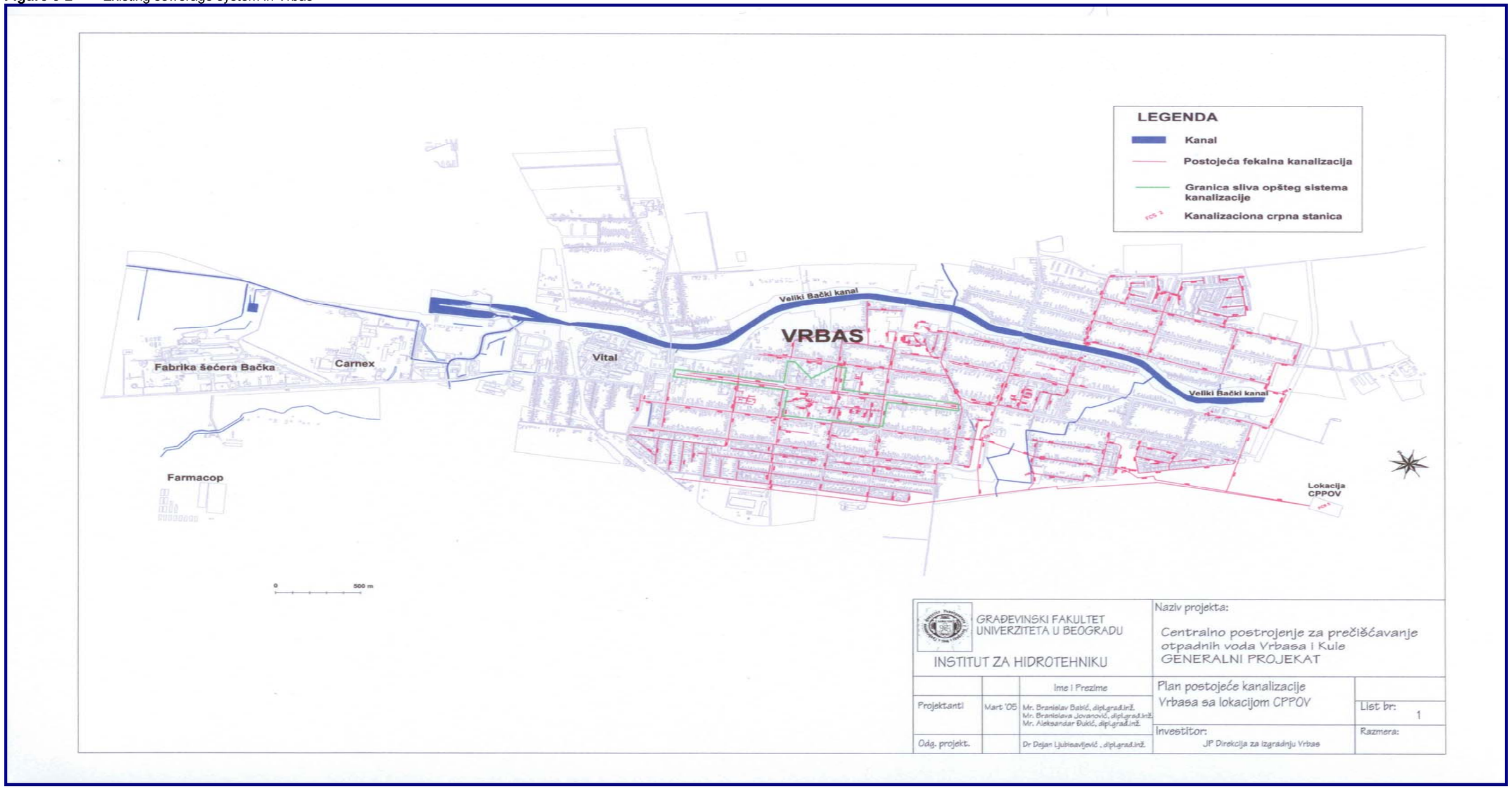


Figure 3-2 Existing sewerage system in Vrbas



3.1.3 Demand Projections

This paragraph presents the assessment of the population forecast, water demand and wastewater quantities and loads. For planning purposes, a period of 32 years has been chosen covering the period 2008 – 2039.

Demography

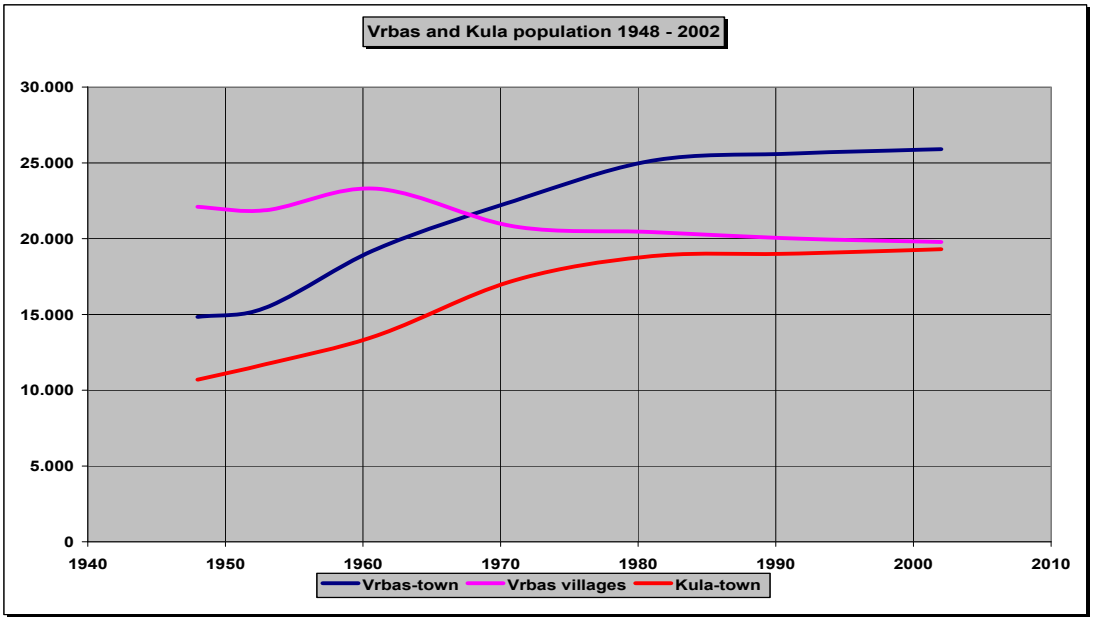
According to the 2002 Census, the total population of Vrbas municipality was 45,852, and of the town of Kula 19.301, and therefore overall population in the project area was some 65.000.

From past census data, it can be concluded that the urban population in both Vrbas and Kula municipalities was moderately to slightly increasing, whereas the rural population was steadily decreasing.

Table 3-5 Vrbas and Kula population in accordance with census results

Year	1948	1953	1961	1971	1981	1991	2002
Vrbas-town	14.837	15.470	19.316	22.496	25.143	25.610	25.907
Growth rate (%)		*0,84*	*2,81*	*1,54*	*1,12*	*0,18*	*0,10*
Bačko Dobro Polje	3.759	3.763	3.922	3.622	3.768	3.919	3.929
Zmajevo	4.717	4.538	5.212	4.859	4.773	4.438	4.361
Kucura	4.731	4.783	4.881	4.655	4.687	4.604	4.663
Ravno Selo	4.046	4.362	4.378	3.814	3.636	3.505	3.478
Savino Selo	4.848	4.437	4.905	3.856	3.575	3.553	3.351
Total villages	22.101	21.883	23.298	20.806	20.439	20.019	19.782
Growth rate (%)		*-0,20*	*0,79*	*-1,12*	*-0,18*	*-0,21*	*-0,11*
Kula-town	10.704	11.733	13.609	17.245	18.847	19.005	19.301
Growth rate (%)		*1,85*	*1,87*	*2,40*	*0,89*	*0,08*	*0,14*

Graph 3-1 Vrbas and Kula population in accordance with census results



Population projection

The population forecast is an important starting point for the estimation of future water consumption and wastewater generation.

The population projection has been elaborated in the Vrbas Urban Master Plan adopted by the Vrbas municipal assembly on 22 September 2003. This decision is further published in the Official Gazette of Vrbas Municipality 04/2003. The population projection presented in the Urban Master Plan is therefore considered to be an official forecast, to be also used in this study. The planning period in the Urban Master Plan is until 2022, and the population in the Master Plan zone is estimated to reach 28.000 for Vrbas town. Starting from the number of population recorded in the 2002 census, in order to reach 28.000 the annual growth rate is to be 0,4% on average, which is adopted for further analysis in this study.

For the rural population however, steady decline has been recorded, and a growth rate close to zero should be applied. Therefore, for the analysis in this study, the growth rate of 0,1% over the considered project period has been recommended and approved by the municipality representatives.

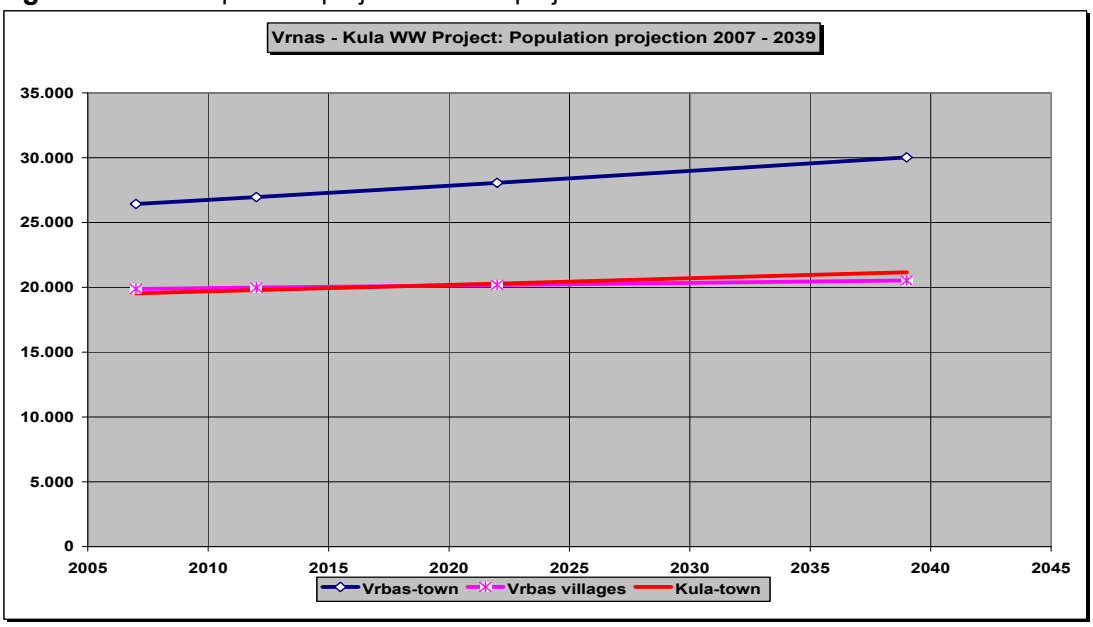
For the town of Kula no official forecasts were available, and therefore the population growth rate was adopted in line with recorded population growth rates, which, in accordance with the abovementioned census data were just above zero in the period 1981 – 2002.

The resulting population projection can be found in table 3-6 and figure 3-5.

Table 3-6 Population projection in the project area till 2039

Year	2007	2012	2022	2039
Vrbas-town	**26.429**	**26.962**	**28.060**	**30.031**
Growth rate (%)	***0,4***	***0,4***	***0,4***	***0,4***
Bačko Dobro Polje	**3.949**	**3.968**	**4.008**	**4.077**
Zmajevo	**4.383**	**4.405**	**4.449**	**4.525**
Kucura	**4.686**	**4.710**	**4.757**	**4.839**
Ravno Selo	**3.495**	**3.513**	**3.548**	**3.609**
Savino Selo	**3.368**	**3.385**	**3.419**	**3.477**
Total villages	**19.881**	**19.981**	**20.181**	**20.527**
Growth rate (%)	**0,10**	**0,10**	**0,10**	**0,10**
Kula-town	**19.543**	**19.789**	**20.289**	**21.169**
Growth rate (%)	**0,25**	**0,25**	**0,25**	**0,25**

Figure 3-3 Population projection in the project area till 2039



Wastewater Flows

At present communal wastewater in Vrbas is collected and transferred through the system of gravity sewers and sewage pumping stations (SPS-s) to the final sewage pumping station located at the site of the CWWTP. The final SPS pumps all collected wastewater into the outlet canal which further discharges into a nearby canal flowing into the bigger canals of the DTD system.

A limited number of flow measurements of wastewater collected and discharged has been conducted and recorded, but on rather random basis, and therefore these measurements can not be used for a consistent and reliable estimate of wastewater flows. However, the measurements shall be utilized for assessment of other discharge components.

Therefore, current wastewater flows shall be estimated in relation to the recorded water supply consumption for consumers connected both to the water supply and to the sanitary sewerage system.

Water Supply – Basic Balances

Water Supply – Production

Based on the Consultant's request a full set of data on water produced and invoiced has been made available for 2004, 2005 and 2006 by PUC Standard.

All settlements in the municipality of Vrbas are supplied by potable water by means of a public water supply system. The town of Vrbas is supplied from an underground water source comprising a number of water wells, a water treatment plant, storage tanks and a corresponding pumping station.

Each of the villages included in the scope of the project is supplied by a corresponding water well and a distribution network.
The data on potable water produced in 2004, 2005 and 2006 in each settlement is presented in the Annex 3.1- Water Distribution in Vrbas Municipality in 2004, 2005 and 2006.

Produced water distributed towards consumers is recorded at a single measuring location – a flow meter installed at the pumping main at the treated water pumping station towards town. The similar principle is also applied for the other villages, where corresponding flow meters are installed at the pumping mains close to the water wells in use. The data on water production are normally recorded on a daily basis, in such a way that realistic monthly and daily production/demand variations can be interpreted.

The abovementioned monthly produced water data show expected trends with peak demand/production recorded during summer months.

Table 3-7 Annual average water production in Vrbas (in l/s)

	2004	2005	2006
Vrbas-town	**76,3**	**71,2**	**72,3**
Kucura	8,2	8,5	7,6
Bačko Dobro Polje	9,6	9,6	9,2
Zmajevo	10,0	8,3	8,8
Savino Selo	7,3	6,2	6,8
Ravno Selo	6,4	6,3	6,6
Villages-total	**41,5**	**38,9**	**39,1**
Total	**117,9**	**110,1**	**111,4**

The average water production for the town of Vrbas ranged from **approximately 71 to 76 l/s**, while the average overall water production in the municipality ranged between **approximately 110 and 118 l/s**.

Apart from recorded annual balances, monthly demand variations are of prime importance for the water and wastewater considerations and planning. The water production records indicate that the maximum monthly production/demand amounted to **1,25** of the average production for the town of Vrbas, and to **1,54** of the average production for the villages. The maximum daily variations that are important for sizing the CWWTP are estimated to be somewhat higher.

Water Supply – Consumption
Apart from the produced water data, PUC Standard provided information on invoiced water consumption in Vrbas and the surrounding villages.

The invoiced water data are classified per basic categories of consumers, including:
- Households (in individual houses and residential buildings);
- Companies within the town area (small businesses, trades, restaurants, cafes, and similar);
- Budget users (municipal administration, different institutions, health care centres, etc.).

It is very important to note that the major industries in Vrbas (Carnex and Vital) to be connected to the future municipal sewerage system in Vrbas and therefore to the CWWTP are not supplied from the public water supply system, but use their own underground water sources. Therefore, water and wastewater balances related to these industries have to be analysed separately.

Households represent the by far dominant category of consumers supplied via the public water supply system in Vrbas, consuming between 85 and 90% of total water invoiced.

Most of the consumption related to households is actually metered, with the exception of residential buildings (less then 10% share in total household consumption). Water consumption in residential buildings in Vrbas is invoiced based on the estimated average per capita consumption (4 m3 per capita monthly, or approximately 135 l/capita/day). Although this practice can be marked as generally undesirable, in this particular case the adopted estimated average per capita consumption very much corresponds to the actually metered per capita consumption, meaning that presented water consumption data can be considered realistic. It is, however, recognised that consumers who pay fixed charges can be expected to use more water per capita than metered consumers.

Regarding the actual connection rate to the public water supply system in Vrbas, based on the official data varies from approximately 95 to 100%, but it is believed and confirmed by the PUC that the gap to full coverage is rather the consequence of deficiencies of administrative records than the actual situation. In practice, it is believed that full coverage of drinking water by the public water supply system has already been reached in Vrbas and in the surrounding villages.

Data on recorded monthly water consumption in Vrbas and surrounding villages, per user category, in 2004, 2005 and 2006 are presented in the Annex 3.2 – Water Consumption in Vrbas Municipality in 2004, 2005 and 2006. It is important to note that the data presented were partly processed from the raw data obtained from the PUC Standard. Namely, in 2004 the household water consumption was recorded only twice a year, and since 2005 the household water consumption is recorded on a quarterly basis. Still, recorded water consumption does not reflect realistic monthly variations, and corresponding correction factors have been introduced. In conclusion, it is confirmed that the water production data much better represent water production/demand variations than the water consumption data.

The total average invoiced water consumption in Vrbas and villages ranged from approximately 76 l/s to 81 l/s. Households in both individual houses and residential buildings represent the dominant category of system users with their share in total recorded consumption ranging from 88 to 90%. Small businesses and local administration use around 10% of water in the system.

Unit water consumption rates

Based on the abovementioned water produced and water consumption data, as well as the number of consumers in the villages, it is possible to calculate the unit water consumption rates, that are very important for estimating current and predicting future wastewater discharges. Based on the water produced data, the average unit (per capita) water distribution in Vrbas is shown in table 3-8.

Table 3-8 Unit water distribution (l/capita/day)

	2004	2005	2006
Vrbas-town	**254,6**	**237,4**	**241,0**
Kucura	151,8	156,8	141,4
Bačko Dobro Polje	211,9	210,6	202,0
Zmajevo	198,5	165,3	175,3
Savino Selo	187,6	159,6	176,0
Ravno Selo	158,7	157,7	165,0
Villages-total	**181,3**	**170,0**	**170,9**
Total	**225,3**	**210,4**	**212,9**

The average overall water distribution rate in Vrbas ranged from approximately 235 to 255 l/capita/day, whereas in the villages this rate was significantly lower, between 170 and 180 l/capita/day. These consumption patterns include water consumption by (small) business and institutions.

Taking into account the annual water consumption data, it is possible to calculate the resulting average unit water consumption (per capita). In Vrbas this rate ranged from 150 to 160 l/capita/day, while in the villages the unit water consumption was 135 to 145 l/capita/day. The difference being much lower than for the unit water distribution, which further indicates that, on average, the percentage of unaccounted water (UFW) in the villages is much lower than in Vrbas.

Table 3-9 Unit water consumption – **total** (l/capita/day)

	2004	2005	2006
Vrbas-town	**156,5**	**149,3**	**159,9**
Kucura	124,1	122,5	127,1
Bačko Dobro Polje	141,5	146,9	150,6
Zmajevo	154,0	145,3	142,4
Savino Selo	144,8	142,6	156,5
Ravno Selo	143,8	132,2	139,6
Villages-total	**141,1**	**137,5**	**142,3**
Total	**151,4**	**145,7**	**153,9**

Of particular significance for further water balance analysis is the information on the average unit water consumption for households only, as shown in the following table.

Table 3-10 Unit water **household** consumption (l/capita/day)

	2004	2005	2006
Vrbas-town	**136,6**	**130,7**	**135,3**
Kucura	117,7	116,0	120,6
Bačko Dobro Polje	131,9	135,4	140,2
Zmajevo	137,9	131,7	130,3
Savino Selo	134,8	130,0	140,5
Ravno Selo	134,3	124,9	132,4
Villages-total	**130,8**	**127,3**	**132,1**
Total	**135,5**	**130,6**	**135,3**

It can be concluded that this parameter for both town and villages is quite consistent, with values normally around 135 l/capita/day, which is therefore regarded as the average household water consumption at present.

Wastewater to water ratio

As mentioned earlier in the report, the wastewater flows at the main outlet location are not recorded regularly, and it is not possible to establish an absolutely exact relationship between the drinking water consumption and the generated communal wastewater flows. Only a limited scope of measurements of wastewater flows at the outlet has been conducted.
Therefore, for the purpose of this study a conventional value of wastewater/water ratio has been adopted of 0,90.

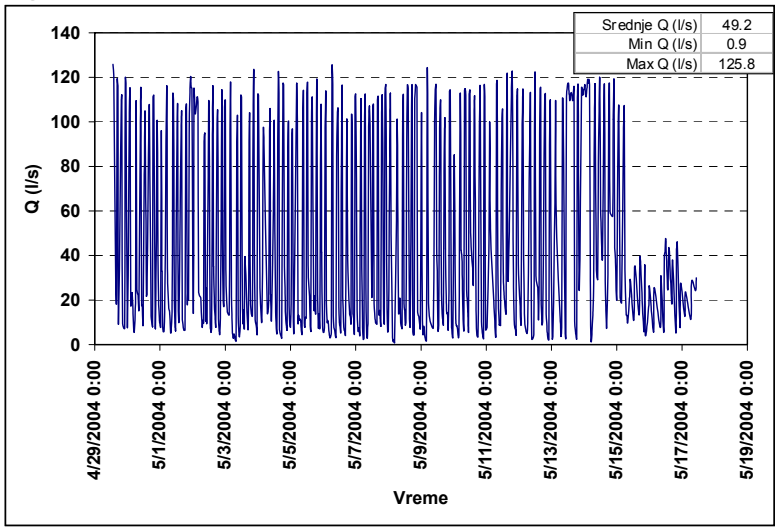
Infiltration

Based on the information presented in the documentation (reference 1.5), the underground water table in the town of Vrbas is some 1,2 to 4 m below the ground surface (depending on the micro-location and seasonal variations). However, it is anticipated that most of the existing sewerage system comes under an influence of underground waters, and may be subject to infiltration.

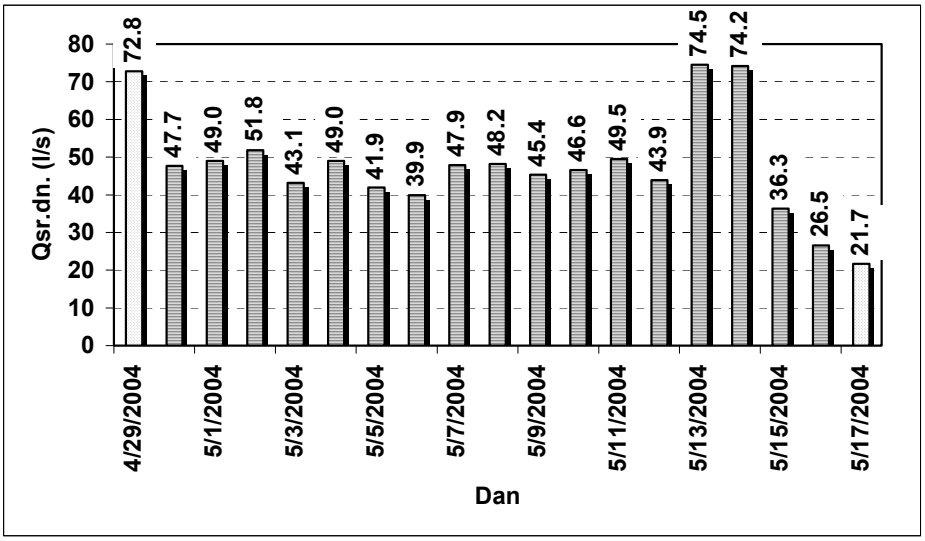
The main results of the flow measurements conducted in May 2005 at the main Vrbas sewerage outlet are also shown in reference 1.5. The average dry-weather daily discharge ranged between 40 and 50 l/s. The connection rate of the population to the sewerage system was around 50%.

Since the average recorded water consumption in Vrbas is 45 to 50 l/s, and taking into account the abovementioned connection rate and the anticipated wastewater to water ratio, a very significant portion of recorded flows (20 to 25 l/s) can be attributed to infiltration.

Figure 3-4 Flow measurements at the main sewerage outlet in Vrbas (May 2005)



Graph 3-2 Flow measurements at the main sewerage outlet in Vrbas – daily average (May 2005)



Since the sewerage network in Vrbas is being extended, and a complete network (excluding service connections) is to be finished in 2007, further increase of infiltration can be expected. It is therefore estimated that infiltration in Vrbas sewerage system is going to reach 35 l/s within the project lifetime.

The area of Kula town has got rather similar hydro-geological characteristics, and similar infiltration rates can be expected. However, taking into account that the total network length in Kula is shorter, the total infiltration of up to 25 l/s is anticipated.

Storm water runoff

Kula: The sewerage system in Kula shall be of a fully separated type: communal wastewater and storm water sewerage shall be completely separated, and no storm water runoff to the CWWTP is expected.

Vrbas: A part of the sewerage system is of so-called combined type, collecting some storm water runoff. Based on the capacity of the pump in the SPS Vasariste devoted to pumping storm water runoff, it is estimated that the maximum storm water discharge that can be diverted to the CWWTP is 190 l/s, at present as well as in the future.

Demand Projection – Future Wastewater Flows

Household Water Demand

The overall trend in Europe has been that the average per capita water consumption increased from 1970s until 1990s reaching an average of 150 l/cap/day. As shown earlier, the records indicate that both in the town of Vrbas and in the villages the average per capita household consumption has reached 135 l/capita/day.

Although based on the information provided by the PUC Standard there were no major supply restrictions or shortages in the water supply system, the plans have been laid out to gradually improve the level of service in water supply, both in terms of water quality

and operational pressures. It is therefore anticipated at this stage that the average per capita household consumption will rise moderately, to ultimately reach 150 l/capita/day.

Table 3-11 Unit per capita household water consumption in Vrbas, villages and Kula

Year	2007	2012	2022	2039
Unit per capita household consumption (l/capita/day)	135	140	145	150

It is also anticipated that water consumption related to small businesses and municipal administration shall gradually rise, so that the average overall unit per capita water consumption would ultimately reach 200 l/capita/day. This increase, that is associated with so called dispersed pollutants, also contains a reserve provision for unforeseen developments of limited nature within the urbanized areas.

Table 3-12 Unit water consumption related to small businesses and local administration in Vrbas and Kula

Year	2007	2012	2022	2039
Unit water consumption (l/capita/day)	25	35	45	50

Given the vicinity and rather similar settlement structure and size, the same rates are applied for the town of Kula. At the same time it is estimated that the wastewater to water ratio shall remain around 0,90 throughout the project lifetime.

Industrial Discharges

The documentation reference 1.5 details all major industries discharging into the DTD Grand Canal and their respective wastewater volumes and pollutant loadings.

Based on technical, technological and cost considerations in the documentation reference 1.5, it was decided that only a limited number of major industries in the area should be diverted to the CWWTP, while the other major pollutants (including sugar processing plants, pig farms, etc.) have to bring their discharges in compliance with effluent quality requirements on their own. It is important to note that, in order to get the approval to discharge into the communal sewerage system, an individual industry has to bring (by means of appropriate pre-treatment) its effluent quality into compliance with the criteria set in the PUC Standard's decision on industrial effluents criteria, which was adopted by the Vrbas municipal assembly on June 14, 2007 (Annex 3.5).

The wastewater effluent related to the industries that are to be served by the CWWTP are based on conducted investigations including field measurements, interviews with their representatives, as presented in the documentation reference 1.5. An overview of the industrial effluents hydraulic loadings from the reference 1.5 is presented in the following tables.

Table 3-13 Overview of adopted design hydraulic loading from the industries in Vrbas and Kula to be diverted to the CWWTP in Vrbas

Description	Hydraulic loading
Carnex, Vrbas	
$V_{average}$ (m^3/day)	3.400
$Q_{average}$ (l/s)	39,4
$V_{max\ day}$ (m^3/day)	4.800
$Q_{max\ day}$ (l/s)	55,6
Q_{peak} (l/s)	83,3
Vital, Vrbas	
$V_{average}$ (m^3/day)	1.250
$Q_{average}$ (l/s)	14,5
$V_{max\ day}$ (m^3/day)	1.750
$Q_{max\ day}$ (l/s)	20,3
Q_{peak} (l/s)	25,0
Istra, facet factory, Kula	
$V_{average} = V_{max\ day}$ (m^3/day)	1.100
$Q_{average} = Q_{max\ day}$ (l/s)	12,7
Q_{peak} (l/s)	25,0
Eterna, tannery, Kula	
$V_{average} = V_{max\ day}$ (m^3/day)	1.500
$Q_{average} = Q_{max\ day}$ (l/s)	17,4
Q_{peak} (l/s)	25,0

Although the abovementioned data are adopted from the reference documentation and believed to represent realistic and relevant hydraulic loading, it should be noted that two of these industries (Istra and Eterna) are not in operation at present, with insecure prospects for re-structuring and possibly privatisation. This de-facto status has been taken into account in drafting the project implementation schedule and phasing.

Wastewater Flows – an Overview

Based on the population projection, estimated per capita consumption, connection rates, wastewater to water ratio, estimated industrial effluents, respective peaking factors, below an overview is presented of the wastewater flows to be diverted and treated at the future CWWTP in Vrbas.

The overview of wastewater flows also reflects recommended project staging:

- The first stage would include construction of the CWWTP at two thirds of the total capacity and should cater for all users in Vrbas municipality: population in the town and villages and the abovementioned industries within Vrbas Municipality;
- The second stage would include construction of the remaining third of the CWWTP, and all elements necessary to connect the users in the municipality of Kula to the system.

This staging has been proposed primarily because of the current status of the sewerage system in Kula municipality: current connection rate of only 30% and major industries not in operation.

Table 3-14 Vrbas-Kula Population Projection

Year	2007	2012	2022	2039
Vrbas-town	26.429	26.962	28.060	30.031
Growth rate (%)	*0,40*	*0,40*	*0,40*	*0,40*
Bačko Dobro Polje	3.949	3.968	4.008	4.077
Zmajevo	4.383	4.405	4.449	4.525
Kucura	4.686	4.710	4.757	4.839
Ravno Selo	3.495	3.513	3.548	3.609
Savino Selo	3.368	3.385	3.419	3.477
Vrbas villages	19.881	19.981	20.181	20.527
Growth rate (%)	0,10	0,10	0,10	0,10
Kula-town	19.543	19.789	20.289	21.169
Growth rate (%)	0,25	0,25	0,25	0,25

Table 3-15 Vrbas town – projection of wastewater flows

Year	2007	2012	2022	2039
	Vrbas-town			
Unit water domestic consumption (l/cap/day)	*135*	*140*	*145*	*150*
Unit water consumption - administration and small industries (l/cap/day)	*25*	*30*	*45*	*50*
Total average water demand - population and administration (m3/annually)	*1.543.471*	*1.673.000*	*1.945.978*	*2.192.236*
Wastewater to water ratio	*0,90*	*0,90*	*0,90*	*0,90*
Connection rate - population and other dispersed consumers (%)	*70,0*	*100,0*	*100,0*	*100,0*
Total average wastewater flow - population and other dispersed consumers (m3/annually)	*972.387*	*1.505.700*	*1.751.380*	*1.973.013*
$Q_{pop\ average}$ (l/s)	*30,8*	*47,7*	*55,5*	*62,6*
$K_{max\ day}$	*1,40*	*1,40*	*1,40*	*1,40*
$Q_{pop\ max\ day}$ (l/s)	*43,2*	*66,8*	*77,8*	*87,6*
$K_{max\ h}$ / $K_{max\ day}$	*1,40*	*1,40*	*1,35*	*1,35*
$Q_{pop\ max\ h}$ (l/s)	*60,4*	*93,6*	*105,0*	*118,2*
$Q_{infiltration}$ (l/s)	*25,0*	*35,0*	*35,0*	*35,0*
Carnex - $V_{average}$ (m^3/day)	*3.400*	*3.400*	*3.400*	*3.400*
Carnex - $V_{max\ day}$ (m^3/day)	*4.800*	*4.800*	*4.800*	*4.800*
Carnex - $Q_{average}$ (l/s)	*39,4*	*39,4*	*39,4*	*39,4*
Carnex - $Q_{max\ day}$ (l/s)	*55,6*	*55,6*	*55,6*	*55,6*
Carnex - $Q_{peak\ h}$ (l/s)	*83,3*	*83,3*	*83,3*	*83,3*
Vital - $V_{average}$ (m^3/day)	*1.250*	*1.250*	*1.250*	*1.250*
Vital - $V_{max\ day}$ (m^3/day)	*1.750*	*1.750*	*1.750*	*1.750*
Vital - $Q_{average}$ (l/s)	*14,5*	*14,5*	*14,5*	*14,5*
Vital - $Q_{max\ day}$ (l/s)	*20,3*	*20,3*	*20,3*	*20,3*
Vital - $Q_{peak\ h}$ (l/s)	*25,0*	*25,0*	*25,0*	*25,0*
Vrbas-town - annual WW flow (m^3/day) - to be treated (population, industries, public, infiltration)	*3.458.037*	*4.306.710*	*4.552.390*	*4.774.023*
Vrbas-town - annual WW flow (m^3/day) - to be invoiced (excludes infiltration)	*2.669.637*	*3.202.950*	*3.448.630*	*3.670.263*

Table 3-16 Vrbas villages – projection of wastewater flows

Year	2007	2012	2022	2039
Villages				
Unit water domestic consumption (l/cap/day)	135	135	135	135
Unit water consumption - administration and small industries (l/cap/day)	10	15	20	30
Total average water demand - population and administration (m3/annually)	1.052.208	1.093.944	1.141.764	1.236.254
Wastewater to water ratio	0,90	0,90	0,90	0,90
Connection rate - population (%)	0,00	100,00	100,00	100,00
Total average wastewater flow - population and administration (m3/annually)	0	984.550	1.027.588	1.112.629
$Q_{pop\ average}$ (l/s)	0,0	31,2	32,6	35,3
$K_{max\ day}$	1,50	1,50	1,50	1,50
$Q_{pop\ max\ day}$ (l/s)	0,0	46,8	48,9	52,9
$K_{max\ h}$ / $K_{max\ day}$	1,60	1,60	1,60	1,60
$Q_{max\ h}$ (l/s)	0,0	74,9	78,2	84,7
$Q_{infiltration}$ (l/s)	0,0	12,0	15,0	17,0
Vrbas-villages - annual WW flow (m^3/day) - to be treated	0	1.362.982	1.500.628	1.648.741
Vrbas-villages - annual WW flow (m^3/day) - to be invoiced (excludes infiltration)	0	984.550	1.027.588	1.112.629

Table 3-17 Kula town – projection of wastewater flows

Kula-town				
Unit water domestic consumption (l/cap/day)	135	140	145	150
Unit water consumption - administration and small industries (l/cap/day)	25	30	45	50
Total average water demand - population and other dispersed consumers (m3/annually)	1.141.339	1.227.907	1.407.064	1.545.343
Wastewater to water ratio	0,90	0,90	0,90	0,90
Connection rate - population (%)	0,00	75,00	100,00	100,00
Total average wastewater flow - population and administration (m3/annually)	0	828.837	1.266.358	1.390.808
$Q_{pop\ average}$ (l/s)	0,0	26,3	40,2	44,1
$K_{max\ day}$	1,50	1,45	1,40	1,40
$Q_{pop\ max\ day}$ (l/s)	0,0	38,1	56,2	61,7
$K_{max\ h}$ / $K_{max\ day}$	1,40	1,40	1,35	1,35
$Q_{pop\ max\ h}$ (l/s)	0,0	53,4	75,9	83,4
$Q_{infiltration}$ (l/s)	7,0	15,0	20,0	25,0
Istra - $V_{average}$ (m^3/day)	1.100	1.100	1.100	1.100
Istra - $V_{max\ day}$ (m^3/day)	1.100	1.100	1.100	1.100
Istra - $Q_{average}$ (l/s)	12,7	12,7	12,7	12,7
Istra - $Q_{max\ day}$ (l/s)	12,7	12,7	12,7	12,7
Istra - $Q_{peak\ h}$ (l/s)	25,0	25,0	25,0	25,0
Eterna - $V_{average}$ (m^3/day)	1.500	1.500	1.500	1.500
Eterna - $V_{max\ day}$ (m^3/day)	1.500	1.500	1.500	1.500
Eterna - $Q_{average}$ (l/s)	17,4	17,4	17,4	17,4
Eterna - $Q_{max\ day}$ (l/s)	17,4	17,4	17,4	17,4
Eterna - $Q_{max\ day}$ (l/s)	25,0	25,0	25,0	25,0
Kula - connection rate - industries	0,0	100,0	100,0	100,0
Kula-town - annual WW flow (m3/day) - to be treated	0	2.250.877	2.846.078	3.128.208
Kula-town - annual WW flow (m3/day) - to be invoiced (excludes infiltration)	0	1.777.837	2.215.358	2.339.808
Total annual WW flow (m3/day) - to be treated	0	7.920.569	8.899.095	9.550.972
Total annual WW flow (m3/day) - to be invoiced (excludes infiltration)	0	5.965.337	6.691.575	7.122.700

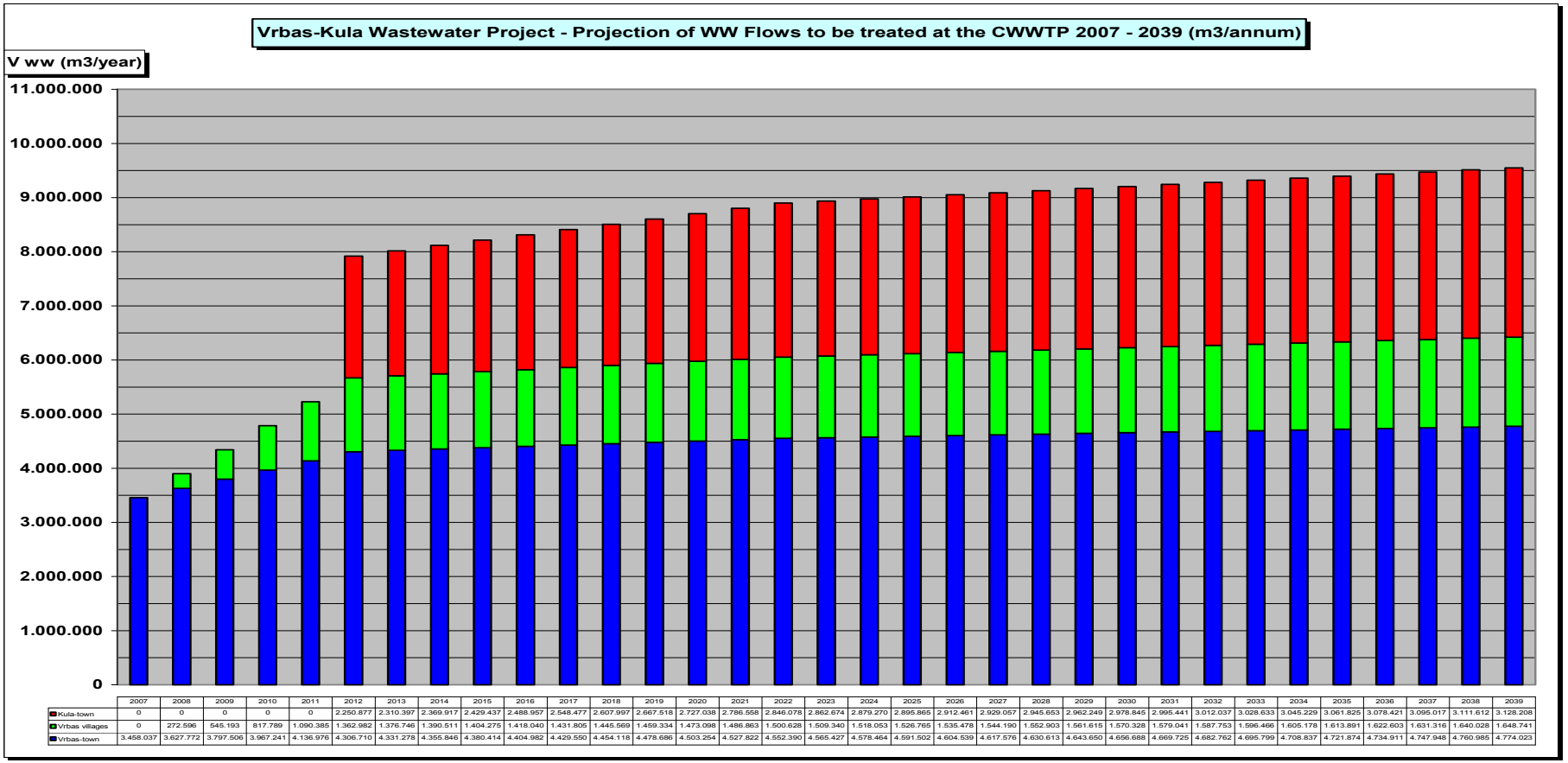
Table 3-18 Vrbas – Kula wastewater flows projection – an overview (m^3)

Year	2007	2012	2022	2039
Overview - V average (m^3/annum)				
Vrbas town - population and other dispersed consumers	*1.543.471*	*1.673.000*	*1.945.978*	*2.192.236*
Vrbas town - industries	*1.697.250*	*1.697.250*	*1.697.250*	*1.697.250*
Vrbas town - infiltration	*788.400*	*1.103.760*	*1.103.760*	*1.103.760*
Vrbas town - total (no infiltration)	*3.240.721*	*3.370.250*	*3.643.228*	*3.889.486*
Vrbas town - total (with infiltration)	*4.029.121*	*4.474.010*	*4.746.988*	*4.993.246*
Vrbas villages - population and other dispersed consumers	*0*	*984.550*	*1.027.588*	*1.112.629*
Vrbas villages - infiltration	*0*	*378.432*	*473.040*	*536.112*
Vrbas villages - total (no infiltration)	*0*	*984.550*	*1.027.588*	*1.112.629*
Vrbas villages - total (with infiltration)	*0*	*1.362.982*	*1.500.628*	*1.648.741*
Kula town - population and other dispersed consumers	*0*	*828.837*	*1.266.358*	*1.390.808*
Kula town - industries	*0*	*949.000*	*949.000*	*949.000*
Kula town - infiltration	*0*	*473.040*	*630.720*	*788.400*
Kula town - total (no infiltration)	*0*	*1.777.837*	*2.215.358*	*2.339.808*
Kula town - total (with infiltration)	*0*	*2.250.877*	*2.846.078*	*3.128.208*
Gross total (no infiltration)	3.240.721	6.132.637	6.886.173	7.341.924
Gross total (with infiltration)	4.029.121	8.087.869	9.093.693	9.770.196
Overview - V average - Share in comparison to overall flows (%)				
Vrbas town - population and other dispersed consumers	*38,3*	*20,7*	*21,4*	*22,4*
Vrbas town - industries	*42,1*	*21,0*	*18,7*	*17,4*
Vrbas town - infiltration	*19,6*	*13,6*	*12,1*	*11,3*
Vrbas villages - population and other dispersed consumers	*0,0*	*12,2*	*11,3*	*11,4*
Vrbas villages - infiltration	*0,0*	*4,7*	*5,2*	*5,5*
Kula town - population and other dispersed consumers	*0,0*	*10,2*	*13,9*	*14,2*
Kula town - industries	*0,0*	*11,7*	*10,4*	*9,7*
Kula town - infiltration	*0,0*	*5,8*	*6,9*	*8,1*
Gross total	*100,0*	*100,0*	*100,0*	*100,0*
Overview - V average - Share in comparison to overall flows without infiltration (%)				
Vrbas town - population and other dispersed consumers	*47,6*	*27,3*	*28,3*	*29,9*
Vrbas town - industries	*52,4*	*27,7*	*24,6*	*23,1*
Vrbas villages - population and other dispersed consumers	*0,0*	*16,1*	*14,9*	*15,2*
Kula town - population and other dispersed consumers	*0,0*	*13,5*	*18,4*	*18,9*
Kula town - industries	*0,0*	*15,5*	*13,8*	*12,9*
Gross total	*100,0*	*100,0*	*100,0*	*100,0*

Table 3-19 Kula wastewater flows projection – an overview (l/s)

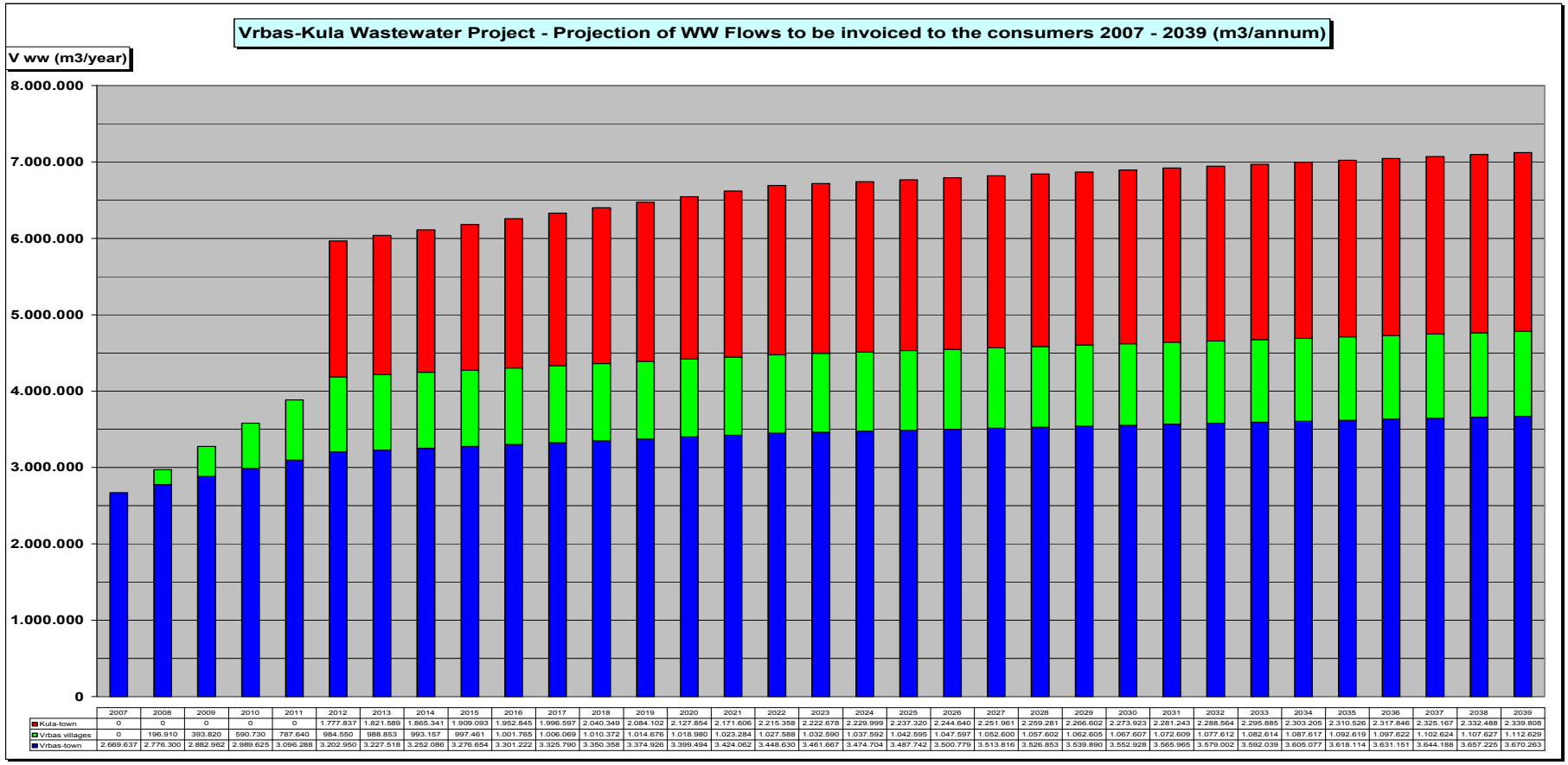
Overview - Q average (l/s)				
Vrbas town - population and other dispersed consumers	*48,9*	*53,1*	*61,7*	*69,5*
Vrbas town - industries	*53,8*	*53,8*	*53,8*	*53,8*
Vrbas town - infiltration	*25,0*	*35,0*	*35,0*	*35,0*
Vrbas town - total (no infiltration)	*102,8*	*106,9*	*115,5*	*123,3*
Vrbas town - total (with infiltration)	*127,8*	*141,9*	*150,5*	*158,3*
Vrbas villages - population and other dispersed consumers	*0,0*	*31,2*	*32,6*	*35,3*
Vrbas villages - infiltration	*0,0*	*12,0*	*15,0*	*17,0*
Vrbas villages - total (no infiltration)	*0,0*	*31,2*	*32,6*	*35,3*
Vrbas villages - total (with infiltration)	*0,0*	*43,2*	*47,6*	*52,3*
Kula town - population and other dispersed consumers	*0,0*	*26,3*	*40,2*	*44,1*
Kula town - industries	*0,0*	*30,1*	*30,1*	*30,1*
Kula town - infiltration	*0,0*	*15,0*	*20,0*	*25,0*
Kula town - total (no infiltration)	*0,0*	*56,4*	*70,2*	*74,2*
Kula town - total (with infiltration)	*0,0*	*71,4*	*90,2*	*99,2*
Gross total (no infiltration)	102,8	194,5	218,4	232,8
Gross total (with infiltration)	127,8	256,5	288,4	309,8
Overview - Q maximum day (l/s)				
Vrbas town - population and other dispersed consumers	*43,2*	*66,8*	*77,8*	*87,6*
Vrbas town - industries	*75,8*	*75,8*	*75,8*	*75,8*
Vrbas town - infiltration	*25,0*	*35,0*	*35,0*	*35,0*
Vrbas town - total (no infiltration)	*119,0*	*142,7*	*153,6*	*163,4*
Vrbas town - total (with infiltration)	*144,0*	*177,7*	*188,6*	*198,4*
Vrbas villages - population and other dispersed consumers	*0,0*	*46,8*	*48,9*	*52,9*
Vrbas villages - infiltration	*0,0*	*12,0*	*15,0*	*17,0*
Vrbas villages - total (no infiltration)	*0,0*	*46,8*	*48,9*	*52,9*
Vrbas villages - total (with infiltration)	*0,0*	*58,8*	*63,9*	*69,9*
Kula town - population and other dispersed consumers	*0,0*	*38,1*	*56,2*	*61,7*
Kula town - industries	*0,0*	*30,1*	*30,1*	*30,1*
Kula town - infiltration	*0,0*	*11,3*	*20,0*	*25,0*
Kula town - total (no infiltration)	*0,0*	*68,2*	*86,3*	*91,8*
Kula town - total (with infiltration)	*0,0*	*79,5*	*106,3*	*116,8*
Gross total (no infiltration)	119,0	257,7	288,7	308,2
Gross total (with infiltration)	144,0	315,9	358,7	385,2
Organic loading - maximum day (PE)				
Vrbas town - population and other dispersed consumers	*18.501*	*26.962*	*28.060*	*30.031*
Vrbas town - industries	*49.125*	*49.125*	*49.125*	*49.125*
Vrbas town - infiltration	*1.800*	*2.520*	*2.520*	*2.520*
Vrbas town - total (no infiltration)	*67.626*	*76.087*	*77.185*	*79.156*
Vrbas town - total (with infiltration)	*69.426*	*78.607*	*79.705*	*81.676*
Vrbas villages - population and other dispersed consumers	*0*	*19.981*	*20.181*	*20.527*
Vrbas villages - infiltration	*0*	*864*	*1.080*	*1.224*
Vrbas villages - total (no infiltration)	*0*	*19.981*	*20.181*	*20.527*
Vrbas villages - total (with infiltration)	*0*	*20.845*	*21.261*	*21.751*
Kula town - population and other dispersed consumers	*0*	*14.842*	*20.289*	*21.169*
Kula town - industries	*0*	*19.500*	*19.500*	*19.500*
Kula town - infiltration	*0*	*1.080*	*1.440*	*1.800*
Kula town - total (no infiltration)	*0*	*34.342*	*39.789*	*40.669*
Kula town - total (with infiltration)	*0*	*35.422*	*41.229*	*42.469*
Gross total (no infiltration)	67.626	130.410	137.156	140.352
Gross total (with infiltration)	69.426	134.874	142.196	145.896

Graph 3-3 Vrbas – Kula wastewater flows projection – to be treated at the CWWTP (m^3)



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Kula-town	0	0	0	0	0	2.250.877	2.310.397	2.369.917	2.429.437	2.488.957	2.548.477	2.607.997	2.667.518	2.727.038	2.786.558	2.846.078	2.862.674	2.879.270	2.895.865	2.912.461	2.929.057	2.945.653	2.962.249	2.978.845	2.995.441	3.012.037	3.028.633	3.045.229	3.061.825	3.078.421	3.095.017	3.111.612	3.128.208
Vrbas villages	0	272.596	545.193	817.789	1.090.385	1.362.982	1.376.746	1.390.511	1.404.275	1.418.040	1.431.805	1.445.569	1.459.334	1.473.098	1.486.863	1.500.628	1.509.340	1.518.053	1.526.765	1.535.478	1.544.190	1.552.903	1.561.615	1.570.328	1.579.041	1.587.753	1.596.466	1.605.178	1.613.891	1.622.603	1.631.316	1.640.028	1.648.741
Vrbas-town	3.458.037	3.627.772	3.797.506	3.967.241	4.136.976	4.306.710	4.331.278	4.355.846	4.380.414	4.404.982	4.429.550	4.454.118	4.478.686	4.503.254	4.527.822	4.552.390	4.565.427	4.578.464	4.591.502	4.604.539	4.617.576	4.630.613	4.643.650	4.656.688	4.669.725	4.682.762	4.695.799	4.708.837	4.721.874	4.734.911	4.747.948	4.760.985	4.774.023

Graph 3-4 Vrbas – Kula wastewater flows projection – to be invoiced to the consumers (m^3)



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Kula-town	0	0	0	0	0	1.777.837	1.821.589	1.865.341	1.909.093	1.952.845	1.996.597	2.040.349	2.084.102	2.127.854	2.171.606	2.215.358	2.222.678	2.229.999	2.237.320	2.244.640	2.251.961	2.259.281	2.266.602	2.273.923	2.281.243	2.288.564	2.295.885	2.303.205	2.310.526	2.317.846	2.325.167	2.332.488	2.339.808
Vrbas villages	0	196.910	393.820	590.730	787.640	984.550	988.853	993.157	997.461	1.001.765	1.006.069	1.010.372	1.014.676	1.018.980	1.023.284	1.027.588	1.032.590	1.037.592	1.042.595	1.047.597	1.052.600	1.057.602	1.062.605	1.067.607	1.072.609	1.077.612	1.082.614	1.087.617	1.092.619	1.097.622	1.102.624	1.107.627	1.112.629
Vrbas-town	2.669.637	2.776.300	2.882.962	2.989.625	3.096.288	3.202.950	3.227.518	3.252.086	3.276.654	3.301.222	3.325.790	3.350.358	3.374.926	3.399.494	3.424.062	3.448.630	3.461.667	3.474.704	3.487.742	3.500.779	3.513.816	3.526.853	3.539.890	3.552.928	3.565.965	3.579.002	3.592.039	3.605.077	3.618.114	3.631.151	3.644.188	3.657.225	3.670.263

3.2 Technical options

3.2.1 Scope of the Project

The municipalities of Kula and Vrbas possess incomplete sanitary sewerage systems. In Kula, service coverage is around 30% in town, and in Vrbas service coverage is going to reach 70% in town, while the rural areas are not (yet) covered by a sewerage system. The population and industries not connected to the present sewer system either discharge their wastewater into the DTD canal system, or to individual septic tanks. Both practices are unacceptable from an environmental and public health point of view because of detrimental effects to both surface and underground water quality.

In order to contribute to the protection of surface waters (mainly the DTD Grand Canal) and underground water in the municipality, a wastewater project for Kula and Vrbas was initiated, aiming to provide collection and treatment of communal wastewater and of part of the industrial effluents.

The scope of the project includes the original components that were defined in the reference documentation 1.1 to 1.7, meaning the Central Wastewater Plant (CWWTP) in Vrbas designed to treat wastewater from the town of Kula, corresponding major industrial polluters, the town of Vrbas and industrial effluents from the major industrial polluters in Vrbas. However, based on the request by the municipality of Vrbas and detailed discussions conducted with municipality representatives, the scope of the project was extended in order to provide not only wastewater treatment of the users concerned, but also to make sure that higher connection rate is achieved and that communal and industrial wastewater in the project area are collected and transferred to the CWWTP.

The complete scope of the project is presented in the enclosed General Layout map, and includes the following components:

- CWWTP in Vrbas as designed in the reference 1.5 – to treat an organic loading of approximately 125.000 PE;
- Extension of the CWWTP to cater for additional hydraulic and organic loading as a result of planned connection of the villages in the municipality of Vrbas to the CWWTP – references 1.8, 1.9 and 1.10;
- Sewerage system (main transmission lines, sewage pumping stations, main gravity sewers, secondary gravity sewers) for five villages (Kucura, Savino Selo, Bačko Dobro Polje, Zmajevo and Ravno Selo) of Vrbas municipality;
- Completion of the main gravity sewer Kula – Vrbas, in order to provide technical pre-requisites to connect to the sewerage system Carnex industry and users in the town of Kula. The sewerage collection network extension in Kula is out of the scope of the project;

Not only the physical scope of the project extended considerably, but also the total investment cost necessary to construct the project components increased substantially, as it shall be shown in the investment costs estimate.

3.2.2 Sanitary Sewerage in Villages (Vrbas municipality)

3.2.2.1 Introduction

The technical proposals for collection and treatment of communal wastewater in the villages of Vrbas municipality (Kucura, Savino Selo, Bačko Dobro Polje, Zmajevo and Ravno Selo) have been elaborated in the references 1.4, 1.8, 1.9 and 1.10.
Two basic technical alternatives were considered:

- Alternative 1 – local collection networks and WWTP-s for each settlement providing adequate effluent quality and stabilized sludge;
- Alternative 2 – collection, transport and treatment of wastewater at the CWWTP in Vrbas.

The Wastewater flow projection has been composed based on the following basic design parameters:

Table 3-20 Sewerage system for villages – basic design parameters

Design parameter	Value
Average unit household drinking water consumption	150 (l/capita/day)
Wastewater to water ratio	0,9
$K_{max\ daily}$	1,5
$K_{peak\ hourly}$ (for settlement)	1,6
$K_{peak\ hourly}$ (collection network)	2,3
Infiltration, inflow (in relation to total flow)	11%

The abovementioned design parameters are very much consistent with the design parameters used in this study, and are based on the current water consumption and expected rational use of water in the future (supposedly influenced by an anticipated full cost-recovery water tariff).
Influent design quality parameters have been assumed in accordance with standard communal wastewater characteristics, as shown in the following table:

Table 3-21 Villages – assumed influent quality

Parameter	Unit	Value
BOD_5	mgO_2/l	267
COD	mgO_2/l	533
SS	mg/l	311
Nitrogen-N	mg/l	49
Phosphorus-P	mg/l	8,0

Required effluent quality has been defined in accordance with the EU Council Directive 91/271/EEC, as shown in the following table applicable for sensitive areas, i.e. natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken.

Table 3-22 Requirements for discharges from urban wastewater treatment plants in accordance with the Urban Wastewater Directive.

Parameter	Unit	Value
BOD_5	mgO_2/l	25
COD	mgO_2/l	125
SS	mg/l	35
Total nitrogen - N	mg/l	15 (10.000-100.000 PE)
Total phosphorus - P	mg/l	2 (10.000-100.000 PE)

In accordance with the said Urban Wastewater directive, and also in accordance with the Water Management Conditions related to WWTP-s effluent discharges issued by the Ministry for Agriculture, Forestry and Water Management on December 23, 2005 (Annex 3.3), the following effluent quality design criteria have been established for the design of local WWTP-s:

Table 3-23 Effluent required design criteria adopted for local WWTP-s

Parameter	Unit	Value
BOD_5	mgO_2/l	25
COD	mgO_2/l	125
SS	mg/l	30
Total nitrogen - N	mg/l	n/a for settlements with population of less than 10.000
Total phosphorus - P	mg/l	n/a for settlements with population of less than 10.000

3.2.2.2 Sewerage Network – Basic Design Criteria

Below are presented some of the basic design criteria incorporated in the project design of sanitary sewerage collection networks, as indicated in reference 1.4:

Sewerage network should comply with the following general functional requirements:
- Structural integrity;
- Capacity;
- Self cleansing;
- Leakage.

Structural integrity
The structural integrity of the sewer pipes will decrease with time and the progress of this process for each pipe will usually depend on:
- Pipe material quality;
- Method of trench digging, back-filling and pipe work;
- Amount of aggressive wastewater;
- Total load of soil, buildings and traffic.

Capacity

The capacity of the sewer pipe depends on:

- Pipe diameter;
- Longitudinal grade.

The pipe diameter and grade are selected so that pipes can transfer the following flow components:

- Communal wastewater discharges;
- Industrial wastewater discharges;
- Infiltration and inflow;
- Storm water runoff (if applicable).

Self-cleansing

The self-cleansing velocity shall be ensured whenever possible in order to reduce settling along the pipe, reduction of capacity, blockages, excessive maintenance. Therefore the minimum pipe grades that provide self-cleansing velocity (usually 0,7-0,8 m/s) should be respected in the design.

Infiltration and inflow

Excessive infiltration due to poor structural integrity of pipes or inadequate pipe joints may significantly contribute to unnecessary additional operational costs (additional pumping) or may reduce the pipe ability to cope with normal wastewater flows. It is therefore recommended to use contemporary, high-quality pipe material and joints and to fully comply with manufacturer's instructions during installation.

3.2.2.3 Alternative 1 – Local WWTP-

This alternative assumes construction of sanitary sewerage networks in the villages conveying wastewater to local WWTP's. After being treated at the WWTP's, effluent is usually discharged into a local melioration canal.

The concept of the collection networks has been defined based on local topography and other site conditions. A summary of the basic sewerage network components is presented in the following table:

Table 3-24 Alternative 1 – local WWTP-s: summary of sewerage network components

Settlement	Length of sewerage network (meter)	No. of (sewage pumping stations) - SPS-s
Bačko Dobro Polje	15.700	3
Zmajevo	18.500	4
Ravno Selo	18.900	4
Kucura	19.900	3
Savino Selo	14.200	3

Local WWTP-s

In accordance with this technical alternative, an individual local WWTP is to be constructed in each of the villages concerned. The design capacities of the plants range from 4.000 to 5.000 PE. The wastewater to be treated at the plants will be typical communal wastewater, and the following treatment options were taken into consideration:

- Biological treatment in aerated lagoons;
- Biological treatment with fixed bio-culture;
- Biological treatment with combination of activated sludge and cyclic technology;
- Conventional treatment (biological treatment with activated sludge and sludge stabilization);
- Biological treatment with activated sludge and application of membrane bio-reactors.

Based on the local conditions, structure and size of the settlement, proposed concept of sewerage system, plant capacities, available plots for plant construction, effluent quality criteria, the option with biological treatment combined with cyclic technology has been adopted.

In accordance with the abovementioned EU wastewater directive, removal of macro-nutrients is not required for this size of facilities. However, in addition to fulfilling the basic effluent criteria, the technology proposed provides a reduction of nitrogen concentration (de-nitrification).

Description of treatment technology

The water line includes the following:

- Flow measurement – raw water;
- Coarse screen;
- Fine screen;
- Removal of grit, sand, suspended matter, fat, floating matter in aerated grit removal chambers;
- Biological treatment in the so called BIOCOS® process;
- Flow measurement – treated water.

The sludge line includes the following:

- Pumping with sludge pumps to thickening;
- Sludg thickening in sludge thickener;
- Sludge flow measurement;
- Stabilized sludge conditioning with polyelectrolyte;
- Sludge dewatering;
- Removal and disposal of sludge cake.

Air is extensively used in the process recommended: in aerated grit removal chambers and for aeration in bio-reactors.

Kati-ionic polyelectrolyte is the major chemical used in the process, for conditioning of the stabilized sludge. An overview of the basic features of the structures and equipment is shown hereafter:

Coarse screen:

- Screen slope - 70º
- Clear opening between bars - 50 mm
- No of units - 1

Main pumping station:

- Length - 2,8 m
- Width - 2,4 m
- Depth of structure - variable
- Capacity - variable
- Nominal head - variable
- No of units - 1

Mechanical treatment:

- Fine screen - d = 5 mm
- Waste materials compaction - 1,0 m3/h
- Fat removal
- Hydraulic capacity - 30 l/s
- Installed power - 5 kW
- No of units - 1

Aeration basin:

- Width - variable
- Length - variable
- Water depth - 5,0 m
- Effective volume - variable
- Recirculation capacity - 30 l/s
- Installed power - 1,5 kW
- No of units - 2

Settling and circulating reactor:

- Width - variable
- Length - variable
- Water depth - 5,0 m
- Effective surface - variable
- Effective volume - variable
- No of units - 4

Silo for sludge (thickener):

- Effective volume - 35 m3
- Length - 3,2 m
- Width - 3,2 m
- No of units - 1

Machine and control building:

- Footprint area - 200 m2

The proposed treatment process provides effluent quality as shown in the following table.

Table 3-25 Effluent quality – minimum required and achieved by the selected process

Parameter	Unit	Guaranteed for applied process	Minimum required
BOD_5	mgO_2/l	≤15	25
COD	mgO_2/l	≤40	125
SS	mg/l	≤30	30
Total N	mg/l	≤15	n/a

Typical design parameters for a 4.000 PE plant (planned in Ravno Selo and Savino Selo) are as follows:

- Hydraulic loading: Q max day - 900 m3/day
- BOD5 - 240 kg/day
- COD - 480 kg/day
- SS - 280 kg/day
- Total N - 44 kg/day
- Total P - 7,2 kg/day

Typical design parameters for a 5.000 PE plant (planned in Bačko Dobro Polje, Zmajevo, Kucura) are as follows:

- Hydraulic loading: Q max day - 1.125 m3/day
- BOD5 - 300 kg/day
- COD - 600 kg/day
- SS - 350 kg/day
- Total N - 55 kg/day
- Total P - 9 kg/day

3.2.2.4 Proposed adjustments of CWWTP loads and capacities

The design pollution and hydraulic loads of the CWWTP will increase to cater the planned extension of sewerage in five villages of the municipality of Vrbas. The following additional loads will have to be considered.

Table 3-26 Additional loads due to connection of five Vrbas villages

PE	Q_{av}	Q_{max}	Q_{max}	BOD_5	COD	SS	Ntot	Ptot
-	m^3/day	m^3/day	l/s	kg O_2/day	kg O_2/day	kg/day	kg/day	kg/day
23.000	3.450	5.175	96	1.380	2.760	1.610	253	41

The considered pollution loads have provisions for minor industrial developments in the five villages (300-500 PE per village).

Analysis of the situation and the current process design implies two important considerations:

- The design capacity of the CWWTP as defined in the General Project Design and Pre-feasibility Study is not sufficient to accept and treat the additional wastewater arising form Vrbas five villages;

- The current status of implementation of accompanying infrastructure (local and regional sewers) is relatively uncertain with possible difficulties on the way to achieving full loading of the CWWTP in the near future.

To cope with these two implications, a phased approach using the same treatment technology is proposed. However, the proposed phasing includes not only technology phasing (extended treatment at a later stage), but also capacity phasing. To be able to accommodate the proposed phasing, the wastewater treatment would have to be split into three identical treatment lines, instead of the currently proposed two treatment lines. This requires budget adjustments.

3.2.2.5 Alternative 2 – Transfer and treatment at the CWWTP Vrbas

This alternative includes collection networks in the villages, sewage pumping stations and transfer mains from the villages to the CWWTP and a corresponding extension of the CWWTP.

The total length of the collection networks is 83,2 km and of the transmission mains 30 km. It is necessary to construct 22 SPS-s altogether. Based on geographical position of the settlements two major clusters are formed, Southern (Ravno Selo, Bačko Dobro Polje, Zmajevo) and Western (Savino Selo, Kucura).

<u>Western branch</u>
The so called Western branch includes the following components:

- Collection network in Kucura;
- Collection network in Savino Selo;
- Section Savino Selo – Kucura;
- Section Kucura – Vrbas.

Major features of this sub-system are as follows:

- Collection network Kucura: - L= 17,9 km
- Sewage pumping stations: - 1 piece
- Section Kucura – Vrbas - gravity sewer HDPE DN300mm, L=3.600m, forcemain HDPE DN225, L=4.700m
- SPS Kucura 1 - Q = 38,4l/s, H=20,3m
- SPS Kucura 2 - Q = 38,4l/s, H=27,2m
- SPS Kucura 3 - Q = 29,4 l/s, H=6,4
- Section Savino Selo - Kucura - gravity sewer HDPE DN300mm, L=1.300m, pressure main HDPE DN160mm, L=3.700m
- Savino Selo collection network - L =12,5 km
- Sewage pumping stations - 1 piece
- SPS Savino Selo 1 - Q = 17,3l/s, H=40,6m
- SPS Savino Selo 2 - Q = 7,8l/s, H=5,7m

Southern branch

The so called Western branch includes the following components:

- Collection network in Bačko Dobro Polje;
- Collection network in Zmajevo;
- Collection network in Ravno Selo;
- Section Ravno Selo – Zmajevo;
- Section Zmajevo – Bačko Dobro Polje;
- Section Bačko Dobro Polje – CWWTP.

Major features of this sub-system are as follows:

- Collection network Ravno Selo: - L= 18,9 km
- Sewage pumping stations - 4 pieces
- Collection network Zmajevo: - L= 18,6 km
- Sewage pumping stations - 5 pieces
- Collection network B.D.Polje: - L= 15,4 km
- Sewage pumping stations - 2 pieces
- Section Ravno Selo – Zmajevo - pressure main HDPE DN160mm, L=4.400m
- SPS Ravno Selo - Q = 17,4 l/s, H = 54,5m
- Section Zmajevo – B.D. Polje - gravity sewer HDPE DN300mm, L=1.300m, pressure main HDPE DN225mm, L=3.700m
- SPS Zmajevo - Q = 39,1 l/s, H = 36,0 m
- Section B.D.Polje – CWWTP - gravity sewer HDPE DN400mm, L=2.700m, pressure main HDPE DN280mm, L=4.500m
- SPS B.D.Polje 1 - Q = 60,5 l/s, H = 37,2m
- SPS B.D.Polje 2 - Q = 63,2 l/s, H = 5,6m

3.2.2.6 Economic Considerations and Selection of the Preferred Option

An overview of the investment costs (excluding VAT) of the abovementioned alternatives is presented in the following tables:

Table 3-27 Sewerage system for villages – Alternative 1 investment costs

Type of works	**Local WWTP-s (€)**	**Collection networks (€)**	**Total investment (€)**
Construction works	1.680.000	1.367.000	3.047.000
Hydro-mechanical equipment	1.920.000	-	1.920.000
Pipes	236.000	8.192.000	8.428.000
Power supply and automation	476.000	-	476.000
HVAC	50.000	-	50.000
Total	**4.362.000**	**9.559.000**	**13.921.000**

Table 3-28 Sewerage system for villages – Alternative 2 investment costs

Type of works	Additional capacity of the CWWTP (€)	Western sub-system (€)	Southern sub-system (€)	Total investment (€)
Construction works		422.000	903.000	1.325.000
Hydro-mechanical equipment		165.000	214.000	379.000
Pipes		3.495.000	5.999.0000	9.494.000
Extension of the CWWTP	2.300.000			2.300.000
Total	**2.300.000**	**4.082.000**	**7.116.000**	**13.498.000**

Table 3-29 shows the estimates of the operational costs for the abovementioned technical alternatives.

Table 3-29 Sewerage System for Villages – an overview of operational costs

Description	Alternative 1 (€/annually)	Alternative 2 (€/annually)
Energy costs	59.000	62.920
Chemical dosing (de-hydration)	28.900	0
Wastes collection and disposal (waste, grit, grease, sludge)	11.100	460
Maintenance	119.100	100.700
Insurance	59.500	50.350
Other material costs	59.500	50.350
Salaries	144.000	36.000
Additional O&M for CWWTP		80.000
Total	**481.100**	**380.780**
Annual volume of collected and treated water (m^3/year)	1.241.000	1.241.000
Operational costs per m^3 of collected and treated wastewater (€/m^3)	0,39	0,31

Source: (3.10) Akva-Projekt, Subotica, General Project Design of Wastewater Collection and Treatment in Vrbas Municipality, Volume 3, with corrections

As can be concluded from the foregoing tables, the estimated investment costs are of the same order for both proposed alternatives, while the operational costs are significantly higher for alternative 2, mainly as a result of higher payroll costs. Centralized wastewater treatment is much less labour intensive, due to economies of scale.

The overall assessment of the proposed alternatives also included consideration of necessary regular maintenance. Alternative 2 is assessed to be more favourable in that regard, because it contains a centralized wastewater treatment unit, versus 5 local WWTP-s in the alternative 1, which should results in lower costs due to economies of scale.

In comparing alternatives to arrive at a least cost solution, normally a discounted cash flow analysis is conducted to take into account timing differences of cost streams. Since investment costs are almost equivalent and assuming that timing of both investment and operational costs of both alternatives do not differ materially, a simple comparison of annual operational cost per unit processed is sufficient.

Based on the significant difference in operational costs, alternative 2 is recommended for further implementation.

3.2.3 Central Wastewater Treatment Plant in Vrbas

3.2.3.1 General

Construction of the Central Wastewater Treatment Plant in Vrbas (CWWTP) is one of key components in the overall protection of the DTD Grand Canal. A regional approach has been chosen and approved by the National Assembly in 2002, combining the treatment of domestic and (pre-treated) industrial wastewater of the municipalities of Vrbas and Kula in a single central wastewater plant.

The location of the plant has been determined and is situated around the location of the old wastewater treatment plant, south-east of the centre of the town of Vrbas. Discharge of treated water will take place in the channel DTD Bogojevo - Becej. In order to connect the municipality of Kula with the CWWTP a missing part of the main sewer Kula – Vrbas and a sewage pumping station in Kula have yet to be constructed. The current rate of service coverage with sewerage in Vrbas (town) is estimated at around 55% and for Kula (town) is some 30%, implying the need for completion of the collection system in Vrbas (ongoing – by the end of 2007 service coverage of 70% is anticipated) and especially in Kula where the service coverage is very low. Moreover, in order to be able to connect population and industries of Kula to the CWWTP it is necessary to construct the final stage of the main sewer between Kula and Vrbas. Increasing of the current service coverage should contribute to a technically and financially sustainable CWWTP.

A number of industries responsible for large and intermittent wastewater loading have been directed to separately deal with their wastewaters, i.e. these industries should (after reaching prescribed effluent standards) discharge treated effluents directly into the canal network, rather than to make use of the CWWTP. These include the sugar factories Crvenka and Backa and the pig farm Farmacoop. In documentation reference 1.1 – 1.7 it was assessed that technically and economically it is not feasible to direct and treat the effluents from these industries to the CWWTP, but they should provide their own full treatment, and discharge treated effluent directly into the canals.

On the other hand, a number of industries shall be connected to the sewerage system, and their pre-treated effluents shall be directed to the CWWTP. These industrial effluents should fully comply with the criteria set in the Decision on sanitary and technical conditions for wastewater discharge into a public sewerage, passed by the municipal assembly on June 14, 2007 (Annex 3.5). Moreover, the decision prescribes that if technical prerequisites are fulfilled, i.e. if the sewerage system is built in the area, a user's (including mentioned industries) connection to the sewerage will be mandatory.

The project period is divided into three phases:

- **Phase I** – Construction of the wastewater facilities to cater for wastewater generated in Vrbas town, villages and industries – The operational capacity of this stage shall be approximately 2/3 of the total CWWTP capacity (i.e. approximately 100.000 PE) and the effluent quality shall be as requested in the Water Management Conditions (Annex 3.3) – full compliance shall be achieved with regard to BOD5, SS, COD, fats and oils, while the nutrients removal shall be carried out in the next stage.
- **Phase II** – Construction of the wastewater facilities to treat, in addition to the abovementioned users (Phase I), also wastewater generated in Kula (population and industries). This phase would include construction of the third treatment line (of the capacity approximately 50.000 PE) with the same treatment technology and removal efficiency as defined in the phase I. Implementation of the phase II shall depend on the completion of the sewerage collection network in Kula, of the main gravity sewer Kula – Vrbas but also on the operational status of the major Kula industries included in the project (Eterna and Istra). At this stage, in this feasibility study, it is assumed that phase II shall be implemented in 2012. However, exact implementation schedule shall be determined based on the abovementioned developments.
- **Phase III** - would include a process upgrade of the CWWTP, for the full design capacity, by means of nitrogen and phosphorous removal, as defined in the Water Management conditions (Annex 3.3). Implementation of the phase III is planned for 2022.

Analysis in the pre-feasibility and general project design – reference 1.1 suggests that there will be no significant variations of wastewater discharges in the project period. The actual flows and quantities of wastewater to be treated at the CWWTP depend, however, on the construction of the missing part of the main collector Vrbas - Kula, the extension of the collection systems and actual performance of the considered industries in terms of effluent quantities and quality.

The plant construction is planned to begin in 2008/2009. The planned exploitation period of the plant is 50 years, and the period for economic analysis is 33 years, i.e. 2007 – 2039, inclusive.

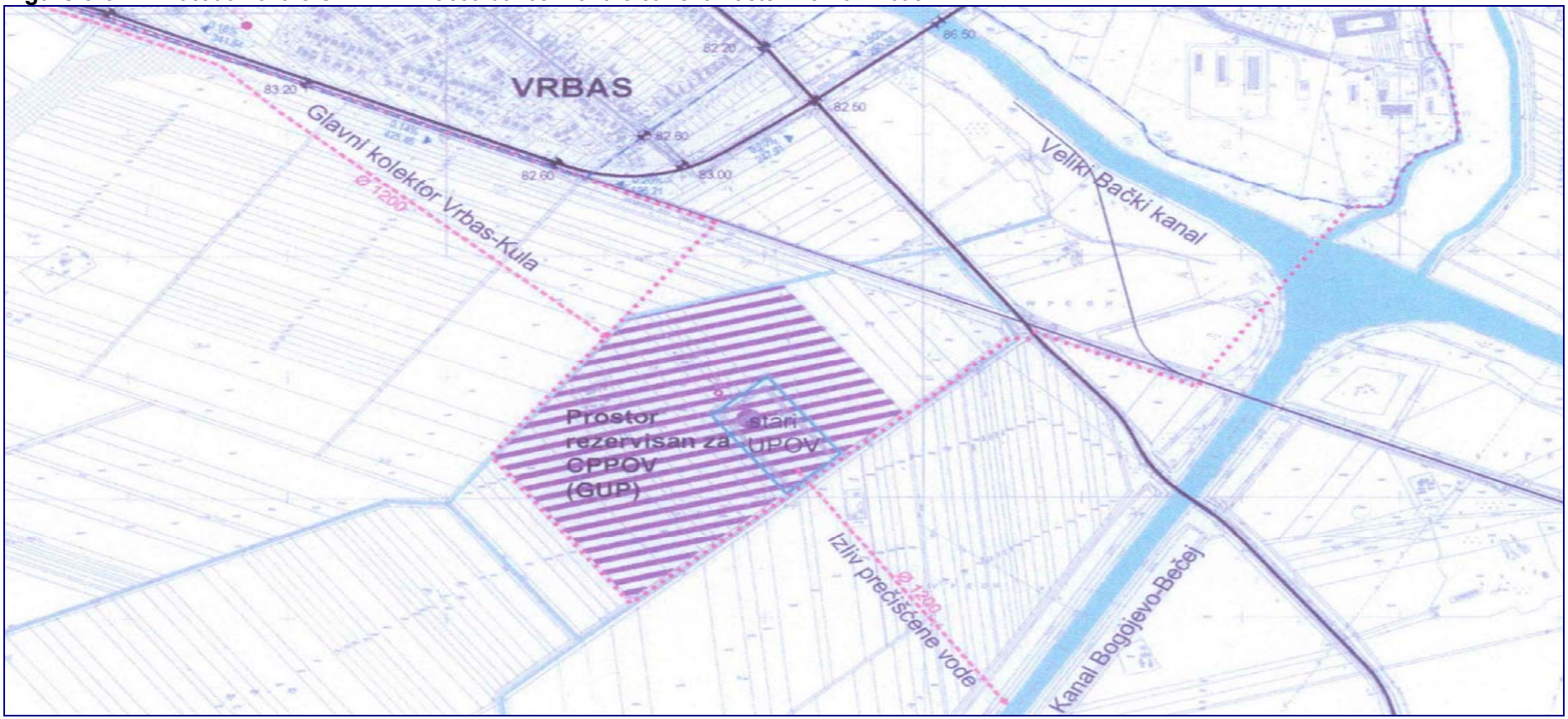
Location of the CWWTP

The location of the planned CWWTP is on the south-east fringes of the urbanized area of Vrbas, close to the connection of the Grand Bačka Canal and Bogojevo – Bečej canal (so-called triangle). In accordance with the current Urban Master Plan of Vrbas (valid till 2022) the reserved location encompasses 20 ha in the zone of the abandoned WWTP. The location of the existing, abandoned WWTP covers a land plot No 2412 of around 2 ha (app. 200m x 100m) currently used by the PUC Standard. The location is currently occupied by the sewage pumping station No5, drainage canals and structures of the WWTP that is out of operation. An access road has been constructed from the main road to the location. Apart from the plot 2412 including the existing WWTP, the rest of the planned zone in accordance with the Urban Master Plan is privately owned and being used for agriculture. The topography is dominantly plain, with elevations 81 to 82 m.a.s.l. The SPS5 pumps wastewater from the incoming main gravity sewer DN1.200mm, via a forcemain, into the canal Bogojevo – Bečej.

Figure 3-5 shows an overview of the location of the abandoned WWTP, while figure 3-6 shows the position of the required site for the new CWWTP.

Figure 3-5 Location of the future CWWTP Vrbas

Figure 3-6 Location of the CWWTP in accordance with the current Master Plan of Vrbas



3.2.3.2 Users of the CWWTP Vrbas

In accordance with the references 1.1 to 1.7, the Central Waste Water Treatment Plant of Vrbas should treat water originating from the following clients/entities:

- Population, administration, small businesses in Vrbas town;
- Meat processing industry Carnex – Vrbas;
- Food oil industry Vital – Vrbas;
- Population, administration, small businesses in Kula town;
- Metal finishing industry Istra – Kula;
- Tannery Eterna - Kula.

In addition to these users, as described earlier in the report, it was proposed and accepted by the municipality of Vrbas that communal wastewater from 5 villages in Vrbas municipality shall be also directed and treated at the CWWTP.

An overview of projected wastewater quantities for the abovementioned users used in references 1.1 – 1.7 can be summarized as follows:

Table 3-30 Summary of hydraulic loadings in accordance with references 1.1 – 1.7

Description	**(m^3/day)**	**(l/s)**
Average flows		
Vrbas – population and small businesses	5.600	64,8
Kula – population and small businesses	4.400	50,9
Infiltration	5.184	60,0
Carnex	3.400	39,4
Vital	1.250	14,5
Istra	1.100	12,7
Eterna	1.500	17,4
Reserve capacity	1.296	15,0
TOTAL	**23.730**	**274,7**
Maximum daily flows	**(m^3/day)**	**(l/s)**
Vrbas – population and small businesses	7280	84.3
Kula – population and small businesses	5720	66.2
Infiltration	5184	60.0
Carnex	4800	55.6
Vital	1750	20.3
Istra	1100	12.7
Eterna	1500	17.4
Reserve capacity	1728	20.0
TOTAL	**29062**	**336.5**
Peak hourly loading		**(l/s)**
Vrbas – population and small businesses		117.3
Kula – population and small businesses		94.2
Infiltration		60.0
Carnex		83.3
Vital		25.0
Istra		25.0
Eterna		25.0
Reserve capacity		20.0
TOTAL (without storm water runoff)		**449,8**

Maximum storm water runoff		190,0
TOTAL (with storm water runoff)		**639,8**

Hydraulic loadings adopted in this study (for the ultimate design horizon) were based on the data included in the references 1.1 to1.7, but also on the water consumption data provided by PUC Standard and also included loading from the villages to be connected to the CWWTP. The reserve capacity has not been shown separately, but it is included in the overall balance through anticipated increase of unit water consumption related to small businesses and industries that can be considered as dispersed industrial polluters in the town area.

Table 3-31 Summary of hydraulic loadings in accordance with references 1.1 – 1.7, adjusted based on water consumption data and supplemented with additional users

Average flows	**(m^3/day)**	**(l/s)**
Vrbas – population and small businesses	5.400	62,6
Kula – population and small businesses	3.810	44,0
Infiltration (Vrbas and Kula)	5.184	60,0
Carnex	3.400	39,4
Vital	1.250	14,5
Istra	1.100	12,7
Eterna	1.500	17,4
Villages (population)	3.041	35,2
Villages (infiltration)	1.470	17,0
TOTAL	**26.155**	**302,7**
Maximum daily flows	**(m^3/day)**	**(l/s)**
Vrbas – population and small businesses	7.570	87,6
Kula – population and small businesses	5.330	61,7
Infiltration	5.184	60,0
Carnex	4.800	55.6
Vital	1.750	20.3
Istra	1.100	12.7
Eterna	1.500	17.4
Villages (population)	4.570	52,9
Villages (infiltration)	1.470	17,0
UKUPNO	**33.274**	**385,2**
Peak hourly loading		**(l/s)**
Vrbas – population and small businesses		118,2
Kula – population and small businesses		83,4
Infiltration		60.0
Carnex		83,3
Vital		25,0
Istra		25,0
Eterna		25,0
Villages (population)		84,7
Villages (infiltration)		17,0
TOTAL (without storm water runoff)		**521,6**
Maximum storm water runoff		190,0
TOTAL (with storm water runoff)		**711,6**

3.2.3.3 Basis of design of the CWWTP

The basics of design for the Central Waste Water Treatment Plant of Vrbas are defined in compliance with:

- Locally set design criteria and requirements – Annexes 3.3 and 3.4;
- The requirements and criteria laid out in the EU wastewater treatment directive (91/271/EEC).

Table 3-32 Comparison of the national and EU effluent criteria

	Effluent criteria set in the EU wastewater directive		**Effluent criteria defined by the relevant national authority to be achieved in the first stage of the CWWTP construction**	
Parameters	**Concentration**	**Minimum percentage of reduction (1)**	**Concentration**	**Minimum Percentage of reduction**
Biochemical oxygen demand (BOD_5 at 20 °C) without nitrification (2)	25 mg/l O_2	70-90	25 mg/l O_2	91
Chemical oxygen demand (COD)	125 mg/l O_2	75	125 mg/l O_2	75
Total suspended solids	35 mg/l 35 under Article 4 (2) (more than 10,000 p.e.) 60 under Article 4 (2) (2,000-10,000 p.e.)	90 (3) 90 under Article 4 (2) (more than 10,000 p.e.) 70 under Article 4 (2) (2,000-10,000 p.e.)	35 mg/l	91

(1) Reduction in relation to the load of the influent.
(2) The parameter can be replaced by another parameter: total organic carbon (TOC) or total oxygen demand (TOD) if a relationship can be established between BOD_5 and the substitute parameter.
(3) This requirement is optional. Analyses concerning discharges from lagooning shall be carried out on filtered samples; however, the concentration of total suspended solids in unfiltered water samples shall not exceed 150 mg/l.

Table 3-33 Comparison of the national and EU effluent criteria

	Effluent criteria set in the EU wastewater directive		**Effluent criteria defined by the relevant national authority to be achieved in the second stage of the CWWTP construction**	
Parameters	**Concentration**	**Minimum percentage of reduction (1)**	**Concentration**	**Minimum percentage of reduction**
Total phosphorus	2 mg/l P (10,000 – 100,000 p. e.) 1 mg/l P (more than 100,000 p. e.)	80	1 mg/l	83
Total nitrogen (2)	15 mg/l N (10,000 - 100,000 p. e.) 10 mg/l N (more than 100,000 p. e.) (3)	70-80	10 mg/l	75

(1) Reduction in relation to the load of the influent.
(2) Total nitrogen means: the sum of total Kjeldahl-nitrogen (organic N + NH_3), nitrate (NO_3)-nitrogen and nitrite (NO_2)-nitrogen.
(3) Alternatively, the daily average must not exceed 20 mg/l N. This requirement refers to a water temperature of 12° C or more during the operation of the biological reactor of the waste water treatment plant. As a substitute for the condition concerning the temperature, it is possible to apply a limited time of operation, which takes into account the regional climatic conditions. This alternative applies if it can be shown that paragraph 1 of Annex I.D is fulfilled.

Based on the abovementioned data, it can be concluded that full compliance of the adopted design criteria has been established:

- Upon completion of phase I – in terms of BOD_5, COD and SS
- Upon completion of phase III – in terms of nutrients removal

The following is an overview of the basic plant design data based on assessments from the pre-feasibility study and general project design (references 1.1 to 1.7, as well an overview supplemented with additional loadings as a result of the project area extension (inclusion of five villages).

Table 3-34 Design data for the CWWTP

Description	**Loading based on the pre-feasibility study and general project design**		**Loading including additional users**
Flows	**Unit**	**Value**	**Value**
$Q_{daily\ average}$	m^3/d	23.730	26.155
$Q_{daily\ max}$	m^3/d	29.117	33.274
$Q_{max\ dry\ weather}$	l/s	450	520
$Q_{max\ rain}$	l/s	640	710
Loadings (average)			
BOD_5	kg/d	6645	8.025
SS	kg/d	7659	9.269
N kj total	kg/d	953	1.206
P total	kg/d	140	181
Loadings (max)			
BOD_5	kg/d	7591	8.971
SS	kg/d	8615	10.225
N total	kg/d	1085	1.338
P total	kg/d	153	194
Inlet water quality			
BOD_5 average	mg/l	280	
COD average	mg/l	500	
SS average	mg/l	322	
N total average	mg/l	40.1	
P total average	mg/l	5.9	

3.2.3.4 Description of alternative technical options

Four technical options (i.e. technological process schemes) have been evaluated in the documentation – references 1.1 to 1.7 for the CWWTP:

- Conventional treatment based on activated sludge and anaerobic sludge treatment;
- Two stage activated sludge treatment (AB Process) and anaerobic sludge treatment;
- Sequencing Batch Reactor plant, with continuous inflow and aerobic sludge treatment;
- Activated sludge treatment based on MBR (Membrane Bio-Reactor) technology.

The considered options are comprised of various process lines, including:

- Water line;
- Sludge line;
- Air line;
- Bio-gas line;
- Chemicals line.

The treatment plant construction has been phased in terms of applied technology. Denitrification would be applied in a later stage of the project. This will be a system based on pre-denitrification by means of recirculation of activated sludge from the aeration basin in a separate denitrification tank, preceding the aeration tank. In this tank the incoming raw water would be brought into contact with the recycled sludge and

anoxic conditions would be created (no aeration) for a specific retention period. This would result into denitrification without the need for dosing of an additional carbon source for the denitrification. A small portion of the phosphorus will also be removed. The remaining bulk of phosphorus will be removed by means of dosing of FeCl3 coagulant in the water entering the secondary sedimentation unit, where it will settle together with other coagulated/flocculated remaining impurities.

In practice, treatment process schemes are also applied that integrally incorporate a denitrification step in one unit. Such pre-denitrification processes are the bio-denitro process (phased oxidation ditch technology) and the Nitrox process (intermittent oxidation ditch aeration). These processes are suitable for an integral solution of the wastewater treatment (i.e. in one phase as compared to the considered phased approach) however, they have not been considered for the CWWTP. Both the considered phased approach and integral process approach have their positive aspects and drawbacks.

The conventional activated sludge and anaerobic sludge treatment is comprised of the following elements per process line:

The water line is comprised of:
- coarse screening for the removal of coarse floating debris and waste;
- automatic fine screens for the removal of finer floating debris;
- aerated sand and grit chamber for the removal of sand, grit and oil and fat;
- primary sedimentation for settling of suspended and colloidal matter;
- biological treatment for the removal of organic matter and nitrification of ammonia by means of intensive submerged (diffused) aeration;
- secondary sedimentation for sludge settling and recirculation;
- UV disinfection of effluent prior to discharge;
- flow measurement and discharge into channel.

The sludge line includes the following:
- thickening of primary sludge from the primary sedimentation and activated sludge from the activated sludge process;
- two stage anaerobic sludge digestion of thickened sludge;
- thickening of fermented sludge;
- dewatering of thickened sludge by means of filter belt press;
- sludge disposal to solid waste disposal site;
- recycle of filter belt press water back to process.

The air line is comprised of low pressure air supply necessary for the operation of:
- the aerated sand and grit removal unit;
- the operation of the pumps in the aerated sand and grit removal unit;
- the aeration basin for provision of oxygen and mixing of biomass.

The bio gas line is comprised of:
- transport and storage of bio gas from the anaerobic digestion units;
- gas motors serving for utilization of bio gas for electricity (internal supply) and heat generation (heating of digesting units).

The chemicals line consists of:
- storage, preparation and dosing equipment for polyelectrolyte for sludge conditioning prior to filter belt press.

The two stage activated sludge treatment (AB Process) and anaerobic sludge treatment is comprised of the following elements per process line:

The water line includes the following:
- coarse screening for the removal of coarse floating debris and waste;
- automatic fine screens for the removal of finer floating debris;
- aerated sand and grit chamber for the removal of sand, grit and oil and fat;
- partial biological treatment for the removal of organic matter means of submerged diffused aeration;
- intermediate sedimentation for sludge settling and partial sludge recirculation (the rest being sent to the sludge line);
- biological treatment for the removal of organic matter and nitrification of ammonia by means of intensive (diffused) aeration;
- additional sedimentation for sludge settling and recirculation;
- UV disinfection of effluent prior to discharge;
- flow measurement and discharge into channel.

The sludge line is comprised of:
- thickening of primary sludge from the primary sedimentation and activated sludge from the activated sludge process;
- two stage anaerobic sludge digestion of thickened sludge;
- thickening of fermented sludge;
- dewatering of thickened sludge by means of a filter belt press;
- sludge disposal to solid waste disposal site;
- recycle of filter belt press water back to process.

The air line is comprised of low pressure air supply necessary for the operation of:
- the aerated sand and grit removal unit;
- the operation of the pumps in the aerated sand and grit removal unit;
- the first stage aeration basin for provision of oxygen and mixing of biomass.

The bio gas includes the following:
- transport and storage of bio gas from the anaerobic digestion units;
- gas motors serving for utilization of bio gas for electricity (internal supply) and heat generation (heating of digesting units).

The chemicals line includes the following:
- storage, preparation and dosing equipment for polyelectrolyte for sludge conditioning prior to the filter belt press.

The Sequencing Batch Reactor plant, with continuous inflow and aerobic sludge treatment is comprised of the following elements per process line:

The water line is comprised of:
- coarse screening for the removal of coarse floating debris and waste;
- automatic fine screens for the removal of finer floating debris;

- aerated sand and grit chamber for the removal of sand, grit and oil and fat;
- flow measurement;
- biological oxidation (aeration by means of membrane diffusers), sedimentation and decantation in continuous inflow SBR (Sequencing Batch reactor) basins;
- UV disinfection of effluent prior to discharge;
- flow measurement and discharge into channel.

The sludge line is comprised of:
- aerobic sludge stabilization basins for sludge stabilization;
- daily equalisation basin for retention of stabilized sludge;
- dewatering of stabilized and (polyelectrolyte) conditioned sludge by means of centrifuge;
- sludge disposal to a solid waste disposal site.

The air line is comprised of low pressure air supply necessary for the operation of:
- the aerated sand and grit removal unit;
- the SBR reactor unit;
- the aerobic sludge stabilization basins.

The chemicals line is comprised of:
- storage, preparation and dosing equipment for cationic polyelectrolyte for sludge conditioning prior to centrifuge.

The activated sludge treatment based on MBR (Membrane Bio-Reactor) technology is comprised of the following elements per process line:

The water line is comprised of:
- coarse screening for the removal of coarse floating waste materials;
- automatic fine screens for the removal of finer floating waste materials;
- aerated sand and grit chamber for the (removal of sand, grit and oil and fat;
- biological oxidation (nitrification) in aeration basins;
- filtration and separation of water from sludge by means of UF (Ultra-filtration) membranes;
- recirculation of activated sludge from the membranes' reactor basin to the aeration basin and evacuation of surplus sludge from the membranes reactor basin to dewatering;
- flow measurement and discharge into channel.

The sludge line is comprised of:
- dewatering of thickened/conditioned sludge from the membrane bioreactor by means of centrifuge;
- sludge disposal to solid waste disposal site

The air line is comprised of low pressure air supply necessary for the operation of:
- the aerated sand and grit removal unit;
- the aeration basin for provision of oxygen and mixing of biomass;
- the membrane bioreactor unit for provision of oxygen, mixing of biomass and mechanical cleaning of the membranes.

The chemicals line is comprised of:

- storage, preparation and dosing equipment for polyelectrolyte for sludge conditioning prior to the centrifuge.

3.2.3.5 Overview of proposal for introduction of nutrients removal

As mentioned earlier, this phase of the CWWTP development is, in accordance with the design criteria, issued by the relevant Water Authority, to provide nutrient removal as follows:

- Total N < 1 mg/l, minimum removal efficiency 83%
- Total P < 10 mg/l, minimum removal efficiency 75%

Upon the request of the municipality of Vrbas, an estimate of the investment and operational costs related to this phase of the CWWTP has been included in reference 1.12 This estimate was prepared for the originally planned CWWTP design capacity, and in the assessment of the investment and operational costs in this study, costs have been corrected on a pro-rata basis.

Construction works related to this phase of the CWWTP construction include the following:

- Basins for de-nitrification of 4.400 m^3 capacity;
- Modification of the existing and installation of additional piping and canals in the water line;
- Building for preparation and dozing of ferry-chloride ($FeCl_3$).

The cost for execution of these works has been estimated at 590.000 €.

Necessary equipment includes the following:

- Submerged mixer in the de-nitrification basin;
- Recirculation pumps aeration basin => de-nitrification basin;
- Recirculation pipelines and accessories;
- Equipment for storing, preparation and dosing of FeCl3;
- Modification of pumping stations for sludge recirculation and surplus sludge;
- New pipeworks, fittings and valves;
- Control and instrumentation equipment;
- Additional power supply equipment;
- Installation, testing, trial run, commissioning.

The total investment cost for the equipment is estimated at 960.000 €, while trial run and six-moth staff training would cost some 120.000 €. The summary of the investment cost is shown hereunder:

- Construction works - 590.000 €
- Equipment - 960.000 €
- Trial run and training - 120.000 €
- Total - 1.670.000 €

Additional operational costs as a consequence of this plant extension include the following:

- Power consumption of the mixer in the de-nitrification basin;

- Additional power consumption related to operation of the recirculation of water and sludge from the aeration basin in the de-nitrification basin;
- Preparation and dozing of $FeCl_3$.

The total installed electrical power of the additional equipment (taking into account operational pumps only, without stand-by pumps) is over 100 kW.

Additional power consumption is estimated at around 600.000 kWh annually. A reduction of power generation from bio-gas can be expected, as well. Anticipated annual consumption of $FeCl_3$ is 350 t/year (in a form of 41% solution). Therefore, the additional operational (running) costs can be presented as follows:

- FeCl3 - 350 t x 160 €/t = 56,000 €/annum
- Power consumption - 600,000 kWh x 0.05 €/kWh = 30,000 €/annum
- **Total costs - 86,000 €/annum**

3.2.3.6 Preliminary investment and O&M costs and summary of the discounted cash-flow analysis

In accordance with references 1.1 to 1.7, the following tables provide an overview of the calculated investment and O&M costs per analysed option (alternative). It should be noted that presented investment costs cover the CWWTP facilities as required to comply with the first stage design criteria (BOD5, COD, SS) while a full de-nitrification (to be introduced in the next stage of the CWWTP construction) has not been considered in the analysis of alternatives.

Table 3-35 Investment costs for the CWWTP alternatives (€)

Description of works	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Project design, investigations	490.000	490.000	490.000	790.000
Construction works	5.544.725	5.768.975	4.991.575	4 797.225
Equipment	5.982.410	6.050 560	5.457.020	9.589.500
Additional land acquisition	20.000	20.000	0	0
Trial run and 12-month operation with staff training	300.000	300.000	300.000	300.000
Total	**12.337.135**	**12.629.535**	**11.238.595**	**15.476.725**
Plant design capacity – organic loading (PE)	125.000	125.000	125.000	125.000
Plant design capacity – hydraulic loading (m^3/day)	29.062	29.062	29.062	29.062
Unit investment costs (€/PE)	**98,2**	**101,0**	**89,9**	**123,8**
Unit investment costs (€/m^3/day)	**422,3**	**434,6**	**386,7**	**532,5**

The lowest investment costs are for the option 3 (SBR technology) and the highest for option 4 (MBR technology). Option 1 (Conventional activated sludge) is more expensive than option 3.

The following table indicates required plot size for each of the options considered. Alternatives 1 and 2 require additional land acquisition of app. 1,1 ha, but given the estimated costs for the land acquisition and availability of the land at the location, required plot size is not a very significant parameter in the analysis/selection of the alternatives.

Table 3-36 Required plot size per CWWTP alternatives (ha)

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Total plot size required	3,4	3,4	2,3	2,3

A breakdown of the O&M costs for the considered CWWTP alternatives is presented in the following table.

Table 3-37 Direct O&M costs for the CWWTP alternatives (€/year)

Description	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Number of staff	12	12	8	8
Annual labour costs	129.600	129.600	100.800	100.800
Annual power consumption (kWh)	3.373.330	3.465.310	5.276.075	4.853.989
Electricity tariff (€/kWh)	0,05	0,05	0,05	0,05
Annual power supply costs (€/year)	168.667	173.266	263.804	242.699
Annual power production from bio-gas (kWh/year)	1.445.400	1.445.400	0	0
Reduction of energy costs due to electricity generation (€/year)	72.270	72.270	0	0
Costs for chemicals for sludge treatment – polyelectrolyte (€/year)	56.119	56.119	56.119	56.119
Annual maintenance of structures (€/year)	27.896	28.845	24.958	23.986
Equipment annual maintenance (€/year)	176.502	181.517	163.711	287.685
Annual costs for sludge and grit transportation and disposal (€/year) (EUR/year)	55.480	55.480	55.480	55.480
Total operational costs	**541.994**	**552.556**	**664.871**	**766.769**
Plant design capacity (PE)	125.000	125.000	125.000	125.000
Assumed annual volume of treated wastewater (m^3/year)	8.661.500	8.661.500	8.661.500	8.661.500
Unit operational costs – €/m^3 of treated wastewater	**0,063**	**0,064**	**0,077**	**0,089**
Unit operational costs €/PE	**4,34**	**4,42**	**5,32**	**6,13**

As indicated, direct O&M costs are the lowest for the alternative 1 and by far the highest for the alternative 4.

The following table shows a summary of the discounted cash-flow analysis for all of the considered alternatives.

Table 3-38 An overview of discounted cash flow analysis for the considered alternatives – source: Pre-feasibility study

Discount rate = 6%		Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Year	Wastewater volume (m^3)	Investment	Replacement	Operational costs	Investment	Replacement	Operational costs	Investment	Replacement	Operational costs	Investment	Replacement	Operational costs
1	0	12,272,635	-		12,629,535	-		11,238,595	-		15,176,725	-	
2	0	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
3	4330725	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
4	4590568	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
5	7795305	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
6	8401606	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
7	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
8	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
9	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
10	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
11	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
12	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
13	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
14	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
15	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
16	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
17	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
18	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769

Discount rate = 6%		Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Year	Wastewater volume (m^3)	Investment	Replacement	Operational costs	Investment	Replacement	Operational costs	Investment	Replacement	Operational costs	Investment	Replacement	Operational costs
19	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
20	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
21	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
22	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
23	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
24	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
25	8661450	-	3,452,800	541,994	-	3,555,600	552,557	-	5,457,020	664,871	-	9,589,500	766,769
26	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
27	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
28	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
29	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
30	8661450	-	-	541,994	-	-	552,557	-	-	664,871	-	-	766,769
	95,652,465	11,577,958	804,498	7,366,095	11,914,656	828,450	7,509,644	10,602,448	1,271,478	9,036,083	14,317,665	2,234,340	10,420,945
Cost structure													
(€/m^3)		0.12	0.01	0.08	0.12	0.01	0.08	0.11	0.01	0.09	0.15	0.02	0.11
Share (%)		58.6%	4.1%	37.3%	58.8%	4.1%	37.1%	50.7%	6.1%	43.2%	53.1%	8.3%	38.6%
Total costs													
(€/m^3)				**0.206**			**0.212**			**0.219**			**0.282**

From the above tables, the following major conclusions can be drawn:

- The analysis has been carried out assuming almost uniform wastewater generation during the project lifetime, which may represent a deviation of the real-time system behaviour;
- Calculated unit costs for wastewater treatment (costs that provide full cost recovery) indicate that the lowest costs are achieved if alternative 1 is adopted;
- However, the differences in calculated total unit costs for wastewater treatment are within the range of 10%, which is less than the contingency margin (10-15%) anticipated in the general project design;
- Therefore, based on the financial/least cost analysis only, it is not recommended to draw straightforward recommendation regarding the optimum alternative selection. Other considerations (technical, operational, etc.) must be taken into account, as well;
- It is further recommended to adopt a concept for tendering the works that would allow more than one technical-technological concept to be submitted in order not to restrict the tender competitiveness. This should lead to the overall optimum proposal, considering technical, economical and financial criteria. The tender should be preferably prepared in accordance with the FIDIC “Yellow book” – guidelines, i.e. on a so called turn-key basis.

3.2.3.7 Preferred option

The following criteria have been used for preliminary selection of the preferred option:

- Total costs;
- O&M costs;
- Possibility of phased plant construction;
- Treatment efficiency in compliance with discharge standards;
- Reliability of operation.

In all of the considered alternatives primary-mechanical treatment has got similar characteristics, and includes the following:

- Coarse screen;
- Raw water pumping station;
- Fine screen;
- Aerated grit chamber with fat removal;

Appurtenant equipment for storing and treatment of collected impurities.

The alternatives proposed differ on the remaining components of the water and sludge line.

Alternative 1 represents a conventional plant with activated sludge and anaerobic sludge stabilization. This is treatment technology well proven in practice as being efficient and it has been applied for decades for wastewater treatment plants of similar magnitude and characteristics. With regard to investment costs, this alternative is ranked as second out of four. The advantages of this alternative can be summarized as follows:

- Possibility of power generation/recovery from sludge;
- The lowest operational costs;
- In accordance with the criteria of unit cost of treated water this alternative is the best or second best.

The disadvantages of the alternative 1 include the following:
- Large plot size (given the circumstances not very relevant);
- Complex plant with a high number of structures and appurtenant equipment.

Alternative 2 includes a plant with two-staged activated sludge (AB process) and anaerobic sludge stabilization. This treatment technology has been applied in several major WWTP's (several hundred thousand PE), and appeared to be efficient. The advantages of this alternative include the following:
- Possibility of power generation/recovery from sludge;
- Reasonably low operational costs;
- In accordance with the cost criteria of m3 of treated water this alternative is ranked as second or third.

The disadvantages related to alternative 2 are as follows:
- Large plot size (given the circumstances not very relevant);
- Complex plant with a high number of structures and appurtenant equipment.

Alternative 3 involves an advanced SBR technology (reactor with continuous inflow) and aerobic sludge stabilization. This process technology has been applied mainly for smaller WWTP's of up to 50.000 PE capacity. However, through development of equipment and instrumentation this technology has been improved lately, it became possible to apply this process even for large WWTP's (Dublin, Ireland, Q_{av}=6m^3/s).

The advantages of this option include:
- Compact plant, relatively small plot size required;
- The lowest investment cost;
- Ranked as first or second in terms of cost of m3 of treated wastewater.

The disadvantages are the following:
- Complex equipment and control and instrumentation;
- Plant does not use sludge for power generation.

Alternative 4 comprises activated sludge and ultra-filtration membranes. This technology is fairly new in wastewater treatment and it has been applied for only about 10 years.

The advantages of this option include:
- The most compact plant of proposed alternatives;
- The lowest required hydraulic head at plant inlet;
- The best effluent quality compared to other options considered.

The disadvantages are summarized as follows:
- High operational costs, primarily because of power consumption;
- Long-term reliability, durability and efficiency of membranes may be questionable;
- Plant does not use sludge for power generation.

Taking into account the abovementioned considerations, total investment costs, operational costs and reliability of proposed treatment technology, alternative 1 (conventional plant with activated sludge and anaerobic sludge treatment) has been recommended for further elaboration (in more detail design documentation – preliminary project design) and implementation.

The abovementioned preferred alternative is shown on the enclosed drawings: CWWTP plot indicating the existing facilities, process flow diagram, CWWTP general layout and hydraulic profile (figures 3-7 till 3-10).

Figure 3-7 Cadastral map of the future CWWTP location

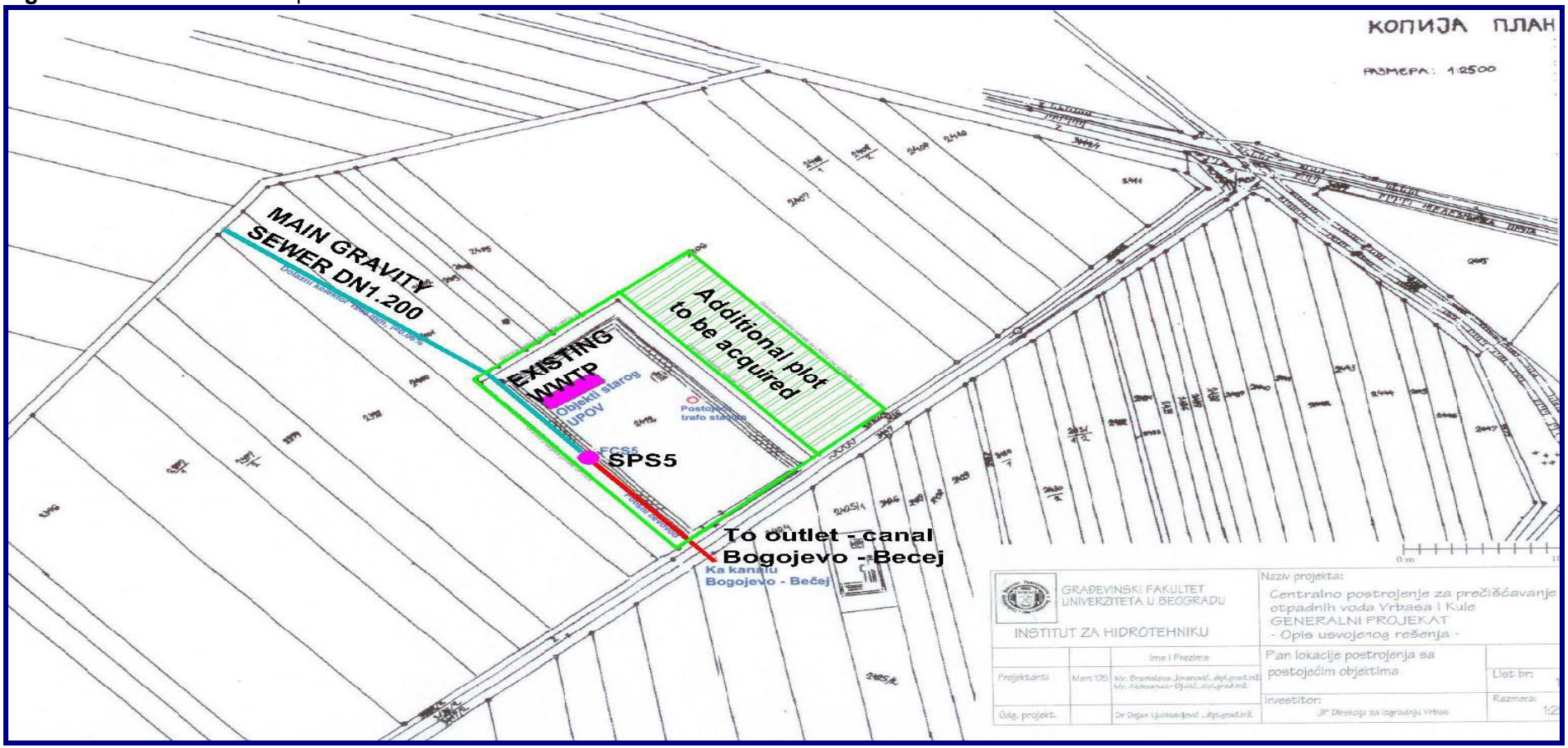


Figure 3-8 Preferred option: CWWTP Process Flow Diagram

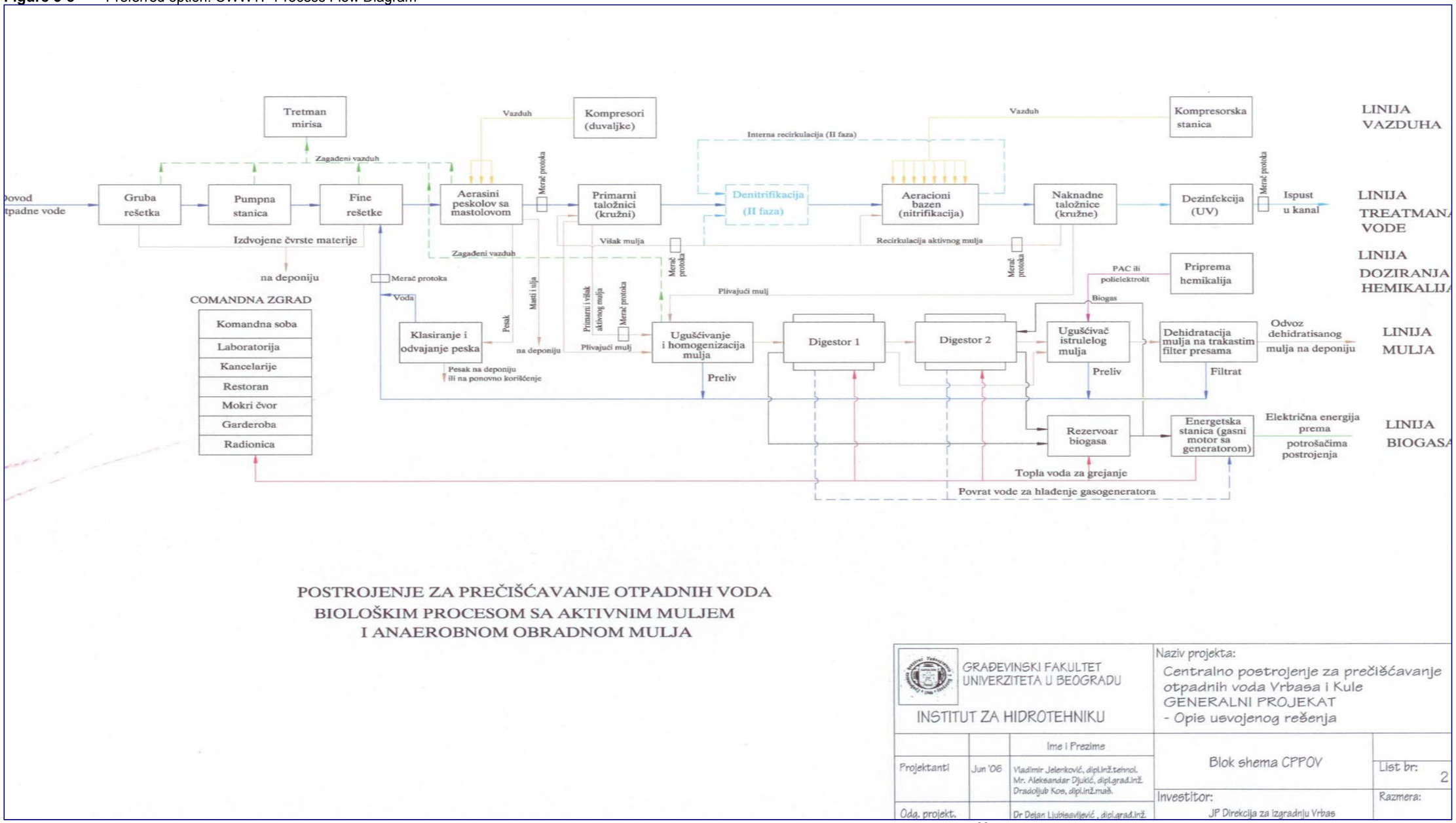


Figure 3-9 Preferred option: CWWTP Layout

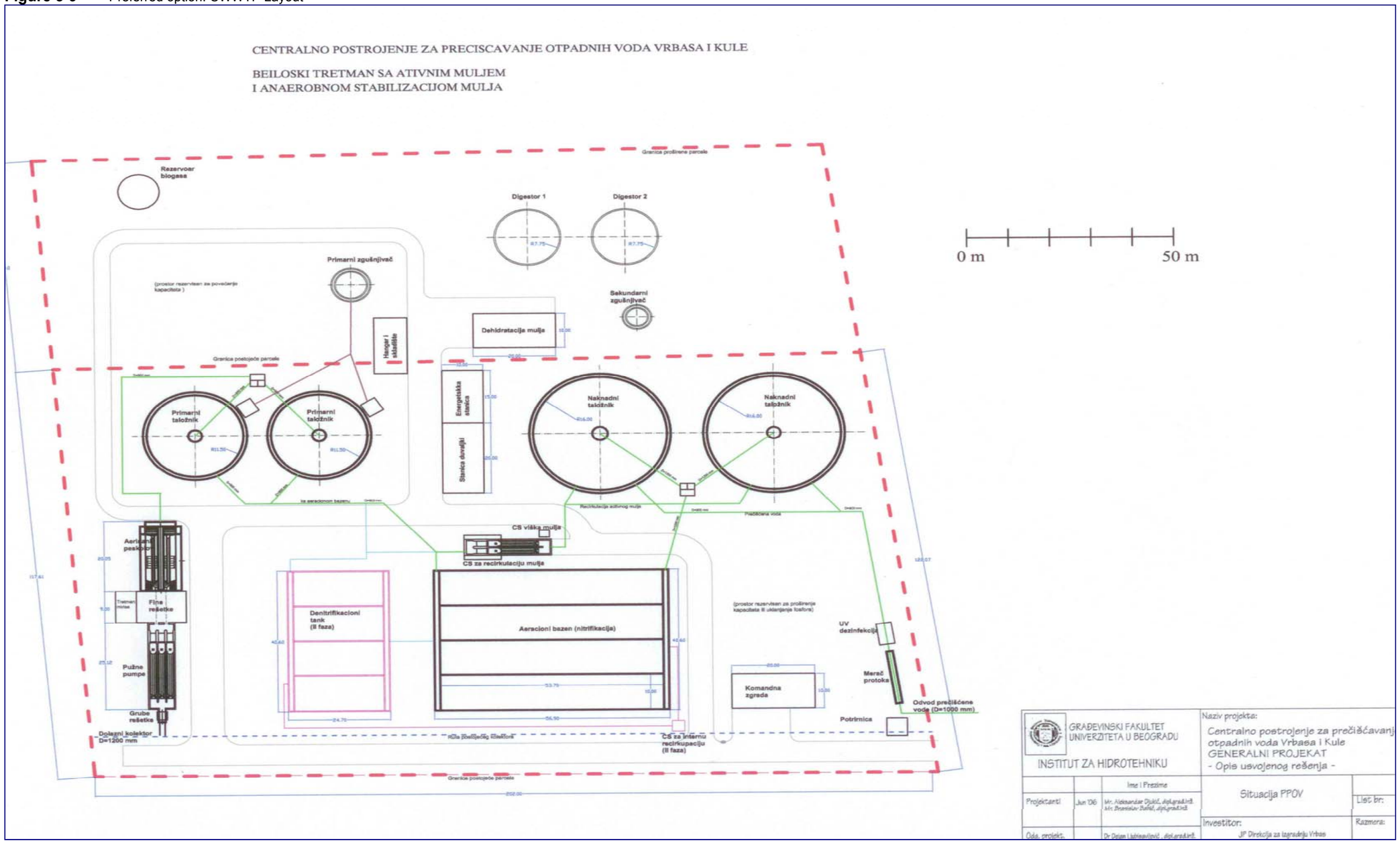
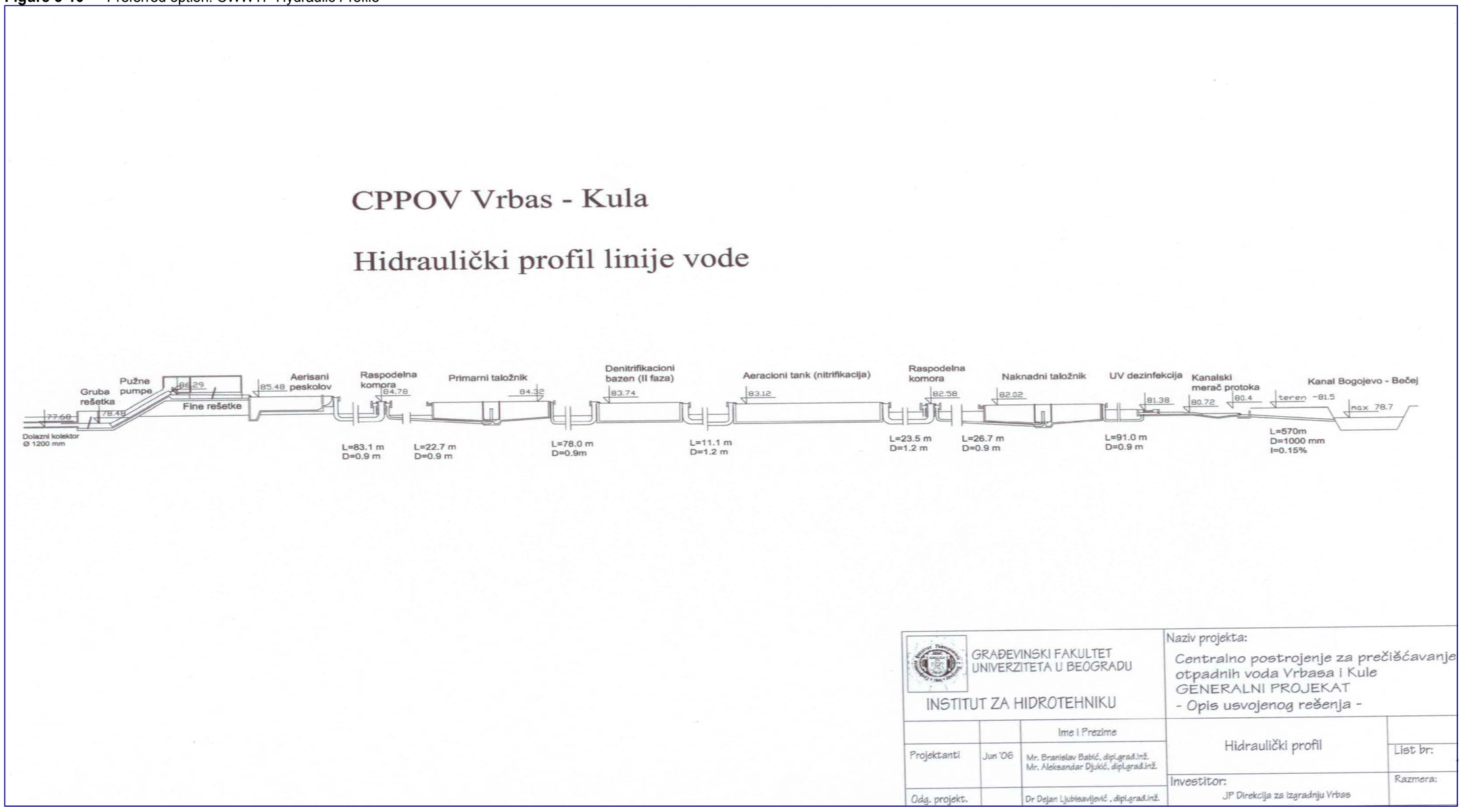


Figure 3-10 Preferred option: CWWTP Hydraulic Profile



3.2.4 Project components

An overview of the project components, as agreed with the representatives of the municipality of Vrbas, includes the following major components:

- Construction of the CWWTP in Vrbas, in accordance with the specified required design parameters (references 1.11 and 1.12), with additional capacity, as required to treat communal wastewater from the extended project area (additional five villages in Vrbas municipality);
- Completion of the main gravity sewer Kula – Vrbas with appurtenant sewage pumping stations in order to be able to connect users in Kula to the sewerage system, and ultimately to the CWWTP;
- Construction of sewerage collection system in five villages in Vrbas municipality with appurtenant sewage pumping stations and transmission mains (gravity, pressure) between settlements and towards the CWWTP.

The abovementioned components are shown in the enclosed General Layout Map, and a detailed breakdown of components is set out later in the report.

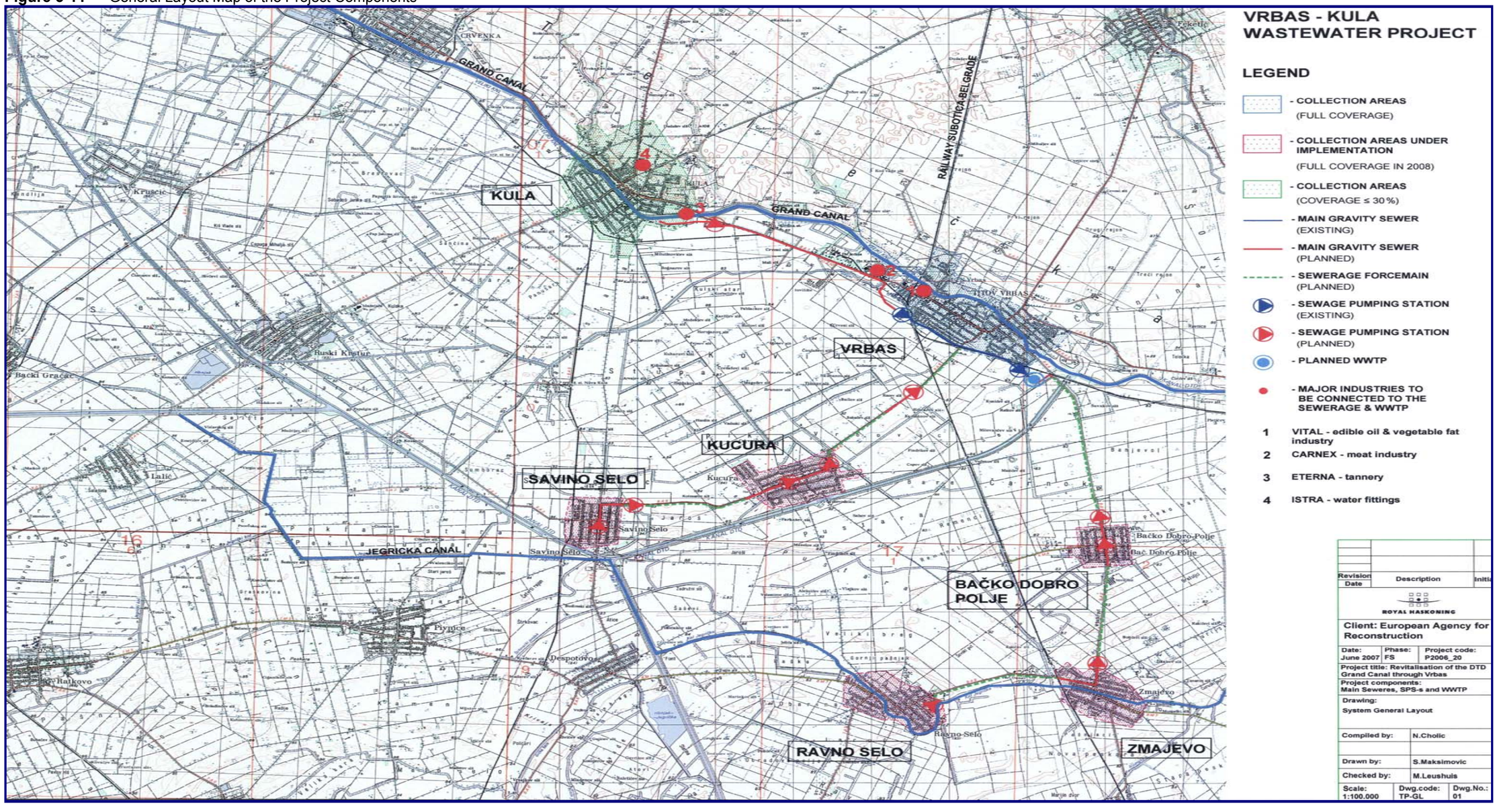
One of the main project components considered in the project feasibility documentation is the CWWTP. The CWWTP is assumed to have three distinct project phases, each with defined technology and associated investment and O&M costs.

- CWWTP phase 1: In terms of effluent quality: to suit phase I requirements in accordance with the design conditions (Annexes 3.3 and 3.4); In terms of capacity to cater for two thirds of the ultimate design capacity. This phase of the CWWTP should cater for the existing and future users of the system in Vrbas municipality; population and small industries in urban areas, population in villages and major industries.
- CWWTP phase 2: Treatment still in accordance with the phase 1 requirements, but the capacity of the CWWTP shall be extended to cater for planned connection of users in Kula municipality; population and industries. Planned capacity of this CWWTP phase is one third of the total design capacity. It is important to note that the basic prerequisites for implementation of this project phase include substantial extension of the sewerage collection network in Kula and finalization of the main sewer Kula - Vrbas.
- CWWTP phase 3: Implies introduction of nutrients removal for the total design capacity of the CWWTP, as defined as “stage 2” in the design conditions (Annexes 3.3 and 3.4).

The project is therefore directly affected by the completion of the construction of the main gravity sewer Vrbas - Kula, recently confirmed plans of the Municipality of Vrbas to connect five villages to the CCWTP, and finally by further extension of the sewerage collection system in the town of Kula.

An important remark is made regarding the existing and technically deteriorated wastewater treatment plant of Vrbas. The feasibility study currently does not consider rehabilitation and (partial) reuse of this existing wastewater treatment plant.

Figure 3-11 General Layout Map of the Project Components



3.2.5 Assessment of design

This section presents an assessment of the existing technical documentation on the CWWTP Vrbas; General Project Design and Pre-feasibility Study (references 1.1 – 1.7).

Design capacities and loads

Proposed construction of the CWWTP is to treat communal and pre-treated industrial wastewater from Vrbas and Kula is a very important segment in integrated regional efforts to reduce pollution of the DTD canal network.

The existing design of the CWWTP foresees two identical wastewater treatment lines. Dimensioning of the treatment units is based on thorough analysis of the design capacities and loads. These loading are based on standard domestic loads and previously assessed industrial loads. The design capacity and loadings of the plant are directly influenced by the ongoing consolidation and control of wastewater discharges from the local industries. Recommended consolidation and control of quantities and qualities of industrial wastewater discharges are apparently being addressed in practice. According to the information received from PUC Standard and Municipality of Vrbas the meat industry Carnex is currently engaged in reducing their wastewater discharges.

In the abovementioned technical documentation it was presumed that the industries of Vrbas shall fully comply with the Decision on sanitary and technical conditions on wastewater discharges in public sewerage passed by the municipal assembly of Vrbas (Annex 3.5).

The industries in Kula currently (June 2007) are either working with reduced operational capacity, or are closed altogether. However, it is still assumed that in the future the industrial polluters in Kula shall resume their full operational capacity and would direct their pre-treated wastewaters to the CWWTP. Since a recovery or re-structuring of these industries can not be predicted or planned precisely, it is recommended to relate construction of the second stage of the CWWTP (remaining third of the CWWTP capacity) to connecting the population and industries of Kula to the inter-municipal sewerage system.

Based on the findings of the documentation (references 1.8 – 1.10) the PUC Standard and the local authorities have announced their plans to connect the following five villages in the vicinity of Vrbas to the CWWTP: Savino Selo, Kucura, Ravno Selo, Zmajevo and Bačko Dobro Polje. These villages have circa 4.000-5.000 inhabitants each and communal wastewaters are normally discharged into individual septic tanks which represent serious sanitary, health and environmental hazard.

In order to connect these villages to the CWWTP two transmission mains will have to be constructed: a so called Southern transmission main and Western transmission main, including corresponding lifting pumping stations. In total 113.080 m of sewer pipelines will have to be constructed, 83.220 m of local sewers and 29.860 m of transmission mains to transport wastewater from the villages to the CWWTP. Twenty two (22) pumping stations are planned to carry out this task. The municipality and the PUC have already prepared a tender for related construction activities. The connection of these villages to the CWWTP would contribute with an average hydraulic loading of circa 3.450 m3/day (additional some 21.000 to 23.000 PE) and the maximum daily hydraulic loading of 5.175 m3/day. This implies that the total capacity of the CWWTP would

amount to app. 145.000 PE, compared to app. 125.000 PE as defined in the General Project Design and Pre-feasibility study.

The projected hydraulic load of the CWWTP considers a significant reserve capacity for unplanned users (5-6% of the total plant hydraulic load). The hydraulic design also considers a significant amount of infiltration water (circa 15-20% of total wastewater flows). This implies that the CWWTP will have a significant reserve capacity at the beginning of its operation, as well as to cope with unpredicted developments. It was assumed that infiltrated water does not contribute to the pollution load of the plant.

The design hydraulic load of the CWWTP must therefore take into account wastewaters from the town of Kula and Vrbas, plus five villages in the municipality of Vrbas. Consolidation and control of the industrial wastewater discharges in both municipalities remain a priority and should be monitored/verified. Information and committed planning for local sewerage extension should be provided by the PUC in Kula. Finally, the developments related to the financing and construction of the connecting sewer between Kula and Vrbas and between the five villages and the CWWTP should be monitored and verified. This will enable and justify implementation schedule for the CWWTP in terms of capacity.

To summarise, the actual pollution load and hydraulic load of the CWWTP will eventually depend on the development and dynamics of the construction of accompanying structures, including:

- Local and regional sewer system connecting the five villages to the CWWTP,
- Main gravity sewer between Vrbas and Kula,
- Extension of the sewerage network in Kula beyond the current 30% coverage.

Process technology

The considered technical solutions for achieving the required removal efficiency is in compliance with the adopted local and EU regulation and includes a wide range of conventional (activated sludge, SBR technology) and state of the art technologies (MBR technology). The process schemes are technically sustainable and include necessary pre-treatment and post treatment, thus guaranteeing compliance with the stated norms and requirements. Both water and sludge processing is considered, minimizing the impact on the environment in line with local and EU regulations. Electricity and heat generation from sludge processing is a valuable by-product of the treatment, in line with modern practice worldwide.

The considered design parameters for the separate process units (primary and secondary water treatment and sludge treatment) are in line and within minimum to maximum ranges applicable for the specific technologies in practice. In this respect and based on the projected water quantities and quality, it may be concluded that all considered technologies can achieve the required water quality. Issues such as total costs, costs for O&M, flexibility to phasing of the construction of the plant and reliability of operation/robustness have rightfully been used for the final choice of process technology.

The chosen conventional activated sludge and anaerobic sludge digestion technological scheme can be considered as technically appropriate/sustainable and economically feasible for the given circumstances.

3.2.6 Project implementation schedule

A preliminary project implementation schedule is presented in the chapter 8.

3.2.7 Adjusted project budget

The costs of the proposed adjustments regarding the capacity loading and phasing of the CWWTP have been analysed. The results of the analyses are presented in the following table.

Table 3-39 Overview of adjusted cost estimates of the CWWTP

Item #	Description	Phase I (€) 2008-2010	Phase II (€) 2012	Phase III (€) 2022	Total (€)
1	Investigation works & design	490,000	0	0	490,000
2	Construction works	4,378,700	1,250,000	684,400	6,313,100
3	Electro-mechanical equipment	5,312,290	1,268,430	1,193,600	7,774,320
4	Additional land acquisition (1,5 ha)	20,000	0	0	20,000
5	Trial run, staff training, operation over 12 moths & construction supervision	300,000	0	120,000	420,000
6	Contingencies WWTP	1,130,034	300,543	214,020	1,644,597
	Subtotal WWTP	**11,631,024**	**2,818,973**	**2,212,020**	**16,662,017**
7	Vrbas main sewers	450,000	0	0	450,000
8	Vrbas villages sewerage extension	11,198,750	0	0	11,198,750
9	Kula main sewers	0	2,350,000	0	2,350,000
	Subtotal investments costs	**23,279,774**	**5,168,973**	**2,212,020**	**30,660,767**
10	Supervision excluding VAT	1,487,319	343,018	167,362	1,997,699
11	VAT	416,958	992,158	428,289	1,837,405
	GROSS TOTAL	**25,184,051**	**6,504,149**	**2,807,670**	**34,495,871**

VAT for phase I is based on estimated share of grant co-funding, which is exempted from VAT. In subsequent phases, the currently applicable VAT rate of 18% is applied.

3.2.8 Alternative incorporation of the existing WWTP Vrbas

At the site of the future CWWTP an old and dysfunctional wastewater treatment plant exists. According to the technical project presented in the General Project Design and Pre-feasibility Study (references 1.1 to1.7), this plant would have to be demolished to provide space for the new plant facilities.

The old plant was built and taken into operation in 1972. It included the following components:

- mechanical screening;
- lifting pumping station (Q = 70 l/s);
- aeration basin (V = 450 m^3, H = 3,4 m);
- sedimentation basins (V = 300 m^3, H = 3,2m);
- stabilisation basin (V = 450 m^3, H = 3,4m);
- thickener (V = 300 m^3, H = 3,2m);
- sludge drying fields – A = 1.280 m^2.

Basic layout of the existing WWTP facilities is shown in the figures below.

Figure 3-12 WWTP Vrbas - Existing structures

Figure 3-13 WWTP Vrbas - Existing structures

The installation hydraulic capacity is Q=253 m^3/h (70 l/s) and the design organic loading is 810 kg BOD5/day or 13.500 PE.

Based on visual inspection and expert judgment the structures of the plant can be rehabilitated and used for wastewater treatment in the future. It is thus recommended to reassess in more detail the plant capacity and possibilities/costs of rehabilitation/extension in light of its possible utilisation for achieving required discharge water quality.

It may be technically sustainable and economically feasible to consider a rehabilitation (as well as an extension) of the plant and incorporating it into the new CWWTP. It is very likely that the existing concrete structures can be reused with minor adjustments. The mechanical and electronic equipment will have to be replaced. It is also likely that the process will have to be extended with additional treatment steps, e.g. screening of coarse floating materials, sand, grit, oil and fat removal, etc. in order to achieve the pursued local and EU standards.

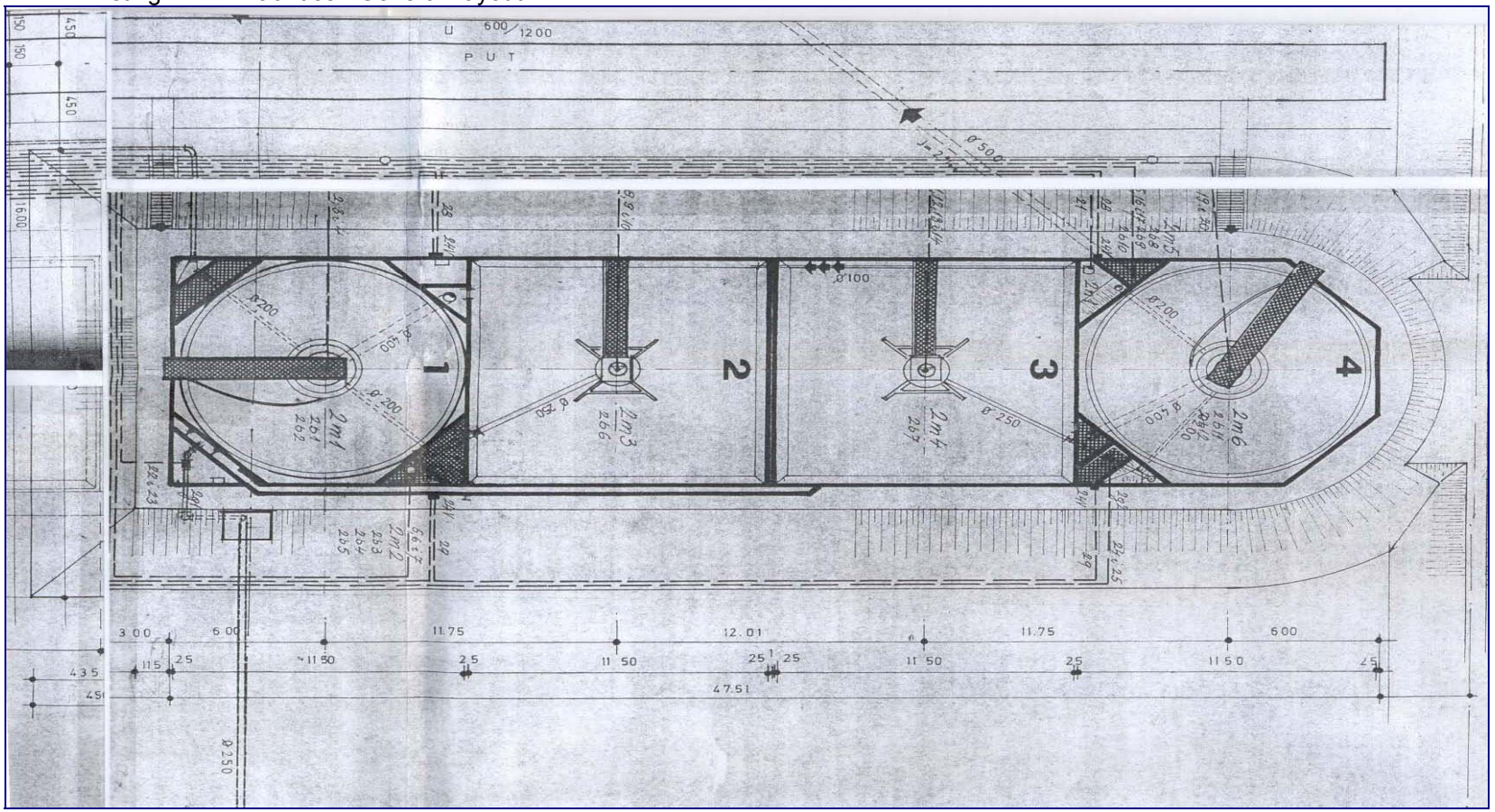
The adjustment/extension of the existing process scheme with new treatment steps requires further analysis and depends on the chosen treatment concept/approach. Incorporation of advanced wastewater treatment technology within the rehabilitated process scheme, e.g. MBR (Membrane Bio- Reactor) technology, may significantly increase the capacity of the plant from its design capacity of 13.500 PE to full coverage of the above implied CWWTP capacity shortage (23.000 PE).

The investment and O&M costs of the rehabilitated/upgraded/extended treatment plant will also have to be calculated and specified. The inclusion of these costs in the overall financial analysis will enable more accurate cost price and tariff determination. Besides cost benefits regarding additional capacity, this would also imply that the plant would not have to be demolished as currently planned. The planned demolition costs could rather be used for its (partial) rehabilitation. If feasible the following activities related to the old WWTP may have to be implemented per phase:

Phase I:
Rehabilitation of civil engineering structures and conservation of the old wastewater treatment plant of Vrbas: to be completed by the end of 2008;

Phase II:
Rehabilitation/extension/upgrade of the old wastewater treatment plant of Vrbas to a capacity of circa 23.000 PE: to be completed by the end of 2011.

Figure 3-14 Existing WWTP facilities - General Layout



3.2.9 Alternative with construction of Kula – Vrbas main gravity sewer in Phase I

As described elsewhere in this study, it has been proposed to technically, financially and environmentally concentrate on actual, active users and polluters of the Grand Canal, in order to achieve maximum pollution reduction, with funds to be invested in the project implementation in Phase I.

Therefore, it was recommended to actually fully support ongoing and planned construction of the sewerage collection system (including collection network, sewers, pressure mains, pumping stations) in the municipality of Vrbas. These works would enable almost full service coverage in Vrbas and neighbouring villages, and would also enable connection to the sewerage system (and thereafter to the future WWTP) critical industrial polluters. Clearly, this scope of the project implementation in the first phase was seen as the technical, financial and environmental optimum.

On the other hand, after acknowledging status of the sewerage system and industrial polluters in the upstream municipality of Kula (very low population connection rate, major industrial polluter not operational with uncertain prospects of re-activation), it was recommended to postpone construction of the main sewer to Kula and corresponding capacity of the WWTP, until the current status substantially changes.

However, at the presentation of the Feasibility Study in Vrbas, it was strongly advocated by the municipal authorities of Vrbas to include construction of the main gravity sewer from Kula to Vrbas in the first phase of the project implementation.

Justification of this proposal presented by the municipality of Vrbas included:

- To provide a pre-requisite for future connection to the sewerage system and to the WWTP population and industries of Kula
- To actually trigger development of the sewerage collection services in Kula
- To potentially prevent any potential upstream pollution of the Grand Canal, if the industrial polluters in Kula become active again.
- To enhance inter/municipal environmental action aimed at reduction of pollution of the Grand Canal.

Although current situation does not justify this approach, this option has been incorporated in the Feasibility Study, just in order to potentially allow construction of the abovementioned element (main gravity sewer Kula - Vrbas), but only provided that financing has been previously secured for all project components already included in this study for the first phase implementation.

Furthermore, the proposed construction of the main gravity sewer from Kula to Vrbas must be also considered in terms of planned phasing of the WWTP. Construction of this main gravity sewer can be justified only in case additional users from Kula are connected. However, if additional users in Kula are connected to the main gravity sewer, and hence diverted to the WWTP, it would affect planned staging of the WWTP.

It has been estimated that currently around 6.000 inhabitants in Kula are connected to the sewerage system. If that additional loading is transferred to the future WWTP (6.000 PE), and in accordance with the demand projection, full capacity of the WWTP would be reached as soon as 2011 – 2012.

That further means that the proposed construction of the main gravity sewer Kula – Vrbas can serve only current users of the sewerage system in Kula, and within very limited period. No further discharges in Kula (either industrial or population) can be allowed, unless the WWTP is extended to its full, final capacity.

This actually demonstrates great potential risks of the proposed main gravity sewer construction, which may impair normal functioning and planned phasing of the WWTP.

4 ENVIRONMENTAL ANALYSIS

4.1 Introduction & scope of EIA

The review of the environmental and social aspects of this project is set against the following requirements, to be found in the following documents:

- Environmental Integration Handbook for EC Development Co-operation, EuropeAid, December 2006
- Local legislation, Law on Environmental Impact Assessment (2004)

An EIA was carried out by the Faculty of Technical Sciences, University of Novi Sad, dated April 2007 (in further text EIA 2007). At the site of the planned WWTP there is already an old non-functional WWTP.

Scope of EIA in relation to project feasibility study
The EIA covers the WWTP but not the sewage connections. In the EIA the WWTP is referred to as the central WWTP for Vrbas and Kula. However, at present phase I of the project is planned for Vrbas and for five surrounding villages. At a later stage it is optional for Kula to join and be connected to the planned WWTP. Although in the EIA Kula is mentioned in all the sections it does not affect the EIA aspects of the WWTP whether Kula will join or not. It is therefore not a major issue for the analysis of the EIA of the WWTP. It is being proposed to phase the construction of the WWTP in three phases (see chapter three).

This EIA needs to be carried out in order to get a construction permit by Serbian law. As the planned WWTP will serve about 145.000 population equivalent, it is not necessary to carry out an EIA according to the EU regulations (EIA needed if > 150.000 population equivalent). However, it is close to the limit and therefore a check has also been made for the compliance with the EU requirements.

Chapter Lay-out
A brief explanation is given of the main environmental requirements set by the Serbian government and the EU. An initial check is made on completeness of the issues that should be dealt with, followed by a more detailed check on the content of the EIA. This deals with the standard environmental issues during construction and operation of the WWTP. Some separate issues are dealt with in separate paragraphs. The final paragraph describes the main issues which have to be carried out as soon as possible and some issues to be taken up during tendering of the construction works.

4.2 EIA Procedure

4.2.1 Serbian requirements

According to Serbian legislation, an Environmental Impact Assessment has to be conducted and approved in order to obtain a construction permit. The Law on Environmental Impact Assessment (Official Gazette of the Republic of Serbia 135/2004) gives requirements for such an EIA. This law on EIA has been developed to be compatible with EU Directives.

EIA scope and contents

According to articles 12 – 15 of the Serbian Law on EIA, the Competent Authority decides on the required scope and contents of an EIA study. Article 17 of the Law lists the following data:

1. The data on project developer;
2. The description of the planned project developer;
3. The description of the project;
4. The outline of the main alternatives studied by the project developer;
5. The outline of the environmental status at the site and its close vicinity (micro location and macro-location);
6. The description of likely significant effects of the project on the environment;
7. The environmental impact assessment in case of accidents;
8. The description of measures envisaged to prevent, reduce and, if possible eliminate any significant adverse effects on the environment;
9. The monitoring programme for impact on the environment;
10. The short non-technical summary of data listed in points 2) to 9);
11. The data on technical shortcomings, absence of the appropriate expertise and skills or, impossibility of obtaining the appropriate data.

Public consultation

Article 14 of the Law on EIA requires public announcement of the decision by the Competent Authority on the scope. Article 20 and 21 describe the public consultation procedures to be followed on the results of the EIA.

4.2.2 Requirements set by EU

According to the Environmental Integration Handbook, an EIA is necessary if the wastewater treatment site is of large scale (i.e. >150,000 population equivalent) or if it effects a particular vulnerability of the recipient environment or an existing SEA report advices it. This project is not of large scale (< 150,000 population equivalent).

The standard format for an EIA report is as follows:

1. Executive summary
2. Background
   a. Project justification and purpose
   b. Project location
   c. Project description and associated activities
   d. Alternatives
   e. Environmental policy, legislation and institutional framework
3. Approach and Methodology
   a. General approach
   b. Geographical or mapping units
   c. Environmental quality indicators
   d. Assumptions, uncertainties and constraints
4. Environmental baseline study
5. Impact identification and evaluation
6. Mitigation/optimization measures and residual impacts
7. Recommendations
8. Conclusions
9. Technical appendices
10. Other appendices

4.2.3 Status of the EIA

In line with requirements by Serbian Law, the EIA 2007 is being reviewed by the Serbian competent authority (Provincial Secretary for Environmental Protection, Technical Committee).

4.3 Gap Analysis on completeness of EIA

In the Table below a review is given of which parts are dealt with in the EIA. It does not give a judgment on whether it is sufficiently described.

Table 4-1 Summary of Serbian Legislation

	Requirement	**EIA 2007**
1	The data on project developer;	√
2	The description of the planned project developer;	√
3	The description of the project;	√
4	The outline of the main alternatives studied by the project developer	√
5	The outline of the environmental status at the site and its close vicinity (micro location and macro-location);	√
6	The description of likely significant effects of the project on the environment;	√
7	The environmental impact assessment in cases of accidents;	√
8	The description of measures envisaged to prevent, reduce and, if possible eliminate any significant adverse effects on the environment;	√
9	The programme of monitoring of impact on the environment;	√
10	The short non-technical summary of data listed in points 2) to 9);	√
11	The data on technical shortcomings, absence of the appropriate expertise and skills or, impossibility of obtaining the appropriate data.	No

Table 4-2 Summary review of EU requirements

	Requirement	**EIA 2007**
1	Executive summary	√
2	Background	√
2a	Project justification and purpose	√
2b	Project location	√
2c	Project description and associated activities	√
2d	Alternatives	√
2e	Environmental policy, legislation and institutional framework	√
3	Approach and Methodology	
3a	General approach	√
3b	Geographical or mapping units	√
3c	Environmental quality indicators	√
3d	Assumptions, uncertainties and constraints	√
4	Environmental baseline study	√
5	Impact identification and evaluation	√
6	Mitigation/optimization measures and residual impacts	√
7	Recommendations	√
8	Conclusions	√
9	Technical appendices	√
10	Other appendices	**?**

4.4 Gap analysis on content of EIA (impact & mitigation measures)

In the tables below an overview is given on the content of the EIA. It focuses on the possible impacts and mitigation measures proposed. Within the column 'evaluation' it is indicated whether the item is dealt with sufficiently or whether additional information is needed.

Table 4.3 illustrate the issues relevant during construction phase and Table 4.4 for the operational phase of the project. Figure 4.1 gives an illustration of the main environmental issues during normal operations of the WWTP

Figure 4-1 Illustration of main environmental issues during operational phase

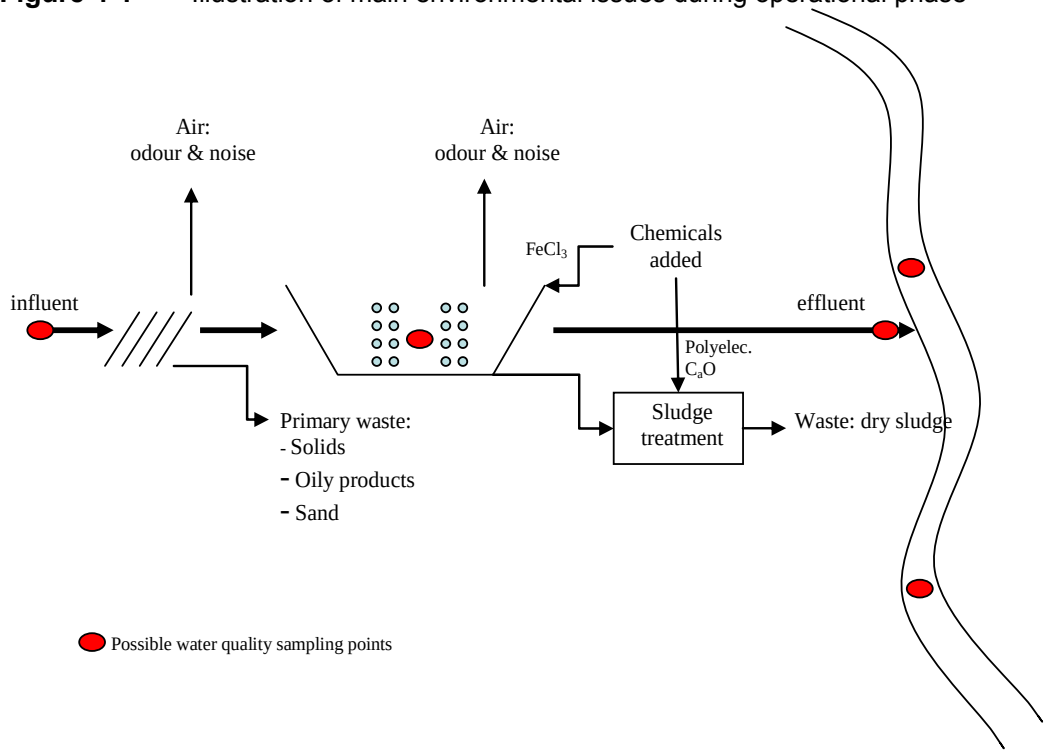


Table 4-3 Main environmental issues and mitigation measures for construction phase

Type	Description of impact related to activity	Evaluation	Mitigation measures proposed
Physical environment			
Air pollution	Caused by • Release of aerosols and unpleasant odours, especially during dry and hot spells caused by construction works.	**no gap in EIA**	• During the construction phase it is not necessary to take any measures with respect to odour as this is expected not to occur.
Noise pollution	Caused by • Construction machinery; this may cause noise levels at short time periods which might exceed the allowed levels, however due to the timeframe of the works and the distance to the town it is neglect able.	**no gap in EIA**	• Good maintenance and check up on vehicles and equipment. Periodic control should take place. • Prevent any unnecessary noise production, leaving equipment and vehicles running whilst they are not being used. • Provide ear protection if limits exceed safety standards
Soil pollution	Caused by • Prevent any spillage at the WWTP of waste water, waste and/or sludge	**no gap in EIA**	• No mitigation measures needed during construction • Good housekeeping at the WWTP through good management during construction
Water pollution	Groundwater caused by: • Prevent any spillage at the WWTP construction site during construction works Surface water caused by: • Prevent any spillage at the WWTP construction site during construction works	**no gap in EIA** **Minor GAP!**	Groundwater • Good housekeeping at the WWTP through good management during construction Surface water caused by: • Good housekeeping at the WWTP through good management during construction
Waste	Domestic waste caused by • Construction workers daily needs, e.g. waste produced due to lunches, toilet. Construction waste • Construction waste: all material which is finally not used during the construction.	**GAP in EIA**	Domestic waste caused by • It should be stated what will happen to this waste, construction workers should be made responsible for this. Construction waste • Indicate what will happen with the construction waste.

Type	Description of impact related to activity	Evaluation	Mitigation measures proposed
Natural environment			
Terrestrial flora & fauna	There are no protected natural estates, habitats of natural rarities not protected or endangered species of flora and fauna. There are no negative effects expected on the terrestrial flora and fauna. At the location there is already a non functional WWTP so there is no removal of any flora and fauna necessary.	**no gap in EIA**	No mitigation measures necessary
Aquatic flora & fauna	There are no negative effects expected on the aquatic flora and fauna during the construction period.	**no gap in EIA**	No mitigation measures necessary
Cultural estate	No protected cultural estate registered	**no gap in EIA**	No mitigation measures necessary In case any archaeological sites are found during the construction, it is necessary to inform the authority and to take necessary measures

Human environment			
General HSE	During the construction phase, workers are inevitably exposed to hygiene, safety and security risks. The following activities (mainly safety) should have special attention; • Excavation work, • Working with heavy machinery, • Working with chemicals, • Working in very noisy environments (noisy machines), • Lifting and or loading of heavy loads. Receptors of this impact are the construction workers of the WWTP. The impact can be classified as minor or major, depending on what will happen in practice. If the correct measures are taken and the correct working atmosphere allows for safe working conditions then the impact will be minor as it will be as low as reasonably practical (ALARP).	**Minor GAP!**	For the construction phase an extensive HSE management plan should be made. It should include all relevant aspects (as mentioned in the chapter on HSE management) but for labour protection the following is essential • Provision of PPE (Personal Protection Equipment), specific for each task, • Regular checks in the field if regulations and standards are respected, • Well trained staff for operations required during construction of the WWTP. • Provide medical assistance to all workers, • Education of all workers on their risks and what to do (also hygiene and illnesses – working in an environment where pathogenic bacteria are present).
Population	With this new WWTP and the choice of its location there are no adverse affects envisaged for the people in Vrbas during the construction period.	**no gap in EIA**	No mitigation measures necessary

Table 4-4 Main environmental issues and mitigation measures for operational phase

Type	Description of impact related to activity	Evaluation	Mitigation measures during operational phase
Physical environment			
Air pollution	Caused by • Release of aerosols and unpleasant odours, especially during dry and hot spells.	**no gap in EIA**	• There where unpleasant odours occur coverage will reduce these impacts and will also be equipped with artificial ventilation system
Noise pollution	Caused by • General operations (aeration, pumps. etc.)	**MINOR**	• Coverage of the installations causing the highest noise levels, such as the aeration pumps. • Good maintenance and check up on vehicles and equipment. Periodic control should take place. • Prevent any unnecessary noise production, leaving equipment and vehicles running whilst they are not being used. • Provide ear protection if limits exceed safety standards
Soil pollution	Caused by • Improvement of soil quality due to the reduction in the number of septic tanks in Vrbas municipality. • Prevent any spillage of chemicals, sludge and waste water during operations. • Less pollution of canal bed soil due to reduction in suspended solids which reach the grand canal through the untreated effluent discharge. Great improvement for the long term quality of the Grand Canal.	**MINOR**	• Design of tank bottom with water-impermeable coating

Type	Description of impact related to activity	Evaluation	Mitigation measures during operational phase
Water pollution	Groundwater caused by: • Pollution to groundwater will decrease as septic tanks will no longer be used by a certain area of the town of Vrbas. This is a very positive aspect. Surface water caused by: • Pollution reduction of the Grand Canal (and therefore water quality improvement in the Danube). This is also in line with the EU Water Framework Directive. • Possible wash-through of sludge into the Grand Canal due to incidence on the WWTP or spillage from chemical used or cleaning solvents.	**no gap in EIA** **no gap in EIA** **Minor GAP!**	Groundwater • No measures needed Surface water caused by: • No measures needed • Good maintenance and operation of the WWTP by employees who are properly trained. Good HSE plan for the operations of the WWTP
Waste	Domestic waste caused by • General operation of the WWTP, e.g. waste produced by the operators, maintenance. • Waste from demolishment of old WWTP still present on the site Sludge from WWTP • General operation of the WWTP and during incidents Waste from primary treatment; • Rough solid waste (bottles etc.) • Oily waste removed within primary stage • Sand which settles in the primary treatment stage Chemical management • Phosphate, chalk, iron; where are these stored and how to prevent any adheres effects	**GAP in EIA**	Domestic waste caused by • It should be stated what will happen to this waste, will it be collected or is the WWTP operator responsible for the disposal of the waste • What will happen with the old WWTP Sludge from WWTP • Disposed of to landfill as sludge cake. It is not clear to which landfill. • Using the sludge as soil improvement within agriculture should be considered Waste from primary treatment; • Final destination not determined Chemical management • Storage, safekeeping and disposal not determined

Natural environment			
terrestrial flora & fauna	There are no protected natural estates, habitats of natural rarities not protected or endangered species of flora and fauna. There are no negative effects expected on the terrestrial flora and fauna. At the location there is already a non functional WWTP so there is no removal of any flora and fauna necessary.	**no gap in EIA**	No mitigation measures necessary
Aquatic flora & fauna	There are no negative effects expected on the aquatic flora and fauna. Due to the improvement of the water quality there will be a positive impulse to the aquatic live in the Grand Canal (which is favorable for the aquatic ecological goals set within the EU Water Framework Directive)	**no gap in EIA**	No mitigation measures necessary
Cultural estate	No protected cultural estate registered	**no gap in EIA**	No mitigation measures necessary
Human environment			
General HSE	During the operational phase, workers are inevitably exposed to hygiene, safety and security risks. The following activities (mainly safety) should have special attention; • Working with heavy machinery, • Working with chemicals, • Working in very noisy environments (noisy machines), • Lifting and or loading of heavy loads. Receptors of this impact are the operators of the WWTP. The impact can be classed as minor or major, depending on what will happen in practice. If the correct measures are taken and the correct working atmosphere allows for safe working conditions then the impact will be minor as it will be as low as reasonably practical (ALARP).	**Minor GAP!**	For the operational phase an extensive HSE management plan should be made. It should include all relevant aspects (as mentioned in the chapter on HSE management) but for labour protection the following is essential • Provision of PPE (Personal Protection Equipment), specific for each task, • Regular checks in the field if regulations and standards are respected, • Well trained staff for the operations work needed at the WWTP. • Provide medical assistance to all workers, • Education of all workers on their risks and what to do (also hygiene and illnesses – working in an environment where pathogenic bacteria are present).
Population	With this new WWTP and the choice of its location there are no adverse affects envisaged for the people in Vrbas. The WWTP will only increase the standard of living for everyone.	**no gap in EIA**	No mitigation measures necessary

4.5 Monitoring plan during construction and operational phase

There needs to be a clear monitoring plan for construction and operational phase. This is not present at the moment or in a minor form. In chapter 9.2 of the EIA, there is a long description of the type of technology which will be used in the control-command center of the WWTP during operations.

In accordance with the relevant technical documentation, the following measurements have been defined as the necessary minimum:

- Raw water pumps and screens:
  - pH and water temperature (continuous measurements);
  - water level upstream of raw water pumps (continuous measurement);
  - differential level at fine screens (limits);
- Pipeline downstream of grit removal chamber:
  - Flow rate (continuous measurement);
- Aeration basin:
  - Dissolved oxygen concentration (continuous measurement);
- Air blowers:
  - Air flow and pressure in a pressure main (continuous measurement);
- Final clarifiers:
  - Sludge level and concentration (continuous measurements);
- Sludge recirculation:
  - Sludge flow and concentration;
  - Surplus sludge flow;
- Sludge treatment:
  - Temperature in digesters (continuous measurement);
  - Sludge pH in digesters (continuous measurement);
  - Flow and pressure of bio-gas for mixing (continuous measurement);
  - Flow and pressure of bio-gas in a bio-gas tank (continuous measurement);
  - Flow of stabilized and thickened sludge to centrifuge (continuous measurement);
- Outlet – effluent discharge:
  - Flow (ultrasonic measurement of level in the outlet canal) (continuous measurement);
  - pH, temperature, turbidity, dissolved oxygen (continuous measurements).

In order to monitor the effectiveness of water pollution prevention measures (i.e. operation of the WWTP) the EIA 2007 specifies necessary monitoring of effluent quality.

Before the waste water treatment plant starts up, the analysis of water and sludge quality in the canal should be performed, in order to establish a baseline status.

Effluent quality at the discharge point should be monitored by the project holder, once per month, and in compliance with the relevant current local legislation.

However, it is not for all locations clear when samples are taken and where, which analysis is done and at which frequency. Therefore, a layout map with the monitoring points needs to be included accompanied by a clear description of all sampling points.

Table 4-5 Tentative monitoring plan (as example for consultant)

Environmental compartment	Location	Type of monitoring	Monitoring frequency
Physical environment			
Air quality - noise - odour	- In the vicinity of the WWTP - Based on physical registration		
Sludge	Study of bacteriological activity Sludge before and after drying	Chemical composition, depending on needs for disposal requirements (landfill/agriculture)	
Water quality	Influent WWTP itself Effluent Receiving water body - upstream of discharge point - downstream of discharge point	All relevant parameters Eg, BOD, pH, T, O2, E. Coli, metals (need to check with permit)	Not all parameters have the same frequency. (check with permit)
Human environment			
HSE	At the site	Correct PPE	

4.6 Inventory of hazardous areas

There are no hazardous areas in the vicinity of the WWTP. There are some hazardous parts within the WWTP which can cause accidental negative effects on the environment. These are described in the EIA (chapter 8).

4.7 Health and safety measures and contingency planning

Chapter 8 of the EIA deals with environmental impacts in case of accidents. The main issues are described.

The Supervisor will conduct inspections in order to check if the HSE rules and regulations are being followed by the construction company. Fines and additional checks will be carried out if incompliance is registered.

During construction and operational phase there must be first aid kids and fire fighting material available for workers. Staff should be properly trained to use this equipment.

In Serbia, HSE plans are not included in construction permits. Although outside of the scope of this feasibility study, it is recommended to consider including HSE plans as an integral part of the construction permit, so that health, safety and environment issues during construction are secured and a legal basis for monitoring thereof is provided.

4.8 Regulatory compliance

The current regulatory environment has been elaborated in chapter 6 – institutional analysis. During construction and operation of the WWTP, the below mentioned procedures will be applied:

Supervision and enforcement
The Republican Directorate for Waters has its Inspectorate with 4 field offices covering the total of 19 regions with 18 inspectors. Authorities of water management and sanitary inspectors are defined in the Water Law. While sanitary inspectors are in charge of control of potable water, water management inspectors are responsible for supervision and control of existing and new water management facilities including functioning and efficiency of waste water treatment facilities, as well as the inspection of polluters. In the event that hazardous elements exceed limits set by Rule book on hazardous elements in waters (RS Official Gazette 31/82), inspectors may order closure of enterprises until the limits are met. The latter one is not a popular measure due to economic reasons and is applied only in event of accidents.

In the municipality of Vrbas, Republican water management inspectors monitor primary treatment in industries and main gravity sewer while communal inspectors are in charge of small enterprises and the collection network. Presently, there are no water management inspectors at provincial level.

Directorate for Environmental Protection of Autonomous Province of Vojvodina
The Directorate was established in 2002 (Article 35 of APV Official Gazette, 21/02) and is responsible for supervision of application of environmental legislation at provincial level. In the Directorate 10 inspectors-advisors and one executive inspector are employed. The Directorate is in charge of environmental issues in the province, in the event that the provincial bodies are responsible for issuing permits. This will be the case with the future Vrbas WWTP project. Authorities of the Directorate do not carry out inspection of hazardous materials.

4.9 Public Participation

The Law on environmental impact assessment (OGRS 135/2004) prescribes a procedure of public consultations, presentation and debate on the EIA Study – article 20 as follows:

The competent authority shall make the EIA Study available to the public and arrange for a public presentation and debate on the Study.

Within seven days from the date of receipt of the application for the EIA Study approval, the competent authority shall inform the project developer, the authorities, organisations and the public concerned about the time and venue for public consultation, presentation and debate on the EIA Study.

Public debate may not be held sooner than 20 days from the date when the public was informed.

The project developer shall participate in the public presentation and debate on the EIA Study. An authorized representative of the municipality of Vrbas and the consultant on environmental protection participated in relevant public consultations conducted for the purpose of the EIA 2007.
All major steps in the EIA procedure for the Vrbas – Kula wastewater project were publicized in the newspapers in the region potentially affected by the project in all languages officially used during the period October 2006 – July 2007 (see Annex 4.1):

- Dnevnik – in Serbian
- Magyar Szo – in Hungarian
- Ruske Slovo – in Rusinian

These major steps included the following:

- The announcement of the decision on the necessity to carry out an EIA for the Project, Provincial Secretary for Environmental Protection and Sustainable Development, October 27, 2006
- The announcement of the application for determining the scope and contents of the EIA for the Project , Provincial Secretary for Environmental Protection and Sustainable Development, December 28, 2006
- The announcement of the decision on the scope and contents of the EIA for the Project , Provincial Secretary for Environmental Protection and Sustainable Development, February 14, 2007
- The announcement of the public consultations on the EIA for the Project , Provincial Secretary for Environmental Protection and Sustainable Development, April, 2007

More specifically, the procedure for public consultations, presentation and debate is defined in the corresponding Rulebook (OGRS, 69/2005).

The competent authority should make the EIA public within 7 days of the request for approval. The availability of the EIA must be published in a daily newspaper, or in a local newspaper in all languages that are in official use in the area affected by the project. Public exposure of the EIA should last at least 20 days.

The EIA can be presented by means of electronic public media.

The announcement of the EIA presentation must include the following:

- Title of the competent authority
- EIA title
- Data on schedule and venue of the EIA public presentation
- Way to get full information and submit comments by all stakeholders (public, organizations, etc.)

The EIA should be publicized in the office of the competent authority, in a specifically allocated room. In this particular instance the EIA has been reviewed by the Provincial Secretary for Environmental Protection in Novi Sad (“the Competent Authority”), and was therefore available to the public between 27 April 2007 and 28 May 2007 (Minutes of the EIA Public Consultations, dated 29 May, 2007 - Annex 4.2). Conducted public consultations did not result in any major comments or objections regarding the EIA or about the project, by the public or other stakeholders.

Upon the completion of the public consultations, the competent authority should submit to the project developer within 15 days all received comments and objections. If required, the project developer should modify the EIA accordingly within the following 15 days. Since no comments or objections regarding the EIA or the project were received, this clause is not applicable for the Vrbas WW project.

The EIA for the Vrbas WW project is still being considered by the Technical Committee established by the Provincial Secretary for Environmental Protection in Novi Sad, with a final report expected in July - August 2007.

4.10 Resettlement

Resettlement is not relevant to this project investment. There are no houses or any other buildings in the vicinity.

4.11 Social analysis of the project

The extension of the WWTP at Vrbas will not negatively influence the population of Vrbas.

Construction phase
During the construction phase, this project will provide jobs for the construction of the WWTP. There is no need for people to be resettled. There will be an increase of traffic in order for the materials to arrive at the site which might be noticed by the public but this adverse effect is negligible.

Operational phase
During operations, the WWTP will need to be maintained and controlled which will provide job opportunities in the region. Further details are provided in chapter 7.

It will also improve the possibilities planned by the local authority to use the Grand Canal for recreational activities and fishing.

4.12 Impact on public health

The impact on public health of the WWTP will be very positive. It is expected that it will reduce the amount of sick people directly related to contact with the Grand Canal. It will reduce the amount of E.coli bacteria which is an indicator for the presence of pathogenic bacteria which can cause illnesses (leading to diarrhea, stomach pains etc.). In order to reduce the pollution of the Grand Canal significantly, it is essential to tackle the pig farm, located North west of Vrbas, as well, since his is a large source of pollution. This is outside the scope of this project but it is currently being looked at by other institutes, such as Vode Vojvdina. Treating the waste water in this WWTP is in any case a great start and in line with EU Directives.

Construction phase
There will be no negative impacts on public health during construction phase. To limit any possible negative impacts to the construction workers it is essential to have a Health Safety and Environmental Management plan in place, making sure that all the PPE (Personal Protective Clothing is present) is made available to the workers and that they are properly trained and aware of the risks during construction.

Operational phase
Possible impacts on the public are negligible, as wind directions are favourable and there are no other risks involved for the WWTP.

4.13 Conclusion and Recommendations

4.13.1 Conclusion

The construction of the WWTP in Vrbas will lead to an increase in water quality of the Grand Canal which flows through the town of Vrbas. This will have a positive effect on public health and aquatic ecosystem of the canal. It will improve recreational possibilities (fishing and swimming). From an environmental and social point of view there are no potential hazards or 'show-stoppers' in order for this project not to be financed as long as all the mitigation measures are taken and the monitoring programme is executed.

It must be realized that the extent of water quality enhancement in the Grand Canal depends also on the successful improvements of other polluters such as the Pig farm and the sugar cane industry. These are being considered by other financial institutes or local authorities and consultants in order to improve these issues as they have been identified clearly by the NIVA (Norwegian Institute for Water management).

4.13.2 Recommendation

The following issues need to be described if known or solved if unknown.

Waste management
It is not clearly stated how waste management will be dealt with during construction phase and operational phase of the WWTP. In chapter 10 of the EIA it is stated that the monitoring of waste (sludge), soil and water must be done in accordance with the law and regulations. The laws and regulations are given by name and published date but it is not elaborated on what this entails for this particular situation. The following needs to be elaborated on;

Waste streams – during construction phase
- general waste from construction period (domestic waste and construction waste)
- removal of the old WWTP, where will this go to (recycling??)

Waste streams – during operational phase
It needs to be clearly described what will be done with all the following waste streams. Where will they go, what are the best options from an environmental point of view (preferably, first recycling then other options such as landfill).
- **Primary waste from pre-treatment** – the first step of treatment is a primary treatment which will take out all the rough waste from the sewage (bottles, plastics, etc.).
- **Oily products during primary treatment** – this will be scraped of the top of the water during this primary treatment stage.
- **Settled sand during primary treatment** – Dirty sand will settle at the bottom of the primary treatment and needs to be cleaned out from time to time.
- **Sludge** – what happens to the sludge, it would be best practice if the sludge can be used for agricultural use. This should be investigated. It is not stated what will happen to the sludge now, most likely it will be dumped on the landfill. It is stated in

the project documentation that the quality of sludge shall be established during the CWWTP operation, and thereafter a decision shall be made to use it (in agriculture) or to dispose it to a landfill.

- **General waste** – from operations (domestic and operational waste from maintenance of machines, etc.)

Chemical management

During the operation of the WWTP it is likely that the following three chemicals will be used:

- Iron chloride ($FeCl_3$); for removal of phosphate during the treatment of the waste water;
- Polyelectrolyte; to be added to the sludge for better flocculation (therefore better settling) higher removal of sludge during last treatment stage of sludge;
- Chalk (C_aO); also added to the sludge for stabilization, higher removal and better for the pressing of the sludge.

Monitoring plan

In paragraph 4.4 an explanation is given of the kind of information needed for a monitoring plan. It is not sufficiently covered in the EIA.

HSE management plan

A general HSE management plan must be put in place. It should elaborate on all the HSE issues, including necessary training of employees.

5 FINANCIAL AND ECONOMIC ANALYSIS

5.1 Financial assessment Public Utility Company

This paragraph sets out an analysis of PUC Standard of the Municipality of Vrbas. The public utility company provides a variety of services. The analysis will deal with the PUC as a whole, but where required, will zoom in on specifically water and waste water related activities. This is done with a view to provide proper data for the financial modelling of the future water & wastewater activities, but also in view of the anticipated establishment of a separate water and wastewater utility.

5.1.1 Profit and Loss statements

The Municipality of Vrbas founded PUC Standard for the purpose of performing activities dealing with water supply, waste water management, solid waste, district heating and all other communal services defined within its scope of activity.

In financial reporting, the PUC records and discloses data on operating activities of all its departments in single financial reports, not showing separate business activities for each of its departments.

The analysis is based on official data that were submitted by the PUC to the Central Bank in accordance with the current Law on Accounting.

Table 5-1 Profit & Loss statement PUC Standard Vrbas (RSD '000)

		2004 actual		2005 actual		2006 actual		2007 plan	
No	**Description**	**RSD**	**%**	**RSD**	**%**	**RSD**	**%**	**RSD**	**%**
1.	**Total revenues**	**142.509**	**100 %**	**152.232**	**100 %**	**184.078**	**100 %**	**206.942**	**100 %**
1.1.	Revenues from the business	141.240	99 %	151.113	99%	182.207	99%	205.042	99%
1.2.	Other revenues	1.269	1%	1.119	1%	1.871	1%	1.900	1%
2.	**Expenditures**	**168.956**	**119 %**	**182.988**	**120 %**	**217.952**	**118 %**	**255.297**	**123 %**
2.1.1	Material costs	61.986	43 %	58.904	39%	75.453	41%	90.076	44%
2.1.2	Salaries	60.360	42 %	74.029	49%	86.846	47%	118.434	57%
2.1.3	Depreciation	11.202	8%	14.305	9%	15.579	8%	10.975	5%
2.1.4	Other	35.408	25 %	35.750	23%	40.074	22%	35.812	17%
3.	**GROSS PROFIT**	**(26.447)**	**-19 %**	**(30.756)**	**-20%**	**(33.874)**	**-18%**	**(48.355)**	**-23%**
3.1.	Net Interest payment	27.497	19 %	32.589	21%	35.772	19%	42.917	21%
3.2.	Net extraordinary items	(531)	0%	(1.784)	-1%	(1.825)	-1%	5.438	3%
3.3.	Taxes and contributions	64	0%	5	0%	7	0%	-	0%
4.	**NET PROFIT**	**455**	**0%**	**44**	**0%**	**66**	**0%**	**-**	**0%**

Below are some of the most important findings of the financial performance analysis of the PUC Standard - Vrbas:

Profitability and revenues

- Main feature of the profit & loss statement of PUC Standard is the consistent operational losses for each year of 19% to 23% of total revenues. In spite of this, net profits are consistently 0 or slightly positive, as a result of large net interest receivables. A breakdown of this net interest receivable revealed that this mainly consists of large operational subsidies/transfers of the Vrbas municipality through the Directorate of Urban Planning to the PUC, to cover the costs of non revenue generating services such as local road maintenance, street/greenery/parks/market cleaning and maintenance. These services are regulated by contracts between the Urban Directorate and the PUC. In principle, these operational subsidies should not be booked as an interest receivable, but be classified under revenues, which would result in the PUC having a slightly positive operational result for each of the analyzed years.
- Financial performance at 0% profit is more or less general practice of Vrbas PUC, similar to most other PUC's in Serbia.
- Total revenues of the PUC Standard – Vrbas range from CSD 142 million in 2004 to 184 million in 2006. As explained above, these are mainly comprised of invoiced revenues for water/waste water, solid waste and district heating services. In total, revenues have increased by 29% for the period of 3 years. Revenues from business activities are dominant throughout the observed period with 99% of total revenues. This situation is typical for PUC's in Serbia.
- The plan for year 2007 is to increase total revenues by 12%, more than the officially allowed tariff increase, which is maximized at 7.5%.
- Total expenditures of Vrbas PUC ranged from CSD 169 million in 2004, to CSD 218 million in 2006. Total expenditures exceeded total revenues by approximately 19% for almost every year.

Table 5-2 Total Expenditures PUC – Standard – Vrbas (RSD 000)

No	Description	2004		2005		2006		2007 plan	
		RSD	%	RSD	%	RSD	%	RSD	%
2.	**Expenditures**	**168.956**	**100%**	**182.988**	**100%**	**217.952**	**100%**	**255.297**	**100%**
2.1	Material costs	61.986	37%	58.904	32%	75.453	35%	90.076	35%
2.2	Salaries	60.360	36%	74.029	40%	86.846	40%	118.434	46%
2.3	Depreciation	11.202	7%	14.305	8%	15.579	7%	10.975	4%
2.4	Other	35.408	21%	35.750	20%	40.074	18%	35.812	14%

Expenditures

- The plan for year 2007 is to increase total expenditures by 17%.
- Most significant items on the expenditure side of the PUC are salaries and material costs. Salaries ranged from 36% in 2004 to 40% in 2006. This reflects the typical situation of state owned companies, in which labor costs overtime become almost fixed costs. Increase in salaries is strictly prescribed by the Government, through the Ministry of Finance. Despite this, the planned 2007 expenditure on salaries is 36% higher than 2006. This increase in salaries of 36% in 2007 is the result of the legally allowed increase in mass of salaries of 9.5% plus some allowed increase with 12 new workers and jubilee bonuses.
- Another large share of total expenditure can be attributed to material costs, which ranges from 32% to 37%. Large expenditures on fuel, electricity and maintenance, are typical for this type of company.
- Depreciation costs as a share of total costs are generally very limited at only 7-8% in the period 2004 to 2006, with a much lower planned share during 2007 of 4%. This reflects the fact that the equipment and other assets are almost completely depreciated.
- Net extraordinary items are rather insignificant and range from -1% to 0%. These consist of revenues from outstanding debts already written off that have undergone court proceedings and were decided in favor of the PUC.
- In respect to outstanding debts the PUC Standard, Vrbas does not have a clear policy. It was explained earlier that they charge their consumers on a three monthly basis, after which they regularly send reminders for outstanding debts. Interest is not charged (the company does not have software for interest calculation). Although the PUC regularly sends to court all the clients that fall under the non-paying category, the courts in Serbia are rather slow in addressing complaints, and it may take up to several years before any court decision actually emerges. However, upon reaching court decision, the PUC, has the legal right to write off their outstanding debts. The last time PUC Standard, Vrbas had written off its outstanding debts was in 2002. This practice is not in line with international accounting standards (IAS) and might lead to the underreporting of expenditures and liabilities of the company.
- All these indicators reflect the poor financial performance of the PUC Standard - Vrbas. In a period 2004 to 2006 PUC Standard – Vrbas operated with negative financial result from operating activities. During the year 2004 to 2005, net profit was symbolic.

5.1.2 Cash flow statements

Table 5-3 Cash flow statement (RSD 000)

Description	2004 actual	2005 actual	2006 actual	2007 plan
A. CASH FLOWS FROM OPERATING ACTIVITIESCash inflows from operating activities	142.509	210.910	231.963	261.477
II. Cash outflows from operating activities	184.079	218.126	237.825	261.479
III. Net cash inflow from operating activities (I-II)	-41.570	-7.216	-5.862	-2
B. CASH FLOW FROM INVESTING ACTIVITIES I. Cash inflow from investing activities	37	24	311	17.200
II. Cash outflow from investing activities	3.766	27.828	6.239	17.200
III. Net cash inflow from investing activity (I-II)	-3.729	-27.804	-5.928	0
C. CASH FLOW FROM FINANCING ACTIVITIES I. Cash inflow from financing activities	45.107	48.912	24.889	37.200
II. Cash outflow from financing activities	1.393	10.369	14.190	37.200
III. Net cash inflow from financing activities (I-II)	43.714	38.543	10.699	0
D. GROSS INCREASE IN CASH	187.653	259.846	257.163	315.877
E. GROSS DECREASE IN CASH	189.238	256.323	258.254	315.879
F. NET INCREASE IN CASH	-1.585	3.523	-1.091	-2
G. CASH AT THE BEGINNING OF PERIOD	2.467	882	4.405	3.314
H. CASH AT THE END OF PERIOD	882	4.405	3.314	3.312

In 2006 **cash inflow from operating activities** increased by 10% compared to 2005. The company plans further 13% cash inflow from operating activities in 2007. Cash inflow from operating activities increased over the observing period, it was highest from sale of services, the PUC's core activity. However, **cash outflow from operating activities** increased from 2005 to 2006 by 9%, and in respect to 2004, outflow in 2006 increased by 30%. This was due to settling accounts payable and salaries for the employees. On balance, the operational cash flow improved considerably during the period, starting form a large negative operational cash flow during 2004 to a planned 0 cash flow in 2007.

Cash inflow from investing activities for the period 2004 to 2006 was negligible. However, a large increase in investment inflow is expected in 2007 of RSD 17 2 million. The company plans to sell their present business premises and expects to receive RSD 17.2 million. However, this money will soon be reinvested in buying new business premises.

Cash outflow from investing activities. With the exception of the year 2005, in which the PUC invested RSD 28 million, other years showed relatively limited investment activities. As is common practice for PUC's in Serbia, most of the investment activities are financed directly by the Municipality. On balance, cash flow originating from investment activities was close to 0, with the exception of the year 2005. In 2007, the PUC plans to use the proceeds of the sale of old business premises to invest in a new office building.

The cash inflow from financing activities decreased in 2006 by 50% compared to 2005. In 2004 and 2005, The Urban Directorate regularly transferred funds for the purchase of machines and equipment. However, in 2006 this was not the case, and the plan is that the Directorate transfers all the outstanding investment funds in 2007.

Cash outflow from financing activities increased in 2006 compared to 2005, by 40%, and compared to 2004 this outflow is considerable.

The **overall cash flow** of the PUC is in all years close to 0. This is a common situation for PUC's in Serbia, which typically manage to cover their direct operational costs only, without building up a reserve for replacement and/or capital maintenance of their assets.

5.1.3 Balance sheet review

The Table below summarizes the balance sheet of PUC Standard during the period 2004 to 2007:

Table 5-4 Balance Sheet (RSD 000)

Description	2004		2005		2006		2007	
	RSD	%	RSD	%	RSD	%	RSD	%
ASSETS	**203.933**	**100 %**	**260.679**	**100 %**	**294.982**	**100 %**	**312.391**	**100 %**
Fixed assets	143.423	70%	167.996	64%	174.168	59%	190.241	61%
Current assets	60.510	30%	92.683	36%	120.814	41%	122.150	39%
Inventories	3.714	2%	10.992	4%	15.754	5%	17.500	6%
Account receivables	55.914	27%	73.707	28%	101.406	34%	100.720	32%
Cash and cash equivalent	882	0%	4.405	2%	3.314	1%	3.563	1%
Accrued	0	0%	3.579	1%	340	0%	367	0%
LIABILITIES	**203.933**	**100 %**	**260.679**	**100 %**	**294.982**	**100 %**	**312.391**	**100 %**
Equity	158.502	78%	197.089	76%	207.855	70%	208.704	67%
Long term reserves	0	0%	0	0%	0	0%	0	0%
Liabilities	45.431	22%	63.590	24%	87.127	30%	103.687	33%
Long termliabilities	0	0%	18.402	7%	4.413	5%	30.413	10%
Long term loans	0	0%	18.402	7%	14.413	5%	30.413	10%
Short term liabilities & Accrual	45.431	22%	45.188	17%	72.714	25%	73.274	23%
Short term loans	15.094	7%	7.061	3%	25.240	9%	25.400	8%
Accounts payable	23.976	12%	30.379	12%	32.121	11%	32.332	10%
Accruals	6.361	3%	7.748	3%	15.353	5%	15.542	5%

During the period 2004 to 2006 **Fixed assets** have increase by 17% in 2005 and 3% in 2006. The company plans to increase its fixed assets in 2007 by 9%.

Current assets in this period have doubled. Within current assets, account receivables were dominant. In 2005 account receivables increased by 31% compared to 2004. This increase continued at the same rate also in 2006. For 2007 the company plans to improve its situation regarding their debtors and lower this trend significantly.

However the **Equity** of the company remained over the past several years almost on the same level. There was an increase in 2005 (in respect to 2004) of 24%. The company does not plan to increase its capital in 2007. This situation, in general would change, once the public companies enter the process of privatization.

The company has taken several long term loans during the analyzed period. All of these loans were mainly leasing contracts for the purchase of vehicles, and the total outstanding amount on 31 December 2006 was RSD 14.4 million. Total short term loans in 2006 amounted to RSD 25.2 million and the company has taken them mainly to fund its operating activities. In 2007, the company plans to take further long term loans.

Accounts payable for the period show that the company still had not succeeded in lowering its debts. Their share in total liabilities ranges from 10% to 12%, and they are actively working on settling their past due obligations.

For the purposes of analyzing the balance sheets of the PUC and specifically the level of indebtedness and liquidity, the following indicators are used:

- **Net Current Fund (NCF)**: the relation between long term assets (fixed assets plus long term financial investments) and long term funds (own capital plus long term debts/financial obligations). A positive value of NCF is a simple and relatively reliable indicator of soundness of the financial situation of the company;
- **Relation between NCF and stocks**: this is an additional test of company's financial position of liquidity and general indebtedness. Again, a positive value of this indicator reflects a good financial position;
- **Relation between total revenues and net debt**: calculated as the share of fixed assets, other long term investments and stocks, which are financed with borrowed funds. This includes loans, but also receivables and other non-paid financial liabilities. A common benchmark is that borrowed funds expressed as a share of total revenues should not exceed 10% of total revenues.

Table 5-5 Balance sheet indicators – PUC Standard Vrbas (RSD 000)

No.	Indicator	2004	2005	2006	2007 plan
1.	Long term sources (own capital and other long term sources)	158.502	215.491	222.268	239.117
2.	Long term assets (fixed assets and long-term investments)	143.423	167.996	174.168	190.241
3.	Net current fund - NCF (1-2)	15.079	47.495	48.100	48.876
4.	NCF minus Stocks	11.365	36.503	32.346	31.376
5.	Borrowed sources/Total revenues (general indebtedness)	10,6%	16,7%	21,5%	27,0%
	LIQUIDITY RATIO I, II and III				
6.	Rigorous Liquidity Ratio (Cash/Short term liabilities)	0,02	0,10	0,05	0,05
7.	Current Liquidity Ratio (Short term receivables and cash/Short Term Liabilities)	1,25	1,73	1,44	1,42
8.	General Liquidity Ratio (Short term receivables and cash and stocks/Short Term Liabilities)	1,33	2,05	1,66	1,67

The main findings regarding the balance sheet review of Vrbas PUC are:

- A common benchmark is that General Liquidity ratio should be 2, and Current liquidity ratio and Rigorous liquidity ratio should be 1.
- General liquidity ratio. The PUC was only able to meet a ratio in excess of 2 during the year 2005. During the years 2004 and 2006, the ratio shows that short term liabilities were not covered well by working capital. Current liquidity ratio shows good performance of the PUC for the observed period. However, rigorous liquidity ratio over the observed period shows actually that the PUC has problems in covering short term liabilities, since it is dramatically less than 1. There is a lack of cash for current operating activities.
- The plan for year 2007 shows that these trends are to continue.
- Net current fund has a positive value in all years. The indicators of indebtedness are relatively high in the range of 10.6% in 2004 to 27% in 2007. This reflects a relatively active investment activity of the PUC and at the same time a model of investment in which the local budget is taking an active part. (However, a common benchmark is that borrowed funds expressed as a share of total revenues should not exceed 10% of total revenues. It is clear that PUC Standard is exceeds this criterion.

5.1.4 Revenues and collection rate by customer groups

In this paragraph, a breakdown of customers, revenues and collection rates for the combined services of the PUC Standard, Vrbas will be provided and analyzed. The following customer groups are distinguished:

- Domestic users
- Industries and small businesses
- Institutions/budget organizations

The services rendered by the PUC Standard are charged to customers in one combined invoice, and include water supply, wastewater management, solid waste removal and district heating. These services are provided to household, small and medium size business, and budgetary beneficiaries (such as schools, sport centers, heath centre etc.).

Large industries such as Vital (factory producing edible oil products) and Carnex (meat factory) have their own wells for water supply and therefore are not served by PUC Standard. These factories (and a number of other large factories from the municipality of Kula that will be covered by the new WWTP) and additional extensions, will require a new organization of the PUC in order to support the existing and the new requirements for water supply and wastewater management. Currently, PUC Standard Vrbas is considering a possible re-organization, by establishing a new PUC solely for water/waste water services. This is in line with current governmental policy. Chapter 7 of this study further elaborates on this issue.

Unfortunately, no further exact breakdown is available for water & wastewater charges separately. However, an accurate estimate of these revenues can be made, since it is known how many cubic meters of water are sold by customer group and tariffs are known as well. This will be done in the financial model as presented later on in this chapter. For the purposes of the analysis, the overall collection rates at PUC level are assumed to be identical to the collection rates of water and wastewater charges, since all services are combined in one invoice. In most cases, the full invoices is paid, or not paid at all. Part payment of invoices happens as well, but usually takes the form of a pro rata payment against the full value of the invoice, without distinguishing between the different services charged

The Tables below show a breakdown of revenues and collection rates by customer group for the combined services of the PUC Standard.

Table 5-6 Vrbas collection ratio all services - domestic users (in RSD 000)

	2003			2004			2005			2006		
Place	**Invoiced**	**Coll.**	**%**	**Inv.**	**Coll.**	**%**	**Inv.**	**Coll.**	**%**	**Inv.**	**Coll.**	**%**
Vrbas	54.960	47.367	86 %	65.998	57.785	88 %	74.621	72.094	97 %	84.828	78.718	93 %
Backo	5.258	3.774	72 %	5.496	4.769	87 %	6.748	5.724	85 %	6.762	6.413	95 %
Zmaje	5.582	4.687	84 %	6.417	5.412	84 %	7.278	6.334	87 %	7.661	6.907	90 %
Kucur	3.964	2.464	62 %	3.970	4.045	102 %	4.542	4.333	95 %	6.023	4.745	79 %
Ravno	3.557	2.129	60 %	3.381	2.907	86 %	3.705	2.854	77 %	5.063	3.670	72 %
Savino	3.219	1.876	58 %	3.245	2.008	62 %	3.601	2.335	65 %	3.863	2.670	69 %
Total	**76.543**	**62.300**	**81 %**	**88.510**	**76.930**	**87 %**	**100.498**	**93.676**	**93 %**	**114.204**	**103.125**	**90 %**

During the period 2003 to 2006, total invoiced services for domestic users show an increase, which of course can be expected if tariffs are increased and demand remains the same. Total collection rates for the villages and the city of Vrbas together range from 81% to 93%. Total Collection rates more or less stabilized during the years 2004 to 2007 at around 90%. This is a relatively high collection rate, compared to other public utility companies in Serbia.

Within the municipality, the highest collection rate in 2006 is achieved in the village of Backo Polje with 95%. The lowest collection rate was in Savino Selo with 69%. The average collection rate for 2006 was 90% and net revenues were RSD 103 million or € 1.3 million.

The Table below sets out the collection rate for business and institutional users. This group of users is much smaller and uses less water, therefore total invoiced services are much lower than those for domestic users. During the analyzed period, collection rates ranged from 80% to 97%, with a peak achieved during the year 2005. In 2006, the highest collected ratio was achieved in the village of Kucur with 111%. On average, the collection rate for 2006 was 90% and net revenue stood at RSD 35.7 million or € 446 thousand.

Table 5-7 Vrbas collection ratio all services - business/institutional users (in RSD 000)

	2003			2004			2005			2006		
Place	**Invoiced**	**Coll.**	**%**	**Inv.**	**Coll.**	**%**	**Invo.**	**Coll.**	**%**	**Inv.**	**Coll.**	**%**
Vrbas	22.718	18.614	82%	24.096	24.141	100 %	29.160	25.444	87 %	37.156	33.625	90 %
Backo	813	440	54%	300	158	53 %	385	211	55 %	526	306	58 %
Zmaje	961	568.	59%	964	560	58 %	945	954	101%	947	784	83 %
Kucur	340	272	80%	321	254	79 %	471	417	89 %	414	459	111 %
Ravno	524	407	78%	212	169	80 %	224	188	84 %	388	332	85 %
Savino	356	251	71%	157	103	66 %	293	151	52 %	456	197	43 %
Total	**25.716**	**20.554**	**80%**	**26.052**	**25.388**	**97 %**	**31.480**	**27.368**	**87 %**	**39.892**	**35.703**	**90 %**

Finally, the table below summarizes data on all users of services of the PUC Standard in Vrbas municipality. The overall collection rate peaked during the year 2005 with 92%, but was more or less stable during the years 2004 to 2006. However, collection rates vary between the villages, with the village of Savino Selo having consistently the lowest collection rates.

On average, the collection rate in 2006 for the municipality of Vrbas was 90%, so that the collected revenues were RSD 138.8 million or € 1.7 million.

Table 5-8 Vrbas collection ratio all services - all users (in RSD 000)

Place	2003			2004			2005			2006		
	Invoiced	**Coll.**	**%**	**Invoced**	**Coll.**	**%**	**Invoced**	**Coll.**	**%**	**Invoced**	**Coll.**	**%**
Vrbas	77.679	65.981	85%	90.095	81.927	91%	103.782	97.539	94%	121.985	112.343	92%
Backo	6.072	4.214	69%	5.797	4.928	85%	7.133	5.935	83%	7.289	6.719	92%
Zmaje	6.544	5.256	80%	7.382	5.973	81%	8.223	7.288	89%	8.609	7.691	89%
Kucur	4.304	2.737	64%	4.292	4.299	100%	5.014	4.751	95%	6.438	5.204	81%
Ravno	4.081	2.536	62%	3.593	3.077	86%	3.930	3.042	77%	5.452	4.002	73%
Savino	3.576	2.127	59%	3.402	2.112	62%	3.894	2.486	64%	4.320	2.867	66%
Total	**102.259**	**82.854**	**81%**	**114.563**	**102.318**	**89%**	**131.979**	**121.044**	**92%**	**154.096**	**138.828**	**90%**

The Charts below clearly illustrate the trends and confirm the conclusions of this paragraph.

Figure 5-1 Vrbas collection rates by customer group

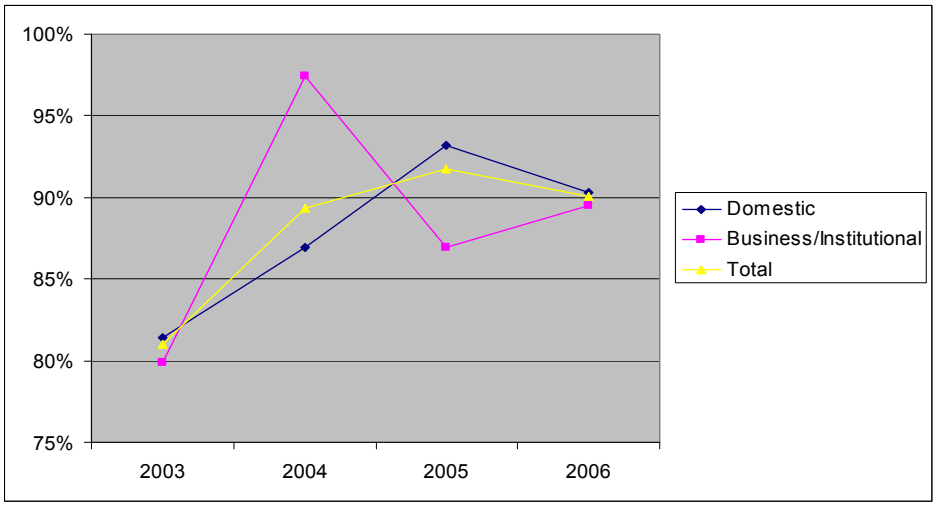
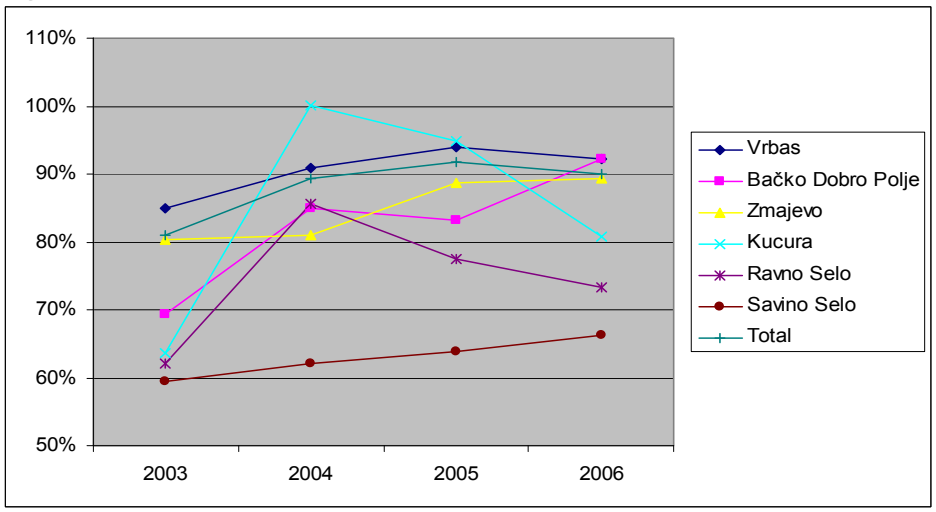


Figure 5-2 Vrbas collection rates by location



5.1.5 Capital structure

The PUC Standard Vrbas was founded in 1967. The PUC, as the majority of public utility companies in Serbia is organized as a 100% state owned company. Therefore, the Municipality of Vrbas has a majority right of management. Ever since founding of the PUC Standard, Vrbas, there was no change in the capital structure. However, with the Government plans on privatizing public companies, there will definitely be some change in the capital structure of public utility companies in the near future.

Table 5-9 Ownership structure (2006)

No	Capital	'000 RSD	Structure (%)
1.	Legal reserves	5,878	2.8
2.	Shareholders capital		
3.	Public capital	199,995	96.2
4.	Other capital	1,982	1.0
	Total Capital	**207,855**	**100**

5.1.6 Water and waste water tariffs

Tariffs for utility companies are regulated and capped by the Ministry of Finance since the year 2006. The current general policy is that tariffs are not allowed to be increased beyond the year's estimated inflation. For the year 2007, the maximum tariff increase has been set at 7.5%. For this reason, PUC's are currently severely constrained in applying a full cost based tariff setting approach. In general, water and waste water tariffs are already at below cost recovery levels, whereas considerable investments will be required to rehabilitate existing infrastructure, let alone extension of service coverage or introduction of new services like waste water treatment.

Tariffs are differentiated by customer groups, with the highest tariff set for the business category and lowest for households. This differentiation is not based on actual cost of service, but rather on the perceived ability to pay. In Vrbas municipality, both water and waste water tariffs for businesses are double the tariff charged to domestic clients. The third category specified as "other" relates to schools, hospitals, and other budgetary beneficiaries. This category is charged at the same level as households. Finally, there is a category of subsidized consumers, which receive discounts on their utility bills, because of their social situation and low ability to pay utility charges

The tariff policy is decided on and approved by the Municipal Assembly. This relates to the tariffs for water supply, waste water, solid waste and minimum cemetery services. For other services supplied by the PUC Standard Vrbas, tariffs are decided and approved by the Managing Board.

Each municipality in Serbia has its own policy of deciding on the moment of tariff increase, often using its power as the PUC owner, and holding the increase for the political or other reasons. Tariffs are often not increased before political elections to maintain social peace.

The tables below set out tariffs for respectively water and waste water services, charged to different groups of users during the last 5 years. As can be concluded from the table, the Municipal Assembly has approved two rather steep tariff increases during the year 2003. Tariffs were not increased during the years 2004 and 2005, although it must be mentioned that as from 2005, 8% VAT is applicable to utility invoices. This resulted in an increase of the tariffs payable by final consumers with 8%. For the years 2006 and 2007, tariffs are increased with the maximum allowed percentage of respectively 9.3% and 7.5%.

Waste water tariffs are set at 50% of the drinking water tariffs. Waste water tariffs are charged pro-rata the quantity of drinking water consumed, without applying a factor water to waste water (usually, wastewater actually discharged into the sewer system is less than the quantity of drinking water consumed).

Table 5-10 Water tariffs RSD/m3 (without VAT)

Consumers/ Categories	Jan 2003	Jul 2003	Apr 2006	Mar 2007
Households	15,00	20,00	21,86	23,50
Business/ Institutional	30,00	40,00	43,72	47,00
Other	15,00	20,00	21,86	23,50

Table 5-11 Wastewater tariffs RSD/m3 (without VAT)

Consumers/ categories	Jan 2003	Jul 2003	Apr 2006	Mar 2007
Households	7,50	10,00	10,93	11,75
Business/ Institutional	15,00	20,00	21,86	23,50
Other	7,50	10,00	10,93	11,75

5.1.7 Cost structure water and wastewater services

Cost structure

PUC Standard Vrbas records all its costs at company level. No breakdown is available for costs by service or place of origin. Therefore, for the purposes of estimating costs incurred for water and waste water and to arrive at an estimate of variable and fixed costs, data had to be extracted manually from the companies' financial accounts.

Certain costs vary directly with each increase or decrease of production units. For example, electricity consumption will increase if more water is produced from the PUC's drinking water wells. These costs are called variable costs. For this study, the following variable costs are identified:

- Electricity consumption
- Fuel consumption
- Chemical consumption

Other costs do not directly fluctuate in the short run when production is increased. These costs are known as fixed costs. The following costs belong to this category:

- Wages & salaries
- Repair & Maintenance
- Taxes and fees
- Depreciation

For the purpose of the financial analysis, the PUC has divided the company into five departments, subdividing costs into fixed and variable for each department:

- Drinking water supply;
- Wastewater/sewerage;
- Komunalac/Ekloterm, comprised of other public services such as district heating, solid waste collection, street cleaning, roads maintenance, parks & public green maintenance, workshop, churches;
- Financial and general department overhead costs. This includes costs for the financial & accounting unit, sales department, customer service, billing & collection;

- Other overhead costs. This includes costs for general management, department for investment and development as well as human resources and legal affairs department.

An organisation chart of the current PUC organization is included in chapter 7. The PUC often shifts people and equipment between departments, in case of urgent repairs, leakages, lack of staff for interventions etc. Therefore, it should be kept in mind that costs cannot be divided strictly between the various identified departments. Despite this, it is believed that the table below provides the best available estimate of direct costs incurred by service.

Table 5-12 Cost break down for different services

	2004	**2005**	**2006**	**2007 plan**
Water supply	**33.585**	**37.519**	**44.927**	**52.695**
Variable costs	7.391	7.706	10.434	11.328
Fixed costs	26.194	29.813	34.493	41.367
Water supply/total costs	19,9%	20,5%	20,6%	20,6%
Wastewater	**6.284**	**9.970**	**9.868**	**9.879**
Variable costs	620	787	1.003	1.180
Fixed costs	5.664	9.183	8.864	8.699
Wastewater/total costs	3,7%	5,5%	4,5%	3,9%
Komunalac+Ekoterm	**110.403**	**113.392**	**136.824**	**159.395**
Variable costs	23.428	27.062	30.238	44.993
Fixed costs	86.975	86.330	106.586	114.402
Komunalac+Ekoterm/ Total costs	65,3%	62,0%	62,8%	62,4%
Financial				
Fixed costs	11.092	13.104	15.284	19.053
Financial/ total costs	6,6%	7,2%	7,0%	7,5%
Overhead costs				
Fixed costs	7.592	9.003	11.049	14.275
Overhead/total costs	4,5%	4,9%	5,1%	5,6%
Subtotal Variable costs	**31.439**	**35.555**	**41.676**	**57.501**
Subtotal Fixed costs	**137.517**	**147.433**	**176.276**	**197.796**
Total costs	**168.956**	**182.988**	**217.952**	**255.297**

During the observing period 2004 to 2006 (and the plan for 2007), regarding water supply, the share of total variable and fixed costs of the water supply department in total costs of the PUC Standard Vrbas, ranged from 19,5% to 20,6%. Within the same department it can be observed that fixed costs were increasing over time, with the share of the total costs ranging from 76% to 78 %. It can also be observed that variable to fixed costs follow the 1:3 ratio. The share of variable costs in the water supply is high due to extensive use of electricity.

The share of total variable and fixed costs of the wastewater department in total costs of the company vary and are low due to the fact that the company does not treat waste water and thus does not consume a lot of chemicals or electricity. The company only uses limited electricity for sewerage pumps, and their share in the total costs ranged from 3.7% to 5.5%. However fixed costs formed almost all the costs incurred in that department, i.e. they ranged from 88% to 92%. The share of variable costs in total costs is expected to grow considerably, once the waste water treatment plant starts to operate.

Variable costs in Komunalac/Ekoterm were high due to costs of fuel used for district heating. Variable and fixed costs of these two departments amounted to 62% to 65% of all costs of the company. Almost 75% of all the variable costs can be traced back to this department. It is expected that during 2007 this ratio will increase eve further to 78%. To off-set this, PUC standard will have to look for subsidies from the founder to cover this future loss, if tariffs cannot be adjusted accordingly.

Since the PUC does not have a decentralized financial management system which allocates overhead to various (productive) departments, the following methodology is used to arrive at an estimate of total water/wastewater costs, including overhead:

- First, total overhead costs are calculated. For PUC Standard, overhead costs consist of the costs of the financial department and other overhead costs;
- Next, for each of the productive departments, the total gross payroll costs are determined;
- Finally, total overhead costs are divided over the various productive departments pro-rata their share in gross payroll.

The rationale for this methodology lies in the assumption that the majority of overhead costs (office costs, human resources costs, financial accounting etc) are directly related to the number of people employed by each of the productive departments.

Application of this methodology leads to the following costs. Since the focus of this study is on the water and waste water activities, only these departments are highlighted, with a more detailed breakdown of costs:

Table 5-13 Cost breakdown water supply including overhead (RSD '000)

Item	actual 2004	actual 2005	actual 2006	plan 2007
Variable costs	**7,391**	**7,706**	**10,434**	**11,328**
Liquid chlorine	418	696	740	750
Electricity	5,688	5,667	7,938	8,143
Fuel and lubricant	1,285	1,343	1,756	2,435
Fixed costs	**29,858**	**34,565**	**40,175**	**49,299**
Wages and Salaries	10,128	12,815	14,768	18,359
Other employer expenses	1,980	2,313	2,705	3,351
Employee benefits		41	19	19
Other materials	1,719	3,826	4,003	3,346
Transport services	388	130	12	15
Repair services	6,672	5,127	6,719	10,080
Other services	2,479	2,394	2,783	2,697
Taxes and fees				
Depreciation	2,828	3,167	3,484	3,500
Other costs				
Overhead costs	3,664	4,752	5,682	7,932
TOTAL	**37,249**	**42,271**	**50,609**	**60,627**

Table 5-14 Cost breakdown waste water collection including overhead (RSD '000)

Item	actual 2004	actual 2005	actual 2006	plan 2007
Variable costs	**620**	**787**	**1,004**	**1,180**
Chemicals				
Electricity	620	787	1,004	1,180
Fixed costs	**7,214**	**11,230**	**10,999**	**11,669**
Wages and Salaries	4,284	5,521	5,549	6,875
Other employer expenses	901	1,068	1,085	1,344
Employee benefits				
Other materials				
Transport services	97			
Repair services		2,166	1,760	
Other services				
Taxes and fees				
Depreciation	382	428	470	480
Other costs				
Overhead costs	1,550	2,047	2,135	2,970
TOTAL costs	**7,834**	**12,017**	**12,003**	**12,849**

Cost recovery

As a general rule, in the analysis of this PUC and in the PUC's alike, full cost recovery can only be achieved through economically set tariffs. From the profit & loss it can be concluded that for the PUC as a whole, tariffs are just sufficient to cover the operating costs. However, it should be kept in mind that the PUC receives considerable operational subsidies from the municipality. These subsidies are in principle paid to offset the costs of non revenue earning services performed by the PUC such as street cleaning, road maintenance etc. However, from the accounts it is not clear what the

individual services actually cost and thus, whether the subsidies received are sufficient or not.

Since this study is mainly concerned with water & wastewater, an attempt is made to assess the level of cost recovery for these services. Since PUC Standard does not make provisions in their accounts regarding doubtful debtors, a provisional calculation has been made, based on the collection rates as detailed in paragraph 5.2.4.

Table 5-15 Pro-forma profit & loss water and waste water PUC Standard (RSD '000)

Description	**2004**	**2005**	**2006**	**2007**
Revenues	**64,187**	**68,871**	**74,602**	**81,000**
Water supply	53,271	54,592	57,290	62,985
Waste water	8,717	8,161	9,709	11,115
Services to third parties	1,275	3,690	5,022	3,200
Septic tank emptying	339	842	878	1,500
Septic waste transport	585	1,586	1,703	2,200
Costs	**52,143**	**59,798**	**70,073**	**81,576**
Water supply	37,249	42,271	50,609	60,627
Waste water	7,834	12,017	12,003	12,849
Doubtful debts	7,061	5,510	7,460	8,100
Gross profit/(loss)	**12,044**	**9,073**	**4,529**	**(576)**
Gross profit margin	19%	13%	6%	-1%

It can be concluded from the table that the current 2007 tariffs are just sufficient to cover the current costs, with a clear declining trend over the years. A continuation of this trend would deteriorate the financial sustainability of the company.

It should be emphasized that most likely depreciation costs are underestimated, since part of the assets in operation are not recognized in the balance sheet of PUC Standard, but remain with the municipality or other financiers. For example, the total net fixed assets for waste water only amount to RSD 14.4 million at 31-12-2006, although substantial investments have been made recently in the main sewerage collector with associated pumping stations and extension of the sewerage network in Vrbas town. If properly recognized and depreciated, conclusion would be that the 2007 tariffs are not sufficient to cover the total costs, but will just be sufficient to cover direct operating costs without depreciation.

5.1.8 Assets

Except for land, capital assets are depreciated each year and the total accumulated depreciation is deducted from the original cost. With the exception of land, capital assets wear out in time or otherwise lose their economic usefulness. Between the time when a given asset is acquired and when it is no longer economically useful, a decrease in its value takes place. This loss in value over a period of years is known as depreciation. Depletion is a term applied to tangible fixed assets, whereas amortization is a term sometimes used to describe the writing off of intangible assets such as patents and trademarks.

All the purchases during the observed years 2004 to 2006 are valued at historical cost. Depreciation is calculated based on the historical value of the real estates, installations and equipment, and intangible assets, applying the linear method.

Table 5-16 Plant and equipment at 31.12. 2006 (RSD '000)

No.	Item	Land	Buildings	Equipment	Plants/ equipment in preparation	Total
1	Purchase value (31.12.05)	2,102	130,537	106,337	26,959	
2	Additions	-		19,862	2,885	
3	Written off (31.12.06)	-		1,972		
4	Subtotal 31.12.2006	2,102	130,537	128,171	29,541	290,351
5	Accumulated depreciation 31.12.2005		55,385	43,423		
6	Depreciation 2006		3,929	13,739	711	
7	Disposals	-		641		
8	Subtotal (5+6)	-	59,314	57,162	711	117,187
9	Net book value 31.12.2006 (4-8)	2,102	71,223	71,009	28,830	173,164

Total net asset value for plant and equipment as at 31 December 2006 is RSD 173 million. Total value of assets over RSD 1.0 million amounts to only RSD 118.0 million. Plant and equipment in preparation were also depreciated in 2006, although this is not required. Land is not depreciated.

As we have seen earlier through the analysis of the Profit and Loss statement, depreciation costs are generally very limited at only 4%-8% of total costs during the period 2004-2007. This proves the fact that the equipment and other assets are almost entirely depreciated. In addition, some fixed assets are not recognized in the balance sheet of the PUC, but remain with the body which originally invested or financed the assets. For example, quite some assets operated by the PUC, but invested directly by the Municipality through its Urban Directorate are not shown in the PUC's balance sheet. It is not known currently what the size is of these off balance sheet assets,

The major categories of assets related to water and waste water are depreciated annually at the following rates:

- Buildings and civil works:
  - Head office 2.5%;
  - Water distribution network 2.5%;
  - Pumping stations 1.5%;
  - Wells 10%;
  - Other buildings / water treatment 2.5%;
  - Other buildings / water supply network 8%;
  - Other buildings / waste water treatment 2%;

For mechanical and electrical equipment, the following rates are used:

- Electrical equipment on capital objects 8%;
- Other mechanical/electrical equipment 6% - 10%;

These rates are in accordance with the government regulation, and are applied respecting the instructions from the Treasury department. By these instructions, fixed assets are depreciated annually, at the end of the fiscal year. However, legal option also leaves it at the company's discretion to depreciate its assets according to their internal regulations, within the period not exceeding 5 years.

The PUC does not regularly revaluate their fixed assets. In an inflationary environment, this leads to the understatement of the real value of the fixed assets if this is valued at historical cost.

5.1.9 Extraordinary revenues and expenditures

Apart from the substantial operational subsidies the PUC receives from the municipality, no other significant extraordinary revenues and expenditure are incurred.

5.1.10 Financial self sufficiency and the current use of profits

In our analysis of the PUC Standard, Vrbas, and through the practice in analyzing other PUC's in Serbia, it is evident that none of these companies is capable of functioning on its own. At best, tariffs are sufficient to cover the direct operating costs. Investments usually are funded directly by the municipality, since these cannot be funded by the PUC from internally generated cash flow. As a result of near zero profits and a low capital base/low depreciation charge, the generated cash flow is only slightly positive.

The PUC is limited in setting its own tariffs. Any tariff adjustments need to be approved by the municipal council, and since 2006 are regulated by the Ministry of Finance.

Any profits made are added to the internal reserves of the company, rather than paid out as dividend.

5.1.11 Billing and collection system

Billing of the customers is done through a combined invoice covering district heating, solid waste collection and water & waste water services. Invoices are issued every third month for households that have water meters and every month for the households without water meter who pay a lump sum amount. Business premise owners are also billed on a monthly basis for the services, as well as Industries.
There is also a category of clients receiving social welfare that do not pay at all for the services of the PUC. Currently, approximately 100 social welfare receivers (mainly war veterans) are exempted from paying PUC standard services. Currently, PUC Standard covers these costs, although in principle these costs should be borne by the municipality.

Collection is somewhat different than in other PUC's. As mentioned earlier, payment of three monthly invoices can be settled by paying the entire bill or just a share of the total. The system is organized in such a way as to first cover any outstanding debt of the client, and than later, more recently billed services. At the end of the year, the PUC

consolidates all the outstanding debts, informs the debtor, and in March clients who still have outstanding debts are brought to court. This cumulative settling is commonly applied in Serbia for payment of electricity bills. Even the lowest payment is recorded as settling of the obligation, and at the end of the calendar year an invoice on outstanding payments is produced, with the level of debt to the PUC. Currently this is the model adopted by the PUC Standard.

With the plans for setting a new PUC for water and wastewater management, this practice of combined billing would have to be changed.

With the current system, a collection rate of 90% is achieved during the year 2006. Although this is relatively high, this figure could be improved even further. A number of measures could be considered, such as:

- Invoice on a monthly basis, instead of quarterly. For metered customers, a monthly estimate could be made and invoiced, based on their past consumption patterns. Meter reading could then be done on an annual basis, followed by a final settlement;
- Pursue settlement of each invoice, instead of waiting until the end of the year;
- Introduce interest or late payment penalty fees;
- Introduce financial incentives to invoice collectors, by linking cash collected to remuneration;

Establish a clear disconnection and reconnection policy, backed by the municipality and council.

5.1.12 Financial management and budgeting practices and systems.

Budgeting system & investment planning

Once per year, a consolidated annual plan and budget is submitted to the Municipal Council for approval. This budget contains:

- A review of last year's operations, including financial overview (budget/realized);
- A descriptive part setting out the plan for the next year;
- A cost/spending budget for the next year;
- An investment plan for the next year, including financing plan;
- A proposed tariff structure for the next year;
- A proposal for operational subsidies from the Municipality.

If approved, this annual plan forms the basis of the operations for the PUC. Problems with this system are:

- Only a 1 year investment and financing plan is prepared. Investments in water/waste water infrastructure are long term in nature, necessitating long term planning and its financing as well;
- Management of the budget is centralized. Monthly management reports compare (cumulative) actual expenditure against the approved budget at the level of the PUC only. No budgets are made available by service line, managed by department heads, nor are costs recordered by service line. Such a hierarchical management system prevents flexibility of operations and actually might lead to higher cost.
- Limited information is available on the actual costs by service; setting of cost based tariffs is therefore next to impossible.

Short term financing

In order to maintain uninterrupted functioning of its company, the PUC has two ways of providing necessary financial means. It is either through borrowing from commercial banks, or through municipal subventions. In respect to subventions from the Municipality of Vrbas, the PUC Standard has to follow a rather strict procedure in order to obtain any funding. The PUC has to provide a list of documents that is often more extensive than the list of documents required by a bank for a commercial loan. However, the PUC Standard rather requests subventions, since this is interest free.

PUC Standard, Vrbas, is taking short term loans to fund its everyday activities. For example, the company cannot risk to postpone settlement of charges from Petrol industry for fuel oil or else risk not be supplied anymore.. In order to settle this and other obligations, the PUC decided to borrow approximately RSD 17 million from commercial banks.

The PUC Standard has also, since last year, a monthly obligation of paying a fee set out by Voda Vojvodine for wastewater discharge into the Grand Canal. This was presented to them through an Executive Decision by Voda Vojvodine (Autonomous Province's Directorate for water and wastewater management). The monthly fee is approximately RSD 620 thousand. Interest for delayed payment is also included, and the PUC Standard will also have to take another loan to fund this obligation.

In 2006 the PUC Standard borrowed from AIK banka several short term loans, amounting to RSD 31.5 million or € 316 thousand. These loans need be repaid within one year.

Table 5-17 Short term loans (in RSD 000 at 31.12.2006)

Bank	Borrowing RSD	Outstanding
AIK banka	22,500	17,950
AIK banka	6,500	5,420
AIK banka	2,500	1,870
Total	**31,500**	**25,240**

The major problem every PUC in Serbia faces is the problem of generating cash, and this is mainly the reason for taking short term loans. The PUC Standard has problems with the Urban Directorate, and other debtors, that are mainly causing this cash shortage (as elaborated above), and forcing the company to find alternative ways of providing uninterrupted services.

Long term financing

PUC Standard took several long term loans to finance purchase of trucks and vehicles for different purposes. These were actually all leasing agreements. These leasing agreements were taken during the period 2004 -2006 and amounted to € 404 thousand, or RSD 31 million. As at year end 2006, RSD 14.4 million was still outstanding.

Table 5-18 Long term loans and outstanding on 31.12.2006

Bank	Borrowing/ 2004-2006 Euro	Borrowing RSD	Outstanding RSD
Panonska banka	177.876	12,028,800	2,874,292
Banka Intesa	58.491	4,991,843	4,438,810
Delta banka	109.081	9,015,740	5,161,844
Hypo banka	58,583	5,011,593	1,938,010
Total	**404,041**	**31,047,976**	**14,412,957**

5.1.13 Accounts receivable and bad debts

Accounts receivable

The table below shows a list of major debtors of the PUC Standard Vrbas for the years 2005 and 2006. During both years, the highest debtor is Direkcija za izgradnju (Urban directorate of Vrbas municipality), which makes up respectively 10% and 13% out of the ten major debtors. PUC Standard, Vrbas signs bilateral contracts with Direkcija za izgradnju (Urban directorate) for the operations that are within the scope of activity of the PUC Standard. These activities are mainly related to the road maintenance in winter period, city hygiene, maintenance of green parks etc. The settling of outstanding debt with Direkcija za Izgradnju is an issue of continuous negotiations, and the PUC Standard, Vrbas is forced to take short term loans in order to fund its operating activities.

Table 5-19 Major debtors 2006

No	NAME	place	RSD (000)	%
1	DIREKCIJA ZA IZGRADNJU	VRBAS	12.816	13%
2	CENTAR ZA FIZIČKU KULTURU	VRBAS	2.186	2%
3	TEHNOMARKET	VRBAS	889	1%
4	VOJVODINA PROMET	VRBAS	740	1%
5	CENTAR ZA FIZIČKU KULTURU	VRBAS	625	1%
6	DANDY PRO	KUCURA	495	0%
7	VELJKO VLAHOVIĆ	VRBAS	422	0%
8	NAPREDAK	VRBAS	366	0%
	TOTAL		**18.540**	**18%**
	Total account receivable		**101.406**	**100%**

Table 5-20 Major debtors 2005

No	NAME	place	RSD (000)	%
1	DIREKCIJA ZA IZGRADNJU	VRBAS	7.506	10%
2	VOJVODINA PROMET	VRBAS	610	1%
3	CENTAR ZA FIZIČKU KULTURU	VRBAS	451	1%
4	BEKO -MODNA KUĆA	VRBAS	423	1%
5	TEHNOMARKET	VRBAS	377	1%
6	NAPREDAK	VRBAS	333	0%
7	BEKO U STEČAJU	BEOGRAD	316	0%
8	VEĆE SAVEZA SINDIKATA	VRBAS	277	0%
9	CARNEX	VRBAS	251	0%
	TOTAL		**10.545**	**14%**
	Total accountsreceivable		**73.707**	**100%**

Total accounts receivable amounted to RSD 73.7 million in 2005 and RSD 101.4 million in 2006.

Bad debts

As discussed earlier in this chapter, PUC Standard has a relatively high collection rate of 90% for all customer categories combined. However, no bad debt policy is applied to make provisions for debt, or to write off debt after a certain event, or time. This leads to the understatement of actual cost of the business and thus the PUC's profitability. When asked, it was stated by PUC staff that the last time the accounts receivable were cleaned from old uncollected debts was during the year 2002.

This situation leads to the rapid increase of total accounts receivable, both in relative (number of days outstanding) and absolute terms, as shown in the table below.

Table 5-21 Accounts receivable (RSD)

Place	2003		2004		2005		2006	
	A/R	Days	A/R	Days	A/R	Days	A/R	Days
Vrbas	13,059,820	61	24,469,140	99	32,636,808	115	38,880,072	116
Bačko Dobro Polje	1,530,235	92	2,655,939	167	3,436,028	176	4,554,525	228
Zmajevo	1,572,74	88	2,887,009	143	3,695,926	164	4,631,078	196
Kucura	856,205	73	2,417,307	206	2,409,960	175	2,673,358	152
Ravno Selo	591,098	53	2,077,032	211	2,593,593	241	3,481,01	233
Savino Selo	506,834	52	1,925,449	207	3,215,602	301	4,623,904	391
Total	**18,116,939**	**65**	**36,431,876**	**116**	**47,987,917**	**133**	**58,843,953**	**139**

Note that the above table only relates to invoiced amounts for services supplied by the PUC and excludes other settlements. Consequently, total accounts receivable cannot be directly compared with the same item as contained in the balance sheet.

5.1.14 Accounts payable

For the years 2005 and 2006, PUC Standard, Vrbas owed to their creditors respectively RSD 30.7 million and RSD 32.1 million. Out of this, the 10 largest creditors had claims totaling respectively RSD 25.3 million (83%) and RSD 24.6 million (77%).

Table 5-22 Major creditors 2006

No	Creditor	Place	RSD (000)	%
1	NAFTNA INDUSTRIJA SRBIJE	NOVI SAD	7.348	23%
2	STF COMMERCE	NOVI SAD	3.958	12%
3	VODE VOJVODINE	NOVI SAD	3.539	11%
4	APV ODELJENJE ZA URB	VRBAS	3.285	10%
5	NAFTAGAS PROMET	NOVI SAD	1.998	6%
6	VRBAS-GAS VRBAS	VRBAS	1.483	5%
7	GRADITELJ	NOVI SAD	901	3%
8	USLUGA	BACKA TOPOLA	769	2%
9	SIGNAL	SOMBOR	701	2%
10	ELEKTROVOJVDINA DOO N. SAD	SOMBOR	616	2%
	TOTAL		**24.596**	**77%**
	Accounts payable		**32.121**	**100%**

Table 5-23 Major Creditors 2005

No	Creditor	Place	RSD (000)	%
1	NAFTNA INDUSTRIJA SRBIJE	NOVI SAD	10.134	33%
2	TEKNOX	BEOGRAD	3.962	13%
3	ELEKTROVOJVODINA DOO N. SAD	SOMBOR	3.435	11%
4	APV ODELJENJE ZA URB	VRBAS	3.285	11%
5	VODE VOJVODINE	NOVI SAD	1.058	3%
6	VRBAS-GAS VRBAS	VRBAS	921	3%
7	ICM ELEKTRONICS	NOVI SAD	854	3%
8	VARIUS -KANTE	BEOGRAD	664	2%
9	ZORKA COLOR	SABAC	521	2%
10	USLUGA	B. TOPOLA	514	2%
	TOTAL		**25.348**	**83%**
	Accounts payable		**30.379**	**100%**

- Outstanding debt decreased by some 9% when comparing 2006 to 2005;
- In both years, the major creditor is the Petrol industry of Serbia, with 33 % in 2005 and 23% in 2006. Costs of fuel and other derivatives used for functioning of the PUC are often subject to permanent increase, and the PUC, like many other companies, have problems in settling these debts. This is the case with almost all PUC's in Serbia, as well as with other public companies;
- Other creditors include private companies like Teknox - Beograd with 13% in 2005 and STF Commerce – Novi Sad with 12% in 2006.
- Obligations towards Vode Vojvodine were 3% in 2005 % to increase to 11% in 2006.
- PUC Standard decreased significantly their outstanding debt towards Elektrovojvodina (Electric company) Novi Sad, from 11% in 2005, to 2% in 2006.

- Directorate for Urbanism was one of the creditors to which the PUC owed 11% in 2005 and 10% in 2006. So, at the same time the Directorate is large debtor and creditor.

Until now, the creditors have not imposed any legal measures against PUC Standard Vrbas. The existing debts toward creditors are settled by means of negotiations and good business practice. Creditors are ready to wait for the PUC and the only measure imposed, is usually an interest and/or penalty fee. The PUC has not experienced any disruptions of their ordinary activities because of the delay in payments.

5.1.15 Non cash settlements

The PUC Standard, Vrbas does not have any operating activities that are covered through non cash settlements.

5.1.16 Tax settlements

Main taxes payable by the PUC are value added tax (VAT) and payroll related taxes and statutory contributions. Corporate tax is also applicable; however in the absence of profits this is usually negligible.

PUC Standard follows the regulations prescribed by the Law on Value Added Tax which states that VAT has to be paid on the 10th of the current month for the previous month. Regulations for taxes on salaries and all other taxes payable to the tax authorities are also prescribed by law for settling each category of taxes.

All of these taxes are paid in cash. No evidence was found on any in kind tax settlements.

5.1.17 Summary and conclusions

Main findings:

- PUC Standard operates at 0% net profit;
- Substantial operational subsidies are received from the municipality to fund non revenue generating activities such as street cleaning, road maintenance and others;
- Labour costs form the largest share of total costs, reaching 46% in 2007. The share of labour costs in total costs is increasing over time;
- Depreciation costs are relatively low and range between 4% to 8% of total costs;
- The company operates at a slightly positive cash flow, but needs to rely on short term bank loans to fund operational expenditure;
- The generated cash flow is insufficient to finance investments; most investments are funded directly by the Municipality or are provided for with capital subsidies;
- Balance sheet ratios are sound; however net debt is relatively high.
- Collection rates are relatively high at 90% during 2006. Although there are no large differences between customer groups, marked differences exist between villages;
- For the PUC as a whole, current tariffs just cover operating costs, although the level of operational subsidies and the costs which they are supposed to cover is difficult to assess in the absence of a cost centre based financial management system;

- The water and waste water tariffs are projected to just cover costs during 2007. The cost coverage ratio is, however, declining as a result of costs increases higher than allowed and applied tariff adjustments;
- Fixed assets are not revaluated regularly. In an inflationary environment, as has been the case in Serbia, this leads to the understatement of the asset base in the balance sheet, but also to the understatement of the depreciation charge and might lead to tariffs being set at below cost recovery levels.
- The PUC does not make provisions for doubtful debts. Instead, uncollectible debt is written off directly, but also this happens irregularly. The last time old debts were written off was during the year 2002. As a result, the average number of days accounts receivable are outstanding increased from 65 days during the year 2003 to 139 days during the year 2006;
- The PUC prepares annual plans and budgets, in conformity with guidelines provided by the Ministry of Finance. There is no multi year planning, integrated with this annual planning & budgeting cycle;
- Management of the budget is centralized at director level;
- There is no tariff setting formula or procedure, since it is currently national policy to cap tariff increase with the estimated inflation for the next year;
- The top 10 of large debtors account for 18% of total accounts receivable during the year 2006. Therefore, there is no concentration of debtors. Largest debtor is the urban directorate of the municipality of Vrbas;
- The top 10 of largest creditors account for 77% of total accounts payable, which is highly concentrated. Main creditor is Naftna Industrija Srbije (fuel supplier), accounting for 23% of the total during 2006.
- The PUC had to take short term loans in order to cover their current liabilities and thus not risk being cut off from supplies.

Main recommendations:

- Review and improve current collection system with the aim to increase the collection rate, revenues and cash flow. Both billing hardware/software and collection procedures can be improved. This would have as an added advantage that the company would be less reliant on short term loans;
- Establish a bad debt policy, including provisioning for bad debt, and make a one time clean up of the debtor database/accounts payables;
- Improve current financial management system by establishing a cost centre based financial management system. In relation to this, establish a more decentralized budgeting and financial management system;
- Based on the improved financial management system, agree on a cost based tariff setting formula or procedure. This is also useful if tariffs continue to be capped, since it serves as facts based information on the required level of tariff;
- Establish a long term financial planning system and integrate this with the annual planning & budgeting cycle;
- Make an inventory of the existing physical asset database and verify these with the financial fixed asset register. Refer also to recommendations made at the end of chapter 6 – institutional analysis;

5.2 Creditworthiness assessment of Vrbas Municipality

5.2.1 Introduction

The PUC Standard in Vrbas is founded and owned by the Municipality of Vrbas. Its functioning is under the direct influence of the local government. This is reflected in all segments of its operations, especially in relation to financial matters. The managing board of the PUC Standard - Vrbas is established in such a way that local government representatives are forming the majority. The managing board of the PUC is entitled to propose tariffs for the services that the PUC is delivering to the citizens. The proposals become effective after municipal assembly approval.

In order to support low income households, tariffs are usually set at a minimum level, that is, at a level at which the PUC can cover their operating costs only without making any profit. As for depreciation costs, which are supposed to recover investments made for long term assets, the PUC is including this item in its costing schemes in accordance with the accounting and other laws and regulations. However, the problem is that the assets of Serbian PUC's were worn out during the 1990-ties with hardly any re-investment or capital replacements taking place. Thus, PUC's were effectively financing their operations - and very often some other social needs - on the expense of their capital asset base. As a result of this policy, most of today's PUC's have a low capital base with corresponding low tariffs. Consequently, they are in a bad position to finance any larger investment from consumer tariffs through internally generated cash flow.

The current situation is that most investments made in Serbian PUC's are financed from the municipal budget. Municipal budgets are the source of direct investments and/or provider of guarantees to the banks for commercial loans. After completion of the investment, the acquired assets are transferred to the PUC's and become part of their balance sheet. PUC's usually do not have any financial obligation against municipal budgets for these assets. To the contrary, if a PUC cannot service its debts, the local government is legally obliged to assume all liabilities and cover the financial obligations.

Therefore, when considering investment in PUC's, it is important to identify the financial position and development of the municipal budget, as well as the financial position of the PUC. The analysis of the budget of Vrbas municipality presented below is based on data from official reports submitted by municipal budget offices to the Ministry of Finance at the end of every budget year, in accordance with the current budget law.

5.2.2 Analysis of the national and local context

The current legal basis for local budget revenues is governed by the Law on Local Self-Government from 2002. Financing of local governments, went through some changes:

- In 2004, local governments' share of revenues based on salary fund tax was discontinued. In order to compensate this decrease in revenues to local budgets, the share of local government in income taxes was increased from 5% to 30%, In addition, the share of sales tax was increased in favour of selected poorer municipalities;
- From January 2005 onwards, sales tax has been replaced with value added tax (VAT). This change affects the way of providing local government budgets with revenues. Instead of sharing the sales tax with central government, the VAT is now

going directly to the central funds, from which local governments are getting current transfers.

- In 2006, a new Law on local government finance has been adopted. The Law became effective on June 23rd, 2007. The main novelty is the decentralization of property tax. Property tax used to be collected by local offices of the National Government and than distributed to local government. By the provisions of the new Law, property tax is directly collected by local government, enabling them to broaden their own tax base/original revenues. Consequently, a unit for collecting property tax is established at the local level and related expenditure is to be borne by local government.

According to the new Law, the local government budgets obtain revenues from three main sources:

- Through local level, where local government can set taxes and collect its own revenues. These are called original revenues, according to the law terminology;
- Through central level, by allocating or sharing the revenues with the central government. These are called shared revenues; and
- Through transfers from central government. This source is defined separately, but since it is coming from central funds it might be considered as a specific type of shared revenue.

Original (own) revenues

The original revenues of local government budgets comprise:

- **Local fees** – administrative, communal and tourist fees;
- **Charges on construction land** – charges for utilization and for development of the city construction land;
- **Other revenues** – include a dozen different revenues (charges for natural resources, charges on sales of assets, interest on deposited budget funds, etc). Generally, revenues generated from this group are small compared to the above two sources. In particular cases these can however provide substantial revenues
- **Self-contribution** – this revenue can be introduced by the decision of citizens made through local referendum. By definition, it is used for development of local capital infrastructure;
- **Donations** – donations could come from different sources such as central level, international organization and other. In this case, they are going directly to the local government;
- **Property taxes** – according to the new Law on local government financing, taxes on property of the private and legal entities are becoming original revenues. This change is important as such, but equally important is the change related to the way how it is collected. After the introduction of this Law (June 23rd, 2007), local governments have taken over part of the central tax administration in order to fully control collection of this revenue. The tax on passing absolute rights is reduced from 5% to 2.5% However during the initial phase, the Republic will for a certain period control the spending of money from tax on passing absolute rights. .

Shared (allocated) revenues

The second large group of local budget revenues consists of revenues that are allocated by national level to the local level. According to the legal terminology, these are called allocated revenues. These revenues consist of:

- **Income taxes** – include a number of taxes on different personal incomes generated from different sources: agriculture and forestry, private business activities, immovable property, leased movable property; prizes in games of chance, personal insurance, part of the salary tax and others; This tax was lowered from 18% to 12% by the Law on income tax in 2006.
- **Property related taxes** – include taxes on inheritance and gift tax, on transfer of absolute rights and on goods and services; These taxes have undergone changes within the new Law on local government financing passed in June 2007, by which the tax on passing absolute rights is reduced from 5% to 2.5%,
- **Different charges on assets of public interest** – include charges for the utilization of different assets of public interest like mineral raw materials; river material; forest land; agricultural land, public roads, environmental protection and environment; investments;
- **Privatization revenues** – include part of the funds (5%) collected through the sale of capital in the privatization process that is taking place within the municipal territory;
- **Transfers** – include transfers from central government. Transfers as a specific type of local budget revenues were introduced in 2005 when the sales tax was replaced by VAT. The new Law on local government finance introduces a wide array of transfers: categorical and non-categorical transfers (which include equalization transfers), compensation, transitional, general and block transfers.

The investment capacity and creditworthiness of local budgets depends on the efficiency of the overall local financial management, which includes the capacity for generating revenues as well as the way in which these revenues are spent. Certain revenues are especially important for funding capital expenditure. These are:

- **Land use development charge**. This revenue is directly related to local investments. It is paid by investors who are planning to invest in construction on land within municipal boundaries. The investor is obliged to pay this charge in cases when he is the owner of the specific construction site, but also when he has the right for using it or the right to erect objects on it. The charge is set in accordance with the costs of developing the site, the purpose of the object and the city zone. Setting the base and rate of this charge is under the jurisdiction of local government.
- **Land use charge**. This charge is used to cover the costs of maintenance of local infrastructure and it is set in accordance with the costs of maintenance. This charge is also under the jurisdiction of local government.
- **Revenue from renting the City assets.** Revenues from renting immobile and mobile assets of the local governments are original revenues. They are supposed to be used exclusively for capital investments. But, since this is not strictly prescribed by law, in certain cases they are used for covering costs of current operations.
- **Self-contribution**. Self-contribution is a traditional revenue source of local government that is to be used for capital investment of special local communities needs such as water supply, roads etc. The contribution is raised and set by local referendum.

- **Privatization revenues**. According to the Law on Privatization, 5% of the proceeds received from selling state or socially owned companies on the territory of the municipality is going to the local government budget.
- **National Investment Plan (NIP) funds** The Government of Serbia had by end of the year 2006, for the first time adopted the NIP for the Serbian economy, covering the period the period 2006 – 2011. The NIP covers all vital economic sectors, employing and allocating on a national level the surplus of the funds from the process of privatization. Due to the increase in citizens' savings and the implementation of a number of economic reforms, the budget of the State of Serbia showed a significant surplus, thus making favourable conditions for development of a concise plan on financing public investments. Municipalities were invited to apply for investment funding.
- **Donations**. From the year 2000 donations, especially from international funds, became an important source of funding capital investments at local government level. In the near future, local government is still planning certain financial inflow from this source, but in mid, and especially in longer period, it is expected that this will decrease. It is expected that accession towards the EU will enable further funding through the EU's new Instrument for Pre-Accession (IPA).
- **Transfers**. Transfers are a relatively new type of revenues for Serbian local government. Until 2005 these transfers were relatively small. It is expected that after the introduction of the new Law on local government finance there will be a considerable increase in transfers. It is expected that this source will become very important for local governments.
- **Property tax**. From June 23rd, 2007 local government has taken over the control of property tax from the Republican level. However, effective from the same date, the taxation rate on tax on passing absolute rights lowered from 5% to 2.5%. However, lowering of this tax rate does not mean that the local government will be less motivated to collect this revenue. Establishment of the local tax administration is considered to be a big change as such and it is expected that this might generally increase fiscal capacity of local government in Serbia.

5.2.3 Municipalities financial operations

Municipal Budget Revenues

As mentioned above, the revenues of the Serbian municipalities consist of two main groups of revenues: own or so called original revenues (the revenues that local governments control, both in defining its level as well as in collecting it) and the allocated or so called shared revenues that are collected by and than distributed from the central level. The new Law on local government finance introduces new types of revenues like transfers which in general could be treated as allocated revenues.

One time transfers for capital investments are apportioned through the National Investment Plan, i.e. if the Municipality presents a well grounded plan to the relevant Ministry, for the investment they wish to be financed.

The budget of municipalities is prepared on the basis of unified budget classification system, that is functional, economic and organizational classification in accordance with the Budget System Law. All the revenues are planned based on the budget realization from previous years, and the plan for current year which is in accordance with the Memorandum on the budget for that year (2007).

The data in the tables below show the limited improvement of the financial autonomy of Serbian local governments, which is the result of Ministry of Finance policy during the last 4-5 years.

Table 5-24 Budget revenues Vrbas municipality

No	Type of revenues	2004 a		2005 a		2006 est		2007 plan	
		RSD m	%	RSD m	%	RS D m	%	RSD m	%
1	2	3	4	5	6	7	8	9	10
I	**Original revenues**	**149**	**34**	**178**	**27**	**171**	**27**	**289**	**31**
1.1.	Fees (administrative, communal, tourist)	28	6	84	13	116	18	108	12
1.2.	Land development charge	52	12	47	7	50	8	55	6
1.3	Property tax							36	4
1.3	Other	70	16	47	7	5	1	90	10
II	**Allocated revenues**	**278**	**64**	**346**	**52**	**412**	**65**	**485**	**52**
2.1	Sales tax	68	16						
2.2	Income tax	163	37	260	39	300	47	283	30
2.3	Property tax	22	5	21	3	32	5		
2.4	Property tax and tax on passing the absolute rights	22	5	30	4	31	5	35	4
2.5	Transfers	2	1	34	5	46	7	163	17
2.6	Other	1	0	1	0	4	1	4	0
III	**Privatization revenues**	4	1	30	5	21	3	10	1
IV	**Credits**		0	100	15	30	5	150	16
V	**Revenue from previous year**	5	1	13	2	0	0	0	0
	TOTAL REVENUES	**436**	**100**	**667**	**100**	**634**	**100**	**933**	**100**

Original revenues
The most important sources of own revenue are different fees that local governments are entitled to introduce and collect.

The share of own (original) revenues in the Vrbas municipal budget was 34% in 2004 and declined in 2005 and 2006 to 27%. However, the plan for 2007 is to increase the share of original revenues to 31%, mainly as a result of the inclusion of property tax from allocated to original revenues.

Compared to the year 2006, the Municipality of Vrbas plans to increase its original revenues during 2007 with 69% compared to 2006. This plan is based on the facts, as presented above, and it is most likely that the Municipality will be able to follow this plan after the switching of property tax collection.

Allocated revenues
The share of allocated revenues changed from 64% in 2004 to 52% in 2005. This change was due to sales tax being replaced by VAT and the introduction of transfers from the Republican level. However, the share of transfers was not as high as the revenue collected through the sales tax. In the following year, 2006, transfers were still relatively low. It was only at the start of 2007 and as a result of the new Law on public

financing that this picture changed for the municipalities, and the transfers apportioned for the Municipality of Vrbas were set at RSD 163 million (four times the amount in 2006). This, of course, should not necessarily represent the final amount; due to the fact that additional revenues can also be approved by the Budget rebalance.
With transfers and revenues from property tax, the Municipality will have a significant increase in both own and allocated revenues. The share of Income tax in 2007 is again lower compared to 2006, because of lowering of this tax from 18% to 12% by the Law on income tax.

Allocated revenues for 2007 will, according to the plan for that year, record an 18% increase. This is again an increase compared to 2006, and revenues will be generated through transfers and income tax.

For allocated revenues, the most significant source is still income tax which constituted more than 37% of total revenues in the period 2004 to 2006. Sales tax participated with 16% in 2004, fiscal revenues obtained through sales tax were used for equalization of the local government budgets. The sales tax was replaced in 2005 with value added tax (VAT), which also took over its role regarding equalization. This revenue is disbursed to local government by means of transfers.

Privatization revenues
Revenues from privatization for Vrbas municipality are relatively minor during the period 2004 to 2007. In 2004 privatization revenue was RSD 4 million, to reach a peak of RSD 30 million in 2005. However, in 2007 it is planned that privatization revenue will be only 1% of total revenues. This is supported by the fact that most of the companies in the area are already privatised, and this trend will continue to decrease even more in the near future, since not many industries are left to be privatised.

Credits
In respect to loans, the municipality of Vrbas borrowed funds from two commercial banks to finance part of their capital expenditures. Loans were taken in 2005, 2006 and, and their share in total revenues was 15% in 2005 to 5% in 2006. The plan for year 2007 is a loan of RSD 150 million or 16% of total sources of finance, to fund an extension of the sewerage network.

Revenues from previous years
Any surplus of budget revenues over expenditures in the previous year is brought forward in the next budget year as budget revenue. This surplus was, however, until 2003 recorded on a separate account. As can be seen from the above table, the Municipality of Vrbas didn't carry over any revenue surplus from 2005 and 2006 from prior years. Planned revenues and expenditures for 2007 do not envisage any budget surplus as well.

<u>Municipal Budget Expenditures</u>
All Serbian municipalities are spending their budget predominantly within the following three areas:

- Financing work of local government administration and governmental bodies, i.e. the municipal council, Mayor office;
- Financing social functions that are under local government competency like education, sport and culture. These institutes are financed by means of transfer of funds; and

- Investments, mostly in local infrastructure.

According to Serbian budget laws, there are no legal restrictions to the use of allocated revenues. These revenues have a general nature. However, for the Serbian municipalities it is compulsory to fund certain social functions like communal services, funding material costs of educational institutions, provision of cultural and sport activities etc. The level of funding of these services and functions is to be decided by the municipality. So, formally local budget expenditures are discretionary, i.e. local governments can independently decide the level of funding for each function.

Having this in mind, it is understandable that the relative share of certain expenditures vary between different Serbian municipalities. Still, a general standard is that municipalities are spending around 1/3 of the total budget to each of the three group of expenditures listed above.

Table 5-25 Budget expenditure Vrbas municipality

No	Type of revenues	2004 a		2005 a		2006 est		2007 plan	
		RSD m	%	RSD m	%	RSD m	%	RSD m	%
1	2	3	4	5	6	7	8	9	10
I	**Municipal bodies and administration**	74	17	219	33	141	22	178	19
II	**Social functions (education, sport, culture, welfare)**	134	31	164	25	193	30	255	27
III	**Reserves**	2	0		0	3	0	14	1
IV	**Funds-residential & others**	25	6	20	3	56	9	95	10
V	**Agency for urbanism and development**	164	38	219	33	171	27	331	35
VI	**Subsidies**	11	3	22	3	45	7	36	4
1	Current subsidies	11	3	22	3	23	4	16	2
	Capital subsidies		0		0	22	4	20	2
VII	**Self-contribution**		0		0	0	0	0	0
VIII	**Other budget expenditure**	19	4	23	4	25	4	25	3
	TOTAL EXPENDITURE	**429**	**100**	**667**	**100**	**634**	**100**	**933**	**100**

The Municipality of Vrbas more or less follows this budget spending pattern, although during the year 2004 and the plan for 2007, spending of municipal bodies is somewhat lower and amounts to respectively 17% and 19%. Agency for urbanism and development, a municipal body to which some of the funds for capital investments are allocated, however receives 35% of the budget.

Municipal Investment Expenditures

The above presented data specify at a rather general level budget revenues and spending in relation to different purposes and/or budget beneficiaries. This paragraph provides more details of the capital investment expenditure budget of Vrbas municipality.

In Serbian municipalities, four main mechanisms of financing investments can be distinguished. These are:

- Capital subventions to the municipal entity specifically established to deal with municipal investments and development. Most Serbian municipalities have this kind of entity, usually called the Agency for Construction and/or Development. Till 2005 this organization had the status of an independent public company and as such was financed through subsidies from the municipal budget. In 2005 in accordance with changes in the current law, the Agency was transformed into a direct budget beneficiary. The scope of work of these departments usually includes spatial planning and development and designing and implementation or monitoring of different municipal investment projects;
- Capital transfers to budget beneficiaries/institutions. Local governments are in accordance with the Law on Local Self Government legally obliged to provide their citizens with certain services like children welfare, culture, sport, covering the material costs of primary and secondary education institutions, etc. Local government is financing the entities that are providing these services. Both operational as well as capital costs are financed;
- Capital subventions to the public companies, include direct transfers of operational and/or capital funds to public companies;
- Direct investments. In this case, municipalities are investing directly into certain projects, so that officially the investor is the municipal administration as a whole. De facto, the investor is usually one of the specific municipal administration departments.

The first two mechanisms are strictly speaking the same: the transfers are made to entities or institutions founded by local government and they have the status of budget beneficiaries, since their legal framework is defined by the Law of Budget System. The practical consequence of this is that all of these institutions are from the financial point of view a part of the local public finance system, meaning that all of them are operating financially within the local treasury system. The only difference is that in the first case municipalities are transferring capital funds to one specialized entity which is then dealing with different investments, while in the second case, each entity is supposed to carry out its own investments.

On the other hand, the third mechanism, subventions to public utility companies, is basically different because the transfers are made to the public companies that do not have a status of budget beneficiaries, although they are users of budget funds. Their legal framework is defined by the Law on Companies/Enterprises, which means that they are not operating within the system of public finance. After the transfer of subventions, the further financial flow to and from the public utility companies is out of the local treasury. In other words, their actual expenditure is not reflected in the local government accounts.

The municipality of Vrbas disburses funds from the local budget to finance capital investments through different channels and institutions:

Table 5-26 Capital expenditure – Vrbas Municipality

No	Type of revenues	2004 a		2005 a		2006 est		2007 plan	
		RSD m	%	RSD m	%	RSD m	%	RSD m	%
1	2	3	4	5	6	7	8	9	10
I	**Capital subventions**	**69**	**69%**	**97**	**43%**	**21**	**13%**	**19**	**6%**
1	PUC Standard	19	19%	22	10%	21	13%	19	6%
2	Water system	-	0%	16	7%	-	0%	-	0%
3	Communal infrastructure	14	14%	-	0%	-	0%	-	0%
4	Low-voltage network	4	4%	-	0%	-	0%	-	0%
5	Sewage	17	17%	33	14%	-	0%	-	0%
6	Public objects	15	15%	26	12%	-	0%	-	0%
II	**Capital expenditure of budget beneficiaries**	**30**	**31%**	**128**	**57%**	**147**	**87%**	**302**	**94%**
1	Municipal administration	2	2%	114	51%	4	3%	5	1%
2	Culture	1	1%	0	0%	5	3%	5	2%
3	Children care	2	2%	1	0%	2	1%	1	0%
4	Sport	7	7%	-	0%	-	0%	1	0%
5	Primary education	4	4%	7	3%	4	2%	-	0%
6	Secondary education	0	0%	1	0%	3	2%	-	0%
7	Social welfare	1	1%	-	0%	-	0%	-	0%
8	Environment	-	0%	-	0%	28	17%	33	10%
9	Water system	-	0%	-	0%	5	3%	2	1%
10	Healthcare	8	8%	6	3%	-	0%	4	1%
11	Solidarity apartments	6	6%	-	0%	-	0%	-	0%
12	Sewage	-	0%	-	0%	21	13%	171	53%
13	Public objects	-	0%	-	0%	74	44%	81	25%
	Total I+II	**99**	**100%**	**225**	**100%**	**168**	**100%**	**321**	**100%**

During the last few years the Vrbas municipality transferred from Capital subventions to Capital expenditure of budget beneficiaries.

During 2006, the municipality of Vrbas incurred capital expenditures amounting to RSD 168 million, equivalent to € 2.1 million. Planned capital expenditure budget for the year 2007 increased considerably to RSD 321 million, equivalent to € 4.0 million.

Main emphasis of the investments during the years 2006 and 2007 is on the environmental system and especially extension end upgrade of the sewage system. During 2006, RSD 74 million or 44% of total capital investment was spent on Public objects such as houses of culture and cinemas, RSD 28 million was spent on environmental protection or 17% of total capital investment and finally improvement of the sewage system was supported with RSD 21 million or 13% of total capital investment. In 2007 the plan is to spend RSD 171 million or 53% on capital investments in the sewage system and RSD 81 million or 25% on public objects, followed by 10% on environmental protection.

These expenditures have been financed from budget revenues and long term loans. The large increase during 2007 is planned to be funded by a combination of loans, but also by introducing new original revenues like: self contribution on wages from employees on the municipality territory (RSD 30 million), revenues from renting real estate owned by the state for the usage of municipality bodies, organisations, and institutions/public offices (RSD 44.5 million) and proceeds from the sales of real estate (RSD 15 million)
Another source of finance is the National Investment Plan. The Municipality of Vrbas has applied for funding from the NIP to finance investments in sewerage network and was granted in total € 400 thousand. Out of this, € 60 thousand was disbursed during 2006, with the remainder expected to be paid during 2007. It should be noted that these funds are directly paid by the organisation managing the fund at national level and thus, are not included in the Vrbas municipal budget.

According to the current Budget System Law, municipalities can borrow up to 50% of current revenues from the previous' year realized budget revenues. Furthermore, the sum of the repayment and interest rate for all unsettled long term debits shall not exceed, on an annual basis, 15% of revenues in the previous year.

The Ministry of Finance is regularly publishing these limits and they are applied very strictly. According to the last official release from the Ministry of Finance, valid for the year 2007, the municipalities of Vrbas and Kula can borrow up to the following limits:

Table 5-27 Borrowing limits Vrbas and Kula municipalities (2007, € 1 = RSD 79)

No	Municipality	Realized revenues 2006		Borrowing limit 2007	
		RSD m	€ th	RSD m	€ th
1	Vrbas	581	7,354	160	2,031
2	Kula	423	5,354	212	2,679
	Total	**1,004**	**12,708**	**372**	**4,710**

Source: Ministry of Finance Serbia

Because of loans already taken during prior years, the borrowing limit of Vrbas municipality as of 2007 is limited to RSD 160 million. During the year 2007, Vrbas municipality plans to take a loan of RSD 150 million. This would almost completely consume their legally allowed borrowing capacity.

Kula municipality on the other hand did not take any loans. Therefore, their 2007 borrowing capacity equals 50% of 2006 realized revenues.

Municipal balance sheet

The balance sheets of Serbian municipalities are burdened with a number of limitations and deficiencies. One of the biggest deficiencies is the fact that during 90-ties, the Republic government took over most of the local government property. This has made a tremendous impact on Local Government balance sheets. Some of the Local governments continued to keep record of the assets in their balance sheets. Others stopped doing that, only to restart recording these assets again around the year 2000. And another group transferred the bookkeeping of their assets to some of their entities, like the Agency for development. Because of this, balance sheets of Serbian local government cannot be compared in a meaningful way.

Having the above in mind, the analysis of local governments' balance sheets and the possible conclusions should be taken into account more as an illustration of the present situation than as a solid fact.

Municipality of Vrbas continued to keep their assets in the accounting books. The major findings regarding the balance sheet of Vrbas municipality are:

- The value of the total assets of Vrbas municipality increased during the period 2003 to 2005 from RSD 125 million to around RSD 295 million, which is the result of relatively intensive investments during these years, as well as a low starting point;
- Fixed assets almost entirely consist of buildings/real estate;
- The only liability Vrbas municipality recorded in the balance sheet, is a loan of RSD 100 million (or € 1.2 million) from a commercial bank in 2005;

Table 5-28 Balance sheet Vrbas municipality (RSD million)

Items		2003	2004	2005
I	**ASSETS**			
1	**Non-financial assets**	**116**	**132**	**278**
1.1	Buildings	97	116	260
1.2	Equipment	17	13	14
1.3	Other assets	2	2	4
1.4	Land			
1.5	Non-financial assets in preparation			
2	**Current assets**	**9**	**15**	**17**
2.1	Cash	9	13	12
2.2	Reserves			
2.3	Receivables (funds)		2	4
	TOTAL	**125**	**147**	**295**
II	**CAPITAL AND LIABILITIES**			
1.	**Capital**	**125**	**147**	**195**
1.1	Buildings	116	132	182
1.2	Equipment			
1.3	Non-financial assets in preparation			
1.4	Received deposits			
1.5	Transfers			
1.6	Payable		1	
1.7	Revenues brought from previous years	2	5	13
1.8	Surplus of revenues	6	9	
2	**Liabilities**	**-**	**-**	**100**
2.1	Credits			100
2.2	Privatization fund			
2.3	Refunds			
2.4	Deficit			
	TOTAL	**125**	**147**	**295**

The balance sheets data for 2006 and 2007 were unavailable at the moment of writing this study, although a breakdown of the municipalities' main fixed assets as at the end of 2006 are detailed in the table below:

Table 5-29 Main assets (as at 31.12.1006)

Offices	RSD m	€ th
Head office Vrbas/city/old	7,3	92
Head office Vrbas/city/new	137	1,717
Head office B.D Polje	0,3	4
Head office Zmajevo	-	-
Head office S.Selo	0,6	7
Head office Kucura	-	-
Total	**146,0**	**1,820**

Credit history and financial management capacity

In general, Serbian municipalities do not have a long credit history since the legal framework enabling municipalities to borrow for investments purposes was limited. Major changes were starting from 2002 with the new Budget System Law which introduced the possibility for Serbian municipalities to make use of capital markets and draw loans. However, the practice of taking long term loans to finance large investment projects did not become significant until 2003.

Municipalities in Serbia are now changing the practice of applying conservative financial policies of avoiding loans and keeping a relatively high surplus of cash in order to avoid liquidity problems. They are more interested in improving the functioning of their regions, and are assisted in this by a number of international grants being awarded to improve communal services.

Being given legal rights to borrow money from commercial banks, municipalities are entering into these agreements respecting various conditions under which banks are ready to lend money to local communities. Municipalities have equal borrowing rights as any other company in the trade market. The difference lies in providing collaterals. Each municipality has an account with the State Treasury, through which all the transfers from the State budget to the Municipality are directed. In case of borrowing, the bank usually requires signing a letter of authorisation with the municipality to debit their account with the Treasury for any outstanding loan repayment. This proves to be rather firm collateral since the municipalities have regular transfers from the State and loans practically bear very little risk of being repaid.

Presently, the municipality of Vrbas has signed two loans amounting to approximately € 1.8 million:

- A contract for a long term loan with Banca Intesa AD Beograd signed in December 2006 amounting to € 383 thousand. This loan was drawn to fund extension of the sewerage network; and
- A long term loan with AIK BANKA AD Nis, from July 2005 for € 1.4 million. This loan was taken to fund the construction of business premises for several PUC's.

The Municipality of Vrbas signed a loan agreement with Banka Intesa on December 22nd, 2006 for € 383 thousand (RSD 30 million), for investing into the extension of the sewerage network. The loan is repayable in RSD at 7.18% interest and a front end fee of 1% is charged. Draw down was spread over 108 months (9 years), with 12 months grace period and first instalment falling due on January 22nd, 2008. The last instalment is falling due on December 22nd, 2016. As collateral, the Municipality has placed 10 promissory notes and 10 Agreements on Authorisation by which the Bank can claim any outstanding debt with the local Treasury department (where the Municipality has its business account). Under the provisions of this contract the beneficiary is obliged to enable the Bank insight into allocation of the borrowed money. The bank shall decide on the time and monitoring method.

The second loan agreement was originally signed on July 29th 2005 and amounted to RSD 100 million repayable in RSD, at 6.7% interest and a front end fee of 1%. Since the loan was dinar denominated, the bank included a clause on retail price increase rate to cover the inflation risk. Drawdown was spread over 5 years with 12 months grace period (eight equal six months instalments, first instalment falling due upon expiry of the grace period). The Municipality had signed bilateral contracts with each contractual party (three public utility companies), under which each party had to submit to the Municipality 10 promissory notes to secure loan repayment. On the other hand, the Municipality, AIK BANKA AD Nis, and the local Treasury department signed an agreement on debiting municipal account with the Treasury as collateral. On January 29th 2007, the bank and the municipality rescheduled the loan. The amount of the loan was increased from RSD 100 million to RSD 113 million or € 1.4 million. It was Euro denominated, but payable in RSD. The repayment period was changed to 3 years (13 equal three months instalments, first falling due on 01.06.2007, and the last falling due on July 29th 2010). Other loan terms and conditions remained unchanged. The Municipality has so far duly paid the first instalment and the front end fee.

The actual increase of this loan by RSD 13 million was not recorded in the budget plan for 2007, since the Annex to the main contract with the bank was signed at the beginning of 2007. The actual increase is expected to be recorded upon the realization of the municipal budget.

The municipality is also in the process of reviewing borrowing conditions of several commercial banks on taking another long term loan for the sewerage network for RSD 150 million or €1.9 million, as planned in their mid term regional plan and the budget plan for 2007. By taking this loan the Municipality would have completely used their legally prescribed borrowing limit, which for the 2007 amounts to € 2.0 million.

The Municipality of Vrbas is eager to build a well organized community, and as many other municipalities in Serbia it has introduced relatively efficiently all of the reforms introduced by the Serbian public finance at local level such as new accounting system (in accordance with international standards), local treasury system and new budget procedures.

5.2.4 Creditworthiness assessment Vrbas municipality

Creditworthiness during the period 2004 – 2007

The Table below summarizes the trends regarding the financial position of Vrbas municipality:

Table 5-30 Vrbas municipality actual 2004 – 2006 and plan 2007 (RSD million)

No	Item	2004	2005	2006	2007 plan
I	**Current Revenues (1+2+3+4)**	**376**	**477**	**533**	**688**
1	Own Current Revenues	98	131	121	204
2	Share of State Taxes	276	312	367	322
3	Other state Transfers	2	34	46	163
4	Donations				
II	**Current Expenditures**	**328**	**439**	**452**	**553**
A	**Current Surplus/Deficit (I-II)**	**48**	**37**	**81**	**136**
5	Capital Revenues	56	78	71	95
6	Capital Expenditures	99	225	168	321
B	**Capital Surplus/Deficit (5-6)**	**(43)**	**(147)**	**(97)**	**(226)**
C	**Net Surplus/Deficit Before Financing (A+B)**	**4**	**(110)**	**(15)**	**(90)**
7	Borrowing	-	100	30	150
8	Cash brought from previous year	5	13	0	0
9	Debt Service	-	3	12	46
10	Reserves	2	-	3	14
D	**Net Debt Increase/decrease (7+8-9-10)**	**3**	**110**	**15**	**90**
E	**Net Surplus/Deficit (C+D)**	**7**	**0**	**-**	**(0)**

- Municipal current revenues have increased during the period 2004 to 2006. During this period, current revenues grew from RSD 376 million in 2004 to RSD 533 million in 2006, or by 42%. The plan for year 2007 is RSD 688 million.
- During the same period, current expenditures were growing slower than current revenues at 38%. The plan for year 2007 is to increase current expenditures by 31% (from RSD 452 million in 2006 to RSD 553 million in 2007).
- Capital expenditures during the period 2004 to 2006 had an irregular trend from RSD 99 million in 2004, RSD 225 million in 2005 and RSD 168 million in 2006. The plan for 2007 is to increase capital investments to RSD 321 million, 52% increase if compared to 2006.
- Capital revenues for the period grew at a relatively low pace with 22% (from RSD 56 million in 2004 to RSD 71 million in 2006). The plan for year 2007 is RSD 95 million.

The high growth rate of the investment expenditure can be partly explained by the low basis of the investments in the year 2004. However, compared with investment data of other municipalities we have analysed for the same period, the Municipality of Vrbas has an active investment history. High growth of investment expenditure is also explained by the active use the municipality makes of loan financing, internal revenue instruments such as local self contribution and international and national grant financing. More recently and supported by reforms of public finance, municipal budgets have been growing strongly, which enabled them to initiate and fund investments.
The current surplus of the municipality of Vrbas, grew from RSD 48 million in 2004 to

RSD 81 million in 2006. The plan for 2007 is a further increase of current surplus to RSD 136 million. On the other hand, the capital cash flow (capital revenues minus capital expenditures) during these years was consistently negative: capital revenues only can finance part of the investment expenditures. The reason for this is the intensive investment program that has been initiated from the year 2000, but also the characteristic of the local public finance system in Serbia, which does not differentiate strictly between current/operational and capital revenues. However, although not legally prescribed, some taxes and fees are levied with the purpose to improve infrastructure in a municipality. For example, the land development charge is usually defined as revenue of the local agency for development, which in turn uses it to upgrade or fund new infrastructure. Revenues from renting municipal assets are used as a general source to fund the municipalities' capital investment program.

In the case of Vrbas municipality, the current surplus during each of the years 2004 to 2007 was insufficient to fund the capital deficit, even after using cash brought forward from previous years. In other words, Vrbas municipality can not manage to finance a fast growing investment program without having to borrow funds.

The Table below provides some selected indicators which confirm the above trend.

Table 5-31 Municipality of Vrbas financial indicators

Indicators of revenues	**Benchmark**	**2004**	**2005**	**2006**	**2007**
Current revenues / Total revenues		87%	86%	88%	88%
Shared revenues / Total revenues		64%	56%	61%	41%
Original (local) revenues / Total revenues		35%	32%	28%	37%
Revenues from sale of property / Total revenues	2 - 5%	0%	0%	0%	2%
Capital revenues / Total revenues		13%	14%	12%	12%
Operating result / Current revenues		13%	8%	15%	20%
Indicators of expenditures					
Current expenditures / Total expenditures		77%	66%	73%	63%
Operating result / Current expenditures		15%	8%	18%	25%
Capital revenues / Capital expenditures		56%	35%	42%	30%
Capital investments / Total expenditures		23%	41%	28%	41%
Indicators of financial state					
Total expenditures / Total revenues	95% - 100%	99%	120%	103%	112%
Total expenditures / Current revenues		114%	139%	116%	127%
Indicators of indebtedness					
Debt / Total revenues from previous year		0%	23%	23%	41%
Debt service / Total revenues from previous year		0%	1%	2%	8%

Revenue indicators:

- The share of current in total revenues is stable throughout the years; the plan for the year 2007 is to maintain this level;
- The share of allocated revenues in total revenues decreased from 64% in 2004 to 61%, in 2006, and according to 2007 plan revenues will be further decreased to 41%, due to the switch of the property tax and decreased income tax;
- Original revenues show oscillations from 28% to 35%. The plan for 2007 is to increase these revenues to 37%, again being the result of reclassified property tax collection.
- The ratio between operating result and current revenues was below 10% in 2005; the plan for the year 2007 is to keep this ratio at 20%.

Expenditure indicators:

- The share of current in total expenditures during the period 2004 to 2006 varied from 63% to 77%; the plan for the year 2007 is to decrease current spending;
- Capital revenues coverage of capital expenditures decreased considerably during the period 2004 to 2006,. This trend is set to continue during the year 2007;
- Capital investments as a percentage of total expenditures varied between 23% to 41%, plan for the year 2007 is 41%;

Indicators of financial state:

- Total expenditures were lower than total revenues in 2004, while in the 2005 to 2006 total expenditures exceeded total revenues by 20% in 2005 and 3% in 2006. The plan for 2007 again envisages that the expenditures will exceed revenues by 12%. The gap is mainly financed by bank loans.

Indicators of Indebtedness:

- During the observed period Debt to Total revenues from previous year was constant in 2005 and 2006 at 23%, but is expected to increase to 41% during the year 2007.

With the planned borrowing in 2007, the Municipality of Vrbas can fund its ambitious investment plan. However, any further indebtedness during coming years would be constrained, because of legal borrowing limits.

Funding of municipal investment plans by issuance of municipal bonds could be an appealing alternative compared to commercial bank loans. So far, however, this has not been initiated yet in Serbia. Neighbouring countries, including former FRY republics, are preparing (Republic of Srpska), or started (Croatia) projects on municipal bonds issuance.
Many organizational changes will however have to be made in Serbia, prior to addressing the bond issuance, such as instituting a body that will be in charge of controlling the municipal bond market, but also the issue of ownership of assets.

<u>Creditworthiness forecast during the period 2008-2017</u>
The projection of Vrbas municipal creditworthiness is based on data supplied by the budget department of Vrbas municipality. In order to assess the sensitivity of the projections to changes in the macro-economic environment, three different scenarios are presented: a base case, an optimistic and a pessimistic macro-economic scenario. Details of these macro-economic scenarios are presented in paragraph 5.2 financial and

economic analysis. The projections are based on the municipal plan for 2007, with corrections for changes related to the new Law on local government financing.

The projection of budget revenues is based on the following assumptions:

- Current division of local budget revenues in accordance with the new law on local government finance;
- According to the same law, as from 2007, the tax on property is going to change its status from allocated to own revenues. The administration of this tax will be decentralized, so that the local government will be directly in charge of collecting this tax. For this reason it is assumed that this tax will have an autonomous increase in the future

The specific revenue growth parameters that have been used for the projection are presented in the table below:

Table 5-32 Municipal projection – revenue growth assumptions

I	**Own revenues**	
1.	Fees (administrative, communal, tourist)	- RSD Inflation - Real GDP growth
2.	Charge for land use and development	- RSD Inflation - Real GDP growth - Autonomous growth of revenues 1.5% (base), 3% (optimistic), 0% pessimistic
1.3.	Property tax	- RSD Inflation - Real GDP growth - Autonomous growth of this revenues from 0 (1-5 year), 3%/5%/0% (5-10 year), 6%/10%/0% (11-15 year)
4.	Other	- RSD Inflation
II	**Allocated revenues**	
2.1.	Income tax	- RSD Inflation - Real Wage Increase
2.2.	Heredity tax and tax on passing the absolute rights	- RSD Inflation - Real GDP growth
2.3.	Property tax	- RSD Inflation - Real GDP growth
2.4.	Transfers	- RSD Inflation - Real GDP growth
2.5.	Other	- RSD Inflation

The projection of Vrbas municipality budget expenditures is based on different growth patterns for the following three main groups of expenditure:

- Expenditure related to the administration and governmental bodies;
- Expenditures related to social functions; and
- Expenditures related to operational expenditures of local development and utility operational subsidies.

The projection of budget expenditures is based on the following assumptions:

Table 5-33 Municipal projection – expenditure growth assumptions

No	Type of expenditures	Parameters of the projections
1.	Administration and municipal bodies	- RSD Inflation
2.	Social functions	- RSD Inflation - Real GDP growth
3.	Current subsidies	- RSD Inflation - Real GDP growth
4	Other current expenses	- RSD Inflation

After projecting revenues and expenditures, the net surplus before financing and before capital expenditure is estimated for each of the three macro economic scenarios. Next, debt service commitments arising from the outstanding loans with AIK and Intesa banks are deducted from this amount. The remaining balance is in principle available for the funding of capital projects.

To assess the possibility for the municipality of Vrbas to finance the first phase of the project, it is assumed that the planned 2007 loan to fund the sewerage extension will carry the following commitments:

Financing by a bank loan, assuming 100% drawdown during 2007, with the following conditions:

- Loan amount RSD 150 million, equivalent to € 1.8 million;
- Loan is Euro denominated, but repayable in RSD;
- 10 year loan period;
- 1 year grace period;
- Interest rate margin 3.5% above EURIBOR, interest during grace period is not capitalized;
- EURIBOR at 4%;
- Front-end fee 1.0%;
- No Commitment fee.

Based on this, the model will assess the capability of Vrbas municipality during the period 2007 to 2017 to assume any further debt and/or capital financing directly from the municipal budget.

Of course this does not mean that this study proposes the Municipality of Vrbas to finance 100% of the investment. The projection just assesses the possibility of Vrbas municipality to assume the maximum amount of the liabilities. In the end it is up to the municipality to decide on an appropriate key or mechanism to finance the municipal part of the project, or to attract funding from other sources to close the financing plan.

The final result of the projection is presented in the tables below. The results are presented both in RSD as well as Euro.

Table 5-34 Vrbas Municipality budget forecast – base case

	Unit	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Vrbas - base case											
Total budget revenues	RSD m	838	914	1,000	1,094	1,203	1,317	1,442	1,579	1,708	1,851
Total current expenditures	RSD m	593	638	687	740	797	855	917	985	1,052	1,124
Operating result	**RSD m**	**246**	**276**	**313**	**354**	**406**	**462**	**525**	**594**	**656**	**727**
Budget capital financing											
Sewerage extension	RSD m										
Others	RSD m										
Loan financing - drawdown											
Sewerage extension	RSD m										
Debt service											
Loan 1: AIK	RSD m	42	41	20	-	-	-	-	-	-	-
Loan 2: Banka Intesa	RSD m	6	6	6	5	5	5	5	5	4	-
New loan	RSD m	28	28	27	26	25	24	23	22	21	-
Available for capital spending	**RSD m**	**169**	**202**	**260**	**323**	**376**	**433**	**497**	**568**	**631**	**727**
Outstanding principal amount (at beginn	RSD m	279	226	170	131	110	90	68	46	23	0
Total budget revenues	€ th	9,865	10,541	11,310	12,197	13,223	14,270	15,389	16,603	17,701	18,910
Total current expenditures	€ th	6,971	7,358	7,771	8,249	8,761	9,263	9,791	10,356	10,901	11,480
Operating result	**€ th**	**2,893**	**3,183**	**3,539**	**3,947**	**4,462**	**5,007**	**5,598**	**6,248**	**6,800**	**7,429**
Budget capital financing											
Sewerage extension	€ th										
Others	€ th										
Loan financing - drawdown											
Sewerage extension	€ th										
Debt service											
Loan 1: AIK	€ th	498	470	225	-	-	-	-	-	-	-
Loan 2: Banka Intesa	€ th	69	66	63	60	57	54	50	47	44	-
New loan	€ th	335	320	305	290	275	260	245	230	215	-
Available for capital spending	**€ th**	**1,991**	**2,327**	**2,946**	**3,597**	**4,130**	**4,693**	**5,302**	**5,970**	**6,541**	**7,429**
Outstanding principal amount (at beginn	€ th	3,284	2,601	1,919	1,456	1,213	971	728	485	243	0
Max borrowing capacity	€ th	4,702	4,932	5,270	5,655	6,098	6,612	7,135	7,694	8,302	8,851
Max additional borrowing capacity (50%	€ th	1,418	2,331	3,352	4,199	4,885	5,641	6,407	7,209	8,059	8,851

Table 5-35 Vrbas Municipality budget forecast – optimistic case

	Unit	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total budget revenues	RSD m	844	917	1,000	1,091	1,198	1,316	1,447	1,591	1,740	1,909
Total current expenditures	RSD m	594	637	683	733	788	847	912	982	1,058	1,141
Operating result	**RSD m**	**249**	**280**	**317**	**358**	**410**	**469**	**535**	**609**	**681**	**768**
Budget capital financing											
Sewerage extension	RSD m										
Others	RSD m										
Loan financing - drawdown											
Sewerage extension	RSD m										
Debt service											
Loan 1: AIK	RSD m	40	37	18	-	-	-	-	-	-	-
Loan 2: Banka Intesa	RSD m	6	5	5	5	5	4	4	4	4	-
New loan	RSD m	27	26	24	23	22	21	20	19	18	-
Available for capital spending	**RSD m**	**177**	**212**	**269**	**330**	**384**	**444**	**511**	**587**	**660**	**768**
Outstanding principal amount	RSD m	262	208	153	116	97	78	59	40	20	0
Total budget revenues	€ th	10,574	11,489	12,531	13,674	14,940	16,331	17,862	19,548	21,268	23,230
Total current expenditures	€ th	7,449	7,983	8,561	9,190	9,824	10,510	11,254	12,061	12,936	13,887
Operating result	**€ th**	**3,125**	**3,506**	**3,970**	**4,484**	**5,116**	**5,821**	**6,608**	**7,487**	**8,331**	**9,343**
Budget capital financing											
Sewerage extension	€ th										
Others	€ th										
Loan financing - drawdown											
Sewerage extension	€ th										
Debt service											
Loan 1: AIK	€ th	498	470	225	-	-	-	-	-	-	-
Loan 2: Banka Intesa	€ th	69	66	63	60	57	54	50	47	44	-
New loan	€ th	335	320	305	290	275	260	245	230	215	-
Available for capital spending	**€ th**	**2,222**	**2,650**	**3,377**	**4,134**	**4,784**	**5,508**	**6,313**	**7,210**	**8,072**	**9,343**
Outstanding principal amount	€ th	3,284	2,601	1,919	1,456	1,213	971	728	485	243	0
Max borrowing capacity	€ th	4,908	5,287	5,744	6,266	6,837	7,470	8,166	8,931	9,774	10,634
Max additional borrowing capacity (50%	€ th	1,624	2,686	3,826	4,810	5,624	6,499	7,438	8,446	9,531	10,634

Table 5-36 Vrbas Municipality budget forecast – pessimistic case

	Unit	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total budget revenues	RSD m	889	987	1,081	1,173	1,260	1,342	1,441	1,548	1,664	1,787
Total current expenditures	RSD m	636	703	766	828	886	940	1,002	1,069	1,140	1,216
Operating result		**254**	**284**	**314**	**345**	**374**	**402**	**439**	**480**	**523**	**571**
Budget capital financing	RSD m										
Sewerage extension	RSD m	-	-	-	-	-	-	-	-	-	-
Others		-	-	-	-	-	-	-	-	-	-
Loan financing - drawdown	RSD m										
Sewerage extension											
Debt service	RSD m										
Loan 1: AIK	RSD m	52	53	27	-	-	-	-	-	-	-
Loan 2: Banka Intesa	RSD m	7	8	8	8	7	7	7	6	6	-
New loan	**RSD m**	35	36	37	37	36	35	33	31	29	-
Available for capital spending	RSD m	**159**	**187**	**243**	**300**	**331**	**360**	**399**	**442**	**488**	**571**
Outstanding principal amount		-	-	-	-	-	-	-	-	-	-
Total budget revenues	€ th	8,446	8,680	8,968	9,269	9,672	10,098	10,741	11,428	12,160	12,942
Total current expenditures	€ th	6,036	6,179	6,359	6,545	6,803	7,075	7,469	7,889	8,334	8,807
Operating result	**€ th**	**2,410**	**2,501**	**2,610**	**2,724**	**2,869**	**3,023**	**3,272**	**3,539**	**3,826**	**4,135**
Budget capital financing											
Sewerage extension	€ th										
Others	€ th										
Loan financing - drawdown											
Sewerage extension	€ th										
Debt service	€ th										
Loan 1: AIK	€ th	498	470	225	-	-	-	-	-	-	-
Loan 2: Banka Intesa	**€ th**	69	66	63	60	57	54	50	47	44	-
New loan		335	320	305	290	275	260	245	230	215	-
Available for capital spending	€ th	**1,508**	**1,645**	**2,017**	**2,374**	**2,537**	**2,709**	**2,976**	**3,262**	**3,567**	**4,135**
	€ th										
Outstanding principal amount	€ th	3,284	2,601	1,919	1,456	1,213	971	728	485	243	0
Max borrowing capacity	€ th	4,203	4,223	4,340	4,484	4,634	4,836	5,049	5,371	5,714	6,080
Max additional borrowing capacity (50%	€ th	918	1,621	2,421	3,028	3,421	3,865	4,321	4,885	5,471	6,080

The main findings of the above projections are:

- Due to existing debt service obligations, the available annual surplus for capital spending is constrained;
- Cumulative total available budget for capital projects during the period 2008 to 2010 under macro-economic base case scenario amounts to € 7.2 million, with a pessimistic scenario resulting in € 5.1 million and an optimistic scenario totalling € 8.1 million;
- Assuming that around 50% of this balance is allocated to waste water infrastructure, the municipality could commit an additional € 3.6 million during the period 2008 to 2010, assuming a base case scenario. Including the already allocated 2007 budget of RSD 171 million (± € 2.1 million), the total potential municipal financing of the waste water project would thus amount to € 5.7 million.
- There is some limited scope for additional borrowing during the period 2008 to 2010, as a result of growing municipal revenues and principal repayment of existing loans. This is estimated at € 3.3 million cumulative (base case scenario);
- Assuming that the grace period for this loan would be set at a minimum of 3 years, the total available municipal capital budget for the period 2008 to 2010 would amount to € 10.3 million (base case scenario);
- If 50% of this would be used to fund waste water infrastructure, the total municipal financing of the project could amount to ± € 7.3 million, including the already allocated 2007 budget of € 2.1 million.

Finally, the table below summarizes some key indicators of Vrbas. These indicators confirm that Vrbas municipality can sustain the debt taken under all macro-economic scenarios. Of course this is also a result of the strict borrowing constraints imposed by the Ministry of Finance.

Table 5-37 Vrbas Municipality - budget forecast indicators

	Unit	Rate		2008	2009	2010	2011	2012	2013	2014	2015	2016
Indicators - base case												
Vrbas												
Operating result / total revenues	%	MIN=	29%	29%	30%	31%	32%	34%	35%	36%	38%	38%
Operating result / Total debt service	multiple	MIN=	3.2	3.2	3.7	6.0	11.3	13.4	16.0	18.9	22.5	26.2
Outstanding Debt / operating result	multiple	MAX=	1.1	1.1	0.8	0.5	0.4	0.3	0.2	0.1	0.1	0.0
Outstanding Debt / revenues previous yı	%	MAX=	35%	35%	26%	18%	13%	10%	7%	5%	3%	1%
Debt service / revenues previous yr	%	MAX=	10%	10%	9%	6%	3%	3%	2%	2%	2%	2%
Indicators - optimistic case												
Vrbas												
Operating result / total revenues	%	MIN=	29%	30%	31%	32%	33%	34%	36%	37%	38%	39%
Operating result / Total debt service	multiple	MIN=	3.5	3.5	4.1	6.7	12.8	15.4	18.6	22.4	27.0	32.1
Outstanding Debt / operating result	multiple	MAX=	1.1	1.1	0.7	0.5	0.3	0.2	0.2	0.1	0.1	0.0
Outstanding Debt / revenues previous yı	%	MAX=	33%	33%	25%	17%	12%	9%	6%	4%	3%	1%
Debt service / revenues previous yr	%	MAX=	9%	9%	8%	5%	3%	2%	2%	2%	2%	1%
Indicators - pessimistic case												
Vrbas												
Operating result / total revenues	%	MIN=	29%	29%	29%	29%	29%	30%	30%	30%	31%	31%
Operating result / Total debt service	multiple	MIN=	2.7	2.7	2.9	4.4	7.8	8.6	9.6	11.1	12.8	14.8
Outstanding Debt / operating result	multiple	MAX=	1.4	1.4	1.0	0.7	0.5	0.4	0.3	0.2	0.1	0.1
Outstanding Debt / revenues previous yı	%	MAX=	39%	39%	31%	22%	16%	13%	10%	7%	5%	2%
Debt service / revenues previous yr	%	MAX=	11%	11%	10%	7%	4%	4%	3%	3%	3%	2%

5.2.5 Risks & Weaknesses

The risk of default on credits and other financial obligations of municipalities in Serbia is generally not very high, because of the strict application of the law on public finance by the Central Government/Ministry of Finance. This law regulates the municipal debt market by setting the limit to accumulated municipal debt to maximum 50% of the previous' year realized budget revenues. In addition, debt service is not to exceed 15% of the previous' year realized budget revenues. Municipalities have to apply for a permit to the Ministry of Finance for any debt they wish to take. The Ministry of Finance controls whether the municipalities adhere to the stipulations of the law on public finance and especially these debt limits, before issuing the permit.

The other factor that is decreasing risk in servicing debts of local governments is the still relatively slow procedure in creating debts. According to the new law on public procurement and new treasury procedures, the process of initiating project implementation is very slow. It could be said that Serbian municipalities still did not develop management capacity to spend efficiently funds available on viable projects. This is one of the reasons for not having spent funds as planned during the budget year.

The municipality of Vrbas has in the recent past actively used the instrument of borrowing from commercial banks. A third loan is currently being procured. This latest loan would completely absorb the remaining legal borrowing capacity during the year 2007. Although the municipality will be exposed to debt service liabilities, its financial position is not considered to be very risky, as shown in the table above,

Certain risks could be related to the coming reform of the local governmental system which includes considerable changes in the financial operational system:

- The new law on local governments financing envisages the establishment of a tax administration at the local level and take over much bigger responsibility for collecting larger original (own) revenues;
- Introduction of the new elaborated treasury system that will integrate the system of public finance in Serbia;
- Introduction of public procurement law;

- Starting with the accounts of the 2006 financial year, municipalities and public companies are obliged to have their accounts audited and certified by an external auditor.

The risk is related to the reforms not being implemented successfully or creating excessive bureaucracy. On the other hand, a successful implementation will enhance the local government financial management system and increase the creditworthiness of the municipalities.

There is a political risk. Change of either the mayor or the constitution of the assembly can change political priorities. Frequently, (senior) managers in both the city administration as well as related public companies are changed as a result of a newly elected mayor from a different political party or a change of the assembly.

Although municipal accounts do separate between capital and current accounts, little attention is paid to a strict separation of the two types of expenditure. Frequently, current and investment expenditures are mixed up. Actual expenditures of subventions given to public utility companies are not reflected in the municipal accounts. This all makes it difficult to track planned investment versus actual expenditure.

Conclusion is that many local government reforms are recently introduced which, if implemented successfully, will contribute to enhance the creditworthiness of municipalities. A potential item for a creditworthiness enhancement program could be strengthening the municipalities' capacity to plan and track long term capital investment.

5.3 Financial analysis of the Project and affordability analysis

5.3.1 Introduction

Based on several assumptions as outlined below, this chapter analyses the financial feasibility of both the project and its effect on the finances of the planned new water and waste water treatment Public Utility Company. The analysis and projections for the profit & loss account, balance sheet, cash flow statement of the company as well as the financial cost-benefit analysis will be carried out for 32 years in total (2 year construction and 30 operational years), which coincides with the estimated usable lifetime of the equipment of the waste water treatment plant and is in accordance with international practice for such type of projects. Therefore, the analysis will cover the years 2008 to 2039.

The model uses as an input the water and waste water demand projections elaborated upon in chapter 3. Furthermore, it builds upon the estimated staffing numbers required to operate the scheme as set out in chapter 7 and the priority investment plan detailed in chapter 3.

The financial analysis only takes into consideration the first stage investment and any necessary reinvestment required to sustain operations. The proposed second stage (main sewer to Kula and capacity expansion of WWTP) and third stage (tertiary treatment of WWTP) are therefore excluded from all calculations. This is done in order to be able to clearly identify the financial effects on the company and required tariffs of the first stage construction, and to be able to carry out a financial cost-benefit analysis in line with EU guidelines.

All revenues and expenditures are presented in nominal values.

The appendices contain the full set of outputs of the financial model.

5.3.2 Option analysis

This chapter does not contain a further option analysis, since this has been summarized already in chapter three – technical analysis. The selected technical alternative will be used as a starting point for this chapter. The selected alternative is:

- Staged construction of a central waste water treatment plant using conventional technology (primary and secondary treatment). The short tem investment plan (Stage I) will be able to treat waste water of 100,000 people equivalent (PE);
- Construction of a sewage distribution system in 5 villages in Vrbas municipality, with connection to the central waste water treatment plant, instead of decentralized treatment.

5.3.3 Assumptions

Macroeconomic scenarios

Underlying macro-economic assumptions of the model build upon data used by the EBRD, with some changes to reflect recent actual exchange rates. A base case scenario, with a probability of 50% will be used throughout this chapter. Pessimistic and optimistic scenarios are used to assess the sensitivity of the financial model to changes in these assumptions.

The table below summarizes the three macro economic scenarios:

Table 5-38 Base case scenario

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2037	2039
RSD Inflation	%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EUR Inflation	%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
RSD/EUR Nominal Exchange Rate	RSD	85.0	86.7	88.4	89.7	91.0	92.3	93.7	95.1	96.5	97.9	113.4	131.4	135.3
Real Appreciation RSD vs EUR	%	1.0%	1.0%	1.0%	1.5%	1.6%	1.6%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Real GDP Growth	%	4.0%	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Real labour wage increase	%	3.0%	3.0%	4.0%	4.0%	5.0%	5.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%

Table 5-39 Pessimistic scenario

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2037	2039
RSD Inflation	%	15.0%	10.0%	8.0%	7.0%	6.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
EUR Inflation	%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
RSD/EUR Nominal Exchange Rate	RSD	105.3	113.7	120.5	126.5	130.3	132.9	134.2	135.5	136.8	138.1	152.4	168.0	171.3
Real Appreciation RSD vs EUR	%	0.0%	0.0%	0.0%	0.0%	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Real GDP Growth	%	0.0%	1.0%	2.0%	2.0%	2.0%	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Real labour wage increase	%	0.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

Table 5-40 Optimistic scenario

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2037	2039
RSD Inflation	%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
EUR Inflation	%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
RSD/EUR Nominal Exchange Rate	RSD	79.8	79.8	79.8	79.8	80.2	80.6	81.0	81.4	81.8	82.2	86.2	90.2	91.0
Real Appreciation RSD vs EUR	%	2.0%	2.0%	2.0%	2.0%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.6%	1.6%
Real GDP Growth	%	7.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Real labour wage increase	%	3.0%	3.0%	4.0%	4.0%	5.0%	5.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%

Investments

In chapter 3, a priority investment plan is elaborated upon. The financial model assumes that the first phase priority investment plan can be completed during the years 2008 to 2010.

Re-investments are required after 15 operational years for the electro-mechanical part of the waste water treatment plant and pumping stations of the sewerage network extension. Phase 2 (WWTP capacity extension to serve Kula town and industries) and phase 3 (tertiary treatment of WWTP) are left outside of this financial analysis. The required tariff adjustment therefore only cover phase I investments. If subsequent phases are implemented, a tariff review will be required.

The estimated investment amounts are summarized in the table below. Individual items include provisions for contingencies and VAT.

Table 5-41a Investments

Financial year ending	Units	Total	2008	2009	2010
WWTP (incl. contingencies, incl. VAT)					
Investigation works & design	€ m	0.50	-	0.25	0.25
Construction works	€ m	5.11	-	2.55	2.55
Electro-mechanical equipment	€ m	5.87	-	2.93	2.93
Additional land acquisition (1,5 ha)	€ m	0.02	-	0.02	-
Trial run, staff training, operation	€ m	0.30	-	0.15	0.15
Sewerage			-	-	-
Vrbas main sewers	€ m	0.46	-	0.23	0.23
Vrbas villages sewerage extension - civil works	€ m	1.35	0.28	0.54	0.54
Vrbas villages sewerage extension - elctr/mechanical	€ m	0.39	0.08	0.15	0.15
Vrbas villages sewerage extension - pipes & fittings	€ m	9.69	1.98	3.85	3.85
Supervision			-	-	-
Supervision WWTP	€ m	0.92	-	0.46	0.46
Supervision sewer extension	€ m	0.59	0.12	0.24	0.24
Total	**€ m**	**25.18**	**2.46**	**11.37**	**11.35**

Table 5-41b Re-investments

Financial year ending	Units	Total	2024	2025
WWTP - electro-mechanical equipment	€ m	8.26		8.26
Sewerage pumps Vrbas villages	€ m	0.53	0.53	

Apart from the re-investment listed above, no other discretionary investments have been included for the new investments, since the investment program is assessed to capture all required investments for support of the operations of the waste water treatment plant and sewerage extension in Vrbas villages. In addition, sizable allocations are made in the projections for maintenance and repair, which should be sufficient to keep the investments in a proper condition.

The new PUC will also operate the current drinking water supply system and existing sewage collection network in Vrbas city. For these current operations, replacement investments have been estimated in such a way that these are equal or slightly higher than the current depreciation charge, with one exception. The sewerage extension in Vrbas city is currently being finalized, with a total investment value estimated at € 1.4 million. It is assumed that depreciation of this investment will commence as from the year 2008. It should be noted that the level of investment for drinking water supply is not

sufficient to either substantially upgrade or extend current service level quantity and/or quality.

Financing

The first phase priority investment plan is planned to be financed by Vrbas municipality, a grant from the Ministry of Agriculture, Forestry and Water, Directorate-General Water and the EU-IPA funds.

At present, the municipality has already allocated in its 2007 budget RSD 171 million (€ 2.1 million) for sewerage projects. The Ministry of Agriculture, Forestry and Water has committed in writing € 3 to € 4 million for the new waste water treatment plant, provided 100% financing is secured (see Annex 5.1). For the purposes of this financial analysis, 1/3 of the total cost of the waste water treatment plant is assumed to be financed by the Ministry, in line with the Ministries' current policy for this type of investment.

For the purposes of the financial analysis, EU-IPA funds are assumed to amount to 75% of eligible costs (excluding VAT, land acquisition). Actual grant size will depend on the appraisal of this feasibility study, availability of funds and the applicable grant determination mechanism. This is further discussed in paragraph 5.3.10 of this chapter.

Table 5-42 Source of financing phase I/Priority Investment Plan

Financial year ending	Units	Total	2008	2009	2010
EU-IPA	€ m	18.56	-	9.28	9.28
Min. Agriculture, DG Water	€ m	3.87	-	1.94	1.94
Municipal contribution	€ m	2.75	2.46	0.16	0.14
Loan	€ m	-	-	-	-
Total	**€ m**	**25.18**	**2.46**	**11.37**	**11.35**

Other potential funding sources are also targeted by the Municipality of Vrbas, such as the National Investment Plan and Vojvodina Investment Fund. However, at present (august 2007), none of these are confirmed. Any additional funding can be used to lower the municipal contribution, or to lower funding from EU-IPA.

Revenues

The single main revenue stream for the PUC is tariffs charged to different customer groups. The setting of these tariffs will be elaborated upon in paragraph 5.3.6, but in principle is based on full cost recovery, using straight line historical depreciation and the polluter pays principle. This will be applied to both existing water system components and proposed new sewage collection and waste water treatment components.

The WWTP sludge treatment process generates electricity, which in principle is a second revenue stream. Since this generated electricity is used for the operations of the WWTP itself, it will be directly deducted from the plant's operational costs, instead of being treated as additional revenues.

A distinction will be made in revenue projections between the "with" and the "without" project situation. This is necessary in order to be able to:

- Estimate total future water and waste water costs and to assess incremental impact on final consumer's tariff and affordability to pay;
- Determine the costs and required tariffs for each component of the water and waste water system;

- Estimate the project's incremental revenue stream for the cost benefit analysis.

The "without" project is comprised of the following components:
- Drinking water production and distribution in Vrbas city and villages;
- Sewage collection in Vrbas city;
- Management & administration of the PUC (i.e., overhead costs).

In addition to the above two components, the "with" project is comprised of the following additional components:
- Sewage collection and transport of 5 villages in Vrbas to the WWTP;
- Waste water treatment plant in Vrbas municipality.

Allowances for bad debt will reduce the revenue stream of the PUC. Two scenarios for revenue collection rate will be used in the analysis. The Base case assumes that collection rates will improve from the current 90% for all customer groups to 95% by the year 2009. This base case scenario will be used throughout the analysis. A low case scenario, which basically assumes that the collection rate remains constant at 90% during the analysis period, will be used to assess the impact on the required tariffs.

Expenditures

Expenditures are distinguished in two categories:
- Variable costs (electricity, fuel, water, chemicals, sludge transport and effluent discharge fees). These costs directly fluctuate with the amount of drinking water produced and waste water delivered to the sewage collection system;
- Fixed costs (wages, maintenance, insurance, depreciation). These costs do not directly fluctuate with the amount of drinking water produced and waste water delivered to the sewage collection system.

Also for expenditures a distinction will be made between the "without project" situation and the "with project situation"

The following 2007 base prices are assumed for the various expenditure categories:

Table 5-43 Variable operation and maintenance assumptions (2007 prices)

Variable costs		
Electricity	RSD/kwh	5.0
Chemicals - FeCl3/Coagulant	RSD/kg	24
Chemicals - polyelectrolyte	RSD/kg	300
Transport & disposal sludge	RSD/m3	320
Effluent discharge fee - Vode Vojvodina , fixed	RSD/m3	1.40
Effluent discharge fee - Vode Vojvodina , variable	RSD/m3	0.46

Table 5-44 Fixed operation and maintenance assumptions (2007 prices)

Fixed costs		
Employee costs (gross salaries)		
Unskilled Labour	RSD/year	360,000
Skilled Labour - high school	RSD/year	480,000
Skilled labour - academic/college	RSD/year	600,000
Management - college	RSD/year	600,000
Management - academic	RSD/year	720,000
Higher Management - academic	RSD/year	840,000
Employee benefits	%	20.0%
Maintenance rates % of investment		
Civil works	%	0.5%
Pipes & fittings - water	%	0.75%
Pipes & fittings - sewerage	%	0.75%
Mechanical equipment	%	3.0%
Electrical equipment	%	2.0%
Insurance costs % of investment		
Civil works	%	0.1%
Pipes & fittings - water	%	0.1%
Pipes & fittings - sewerage	%	0.1%
Mechanical equipment	%	0.7%
Electrical equipment	%	0.7%
Depreciation		
Civil works	years	50
Pipes & fittings - water	years	40
Pipes & fittings - sewerage	years	50
Electro/mechanical equipment	years	15
Average depreciation water infrastructure	years	20
Average depreciation waste water infrastructure	years	20

Depreciation rates are set in accordance with current practice of PUC Standard. It should be noted that the depreciation of civil works at 50 years is rather high compared to international practice, although not unrealistic.

Starting from the first year of operations, input prices are adjusted for real and nominal price increases, using the following assumptions:

Wages and salaries: inflation + real wage increase
Employee benefits: inflation + real wage increase
Electricity: inflation + real GDP growth
Transport services: 50% inflation + 50% real wage increase
Repair/Maintenance: 50% inflation + 50% transport services
Other services: 50% inflation + 50% transport services
Taxes & fees: inflation only
Chemicals: inflation only
Other costs: inflation only

This results in the following nominal increases:

Table 5-45 Price escalation O&M costs

Financial year ending	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2037	2039
Wages and Salaries	8.2%	8.2%	9.2%	9.2%	10.3%	10.3%	10.3%	10.3%	8.2%	8.2%	8.2%	8.2%	8.2%
Employee benefits	8.2%	8.2%	9.2%	9.2%	10.3%	10.3%	10.3%	10.3%	8.2%	8.2%	8.2%	8.2%	8.2%
Electricity	9.2%	10.3%	10.3%	10.3%	10.3%	9.2%	9.2%	9.2%	8.2%	8.2%	8.2%	8.2%	8.2%
Transport services	6.6%	6.6%	7.1%	7.1%	7.6%	7.6%	7.6%	7.6%	6.6%	6.6%	6.6%	6.6%	6.6%
Repair services	5.8%	5.8%	6.1%	6.1%	6.3%	6.3%	6.3%	6.3%	5.8%	5.8%	5.8%	5.8%	5.8%
Other services	5.8%	5.8%	6.1%	6.1%	6.3%	6.3%	6.3%	6.3%	5.8%	5.8%	5.8%	5.8%	5.8%
Taxes and fees	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Chemicals	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Other costs	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%

Apart from unit prices and unit price increases, expenditure patterns are estimated based on the following assessment (major items only):

- Staffing follows the schedules as elaborated upon in chapter 7. It is assumed that the new PUC starts operating as from the year 2011;
- Overhead mainly consists of personnel costs. This will increase as from the year 2011 when the new PUC starts to commence operations. Overhead is charged to the four production units pro-rata their share in total salary- and wages costs. Overhead allocated to the new project components (waste water treatment and sewage collection in 5 villages) is treated as incremental overhead costs.
- Drinking water supply
    - Planned 2007 costs are used as a basis for estimating future costs;
    - Discretionary investments are estimated at the lower of either realized earnings before interest, tax, depreciation and amortization (EBITDA) or cumulated cash;
- Sewage collection Vrbas City
    - Planned 2007 costs are used as a basis for estimating future costs;
    - Discretionary investments is estimated at the lower of either realized earnings before interest, tax, depreciation and amortization (EBITDA) or cumulated cash;
    - As from the year 2008, an additional depreciation charges is added as a result of finalization of the € 1.4 million Vrbas city sewage network extension;
- Sewage collection 5 Vrbas villages
    - Network operational for 20% in 2009, 60% in 2010 and 100% in 2011;
    - Electricity consumption of sewage pumps estimated at 1 million Kwh in 2011;
- Waste water treatment
    - Start of operations in 2011;
    - Use of poly-electrolyte estimated at 9,500 kg in 2011;
    - Electricity usage in 2011 (net of generated electricity from sludge line) estimated at 1,225 million Kwh;
    - Sludge production estimated at 8,800 m3 in 2011;
    - Fixed part effluent discharge fee based on design capacity of 6.4 million m3 waste water delivered at WWTP.

Working capital will be calculated assuming:

- Average day of accounts receivable will gradually reduce from the current 120 days to 60 days by the year 2010;
- Average day of accounts payable will gradually reduce from the current 80 days to 45 days by the year 2010;
- Inventories are estimated at 30 days turnover.

Water and waste water demand projection

In chapter 3, demand projections for both water and waste water have been elaborated upon. The main assumptions have been set out in this chapter as well. This analysis is used as an input in the financial model.

In situations where steep hikes in tariffs occur, final consumer demand can be expected to decrease because of price elasticity effects. Especially in situations where actual water usage is high, demand can be expected to fall per consumer, because consumers can easily and at low cost decrease their (excessive) water usage. Water usage per capita in Vrbas municipality is however rather low at less than 135 liter per capita per day. Although tariff increases are inevitable, price and income elasticity effects on water and waste water demand are not expected to have a major effect on demand per capita and have therefore not been taken into consideration. The sensitivity analysis set out later in this chapter will assess the impact of variations in demand on the financial feasibility of the project.

The tables below summarize the drinking water and waste water demand for Vrbas municipality.

Table 5-46 Drinking water demand projection Vrbas town and villages

Financial year ending	Units	2006	2007	2008	2009	2010	2011	2012	2017	2027	2039
Water sale total - Vrbas town &	m3/y	2,539,976	2,595,679	2,629,539	2,663,595	2,697,847	2,732,297	2,766,944	2,924,873	3,185,199	3,428,491
domestic	m3/y	2,232,727	2,281,945	2,297,820	2,313,793	2,329,866	2,346,040	2,362,315	2,420,123	2,529,816	2,655,658
industry	m3/y	174,890	175,008	185,836	196,714	207,645	218,628	229,663	284,442	370,151	442,610
institutional users	m3/y	132,359	138,725	145,884	153,088	160,336	167,628	174,966	220,309	285,232	330,223
Losses											
Water losses out of water sold	%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%
Water losses out of water produced	%	28%	28%	28%	28%	28%	28%	28%	28%	28%	28%
Water losses	m3/y	973,632	994,984	1,007,964	1,021,018	1,034,148	1,047,353	1,060,634	1,121,172	1,220,961	1,314,220
Water production - TOTAL	m3/y	3,513,608	3,590,663	3,637,503	3,684,613	3,731,995	3,779,650	3,827,579	4,046,046	4,406,160	4,742,711

As can be concluded from the table, water demand is expected to increase slightly over the 32 year analyzed period, at about 1% per annum. This is the result of a slightly projected increase in population and an increase in per capita demand. Water losses as a result of technical and commercial losses have been kept constant at 28% throughout the period. This is done based on the assumption that no major replacement of distribution network or water mains will take place.

Table 5-47 Waste water demand projection Vrbas town and villages

Financial year ending	Units	2006	2007	2008	2009	2010	2011	2012	2017	2027	2039
Wastewater Vrbas city + villages	m3/y	724,566	972,387	1,486,638	2,012,448	2,428,062	4,156,317	4,187,500	4,329,636	4,563,929	4,782,892
by type of customer											
domestic	m3/y	607,050	820,451	1,272,424	1,729,037	2,096,880	2,111,436	2,126,083	2,178,111	2,276,834	2,390,092
Industry -small	m3/y	60,076	75,968	112,500	153,485	186,881	196,765	206,697	255,998	333,136	398,349
industry - big	m3/y	-	-	-	-	-	1,697,250	1,697,250	1,697,250	1,697,250	1,697,250
institutional users	m3/y	57,440	75,968	101,714	129,926	144,302	150,866	157,470	198,278	256,709	297,201
by location											
Vrbas town	m3/y	724,566	972,387	1,200,297	1,435,266	1,458,580	3,179,308	3,202,950	3,323,662	3,511,597	3,670,263
Vrbas villages	m3/y	-	-	286,341	577,182	969,482	977,009	984,550	1,005,974	1,052,332	1,112,629
Infiltration											
Vrbas town	m3/y	788,400	788,400	851,472	914,544	977,616	1,040,688	1,103,760	1,103,760	1,103,760	1,103,760
Vrbas villages	m3/y	-	-	75,686	151,373	227,059	302,746	378,432	425,736	491,591	536,112
Wastewater delivered to the WWTP	m3/y	1,512,966	1,760,787	2,413,797	3,078,364	3,632,738	5,499,751	5,669,692	5,859,132	6,159,279	6,422,764
Wastewater delivered to the WWTP	m3/d	4,145	4,824	6,613	8,434	9,953	15,068	15,533	16,052	16,875	17,597

Waste water demand is expected to grow significantly up to the year 2011 when the major industries are connected to the sewerage system, the sewage collection system in Vrbas villages is finalized and the WWTP becomes operational. Thereafter, demand only grows marginally, roughly in line with growth in water demand. Waste water demand from the two large industries is kept constant.

5.3.4 Expenditure forecast

"Without project" expenditures

Based on the assumptions elaborated upon above, a forecast of expenditures of the "without project situation" is made. The "without project situation" consists of the drinking water supply system, sewage collection system in Vrbas city and part of the overhead costs. The tables below summarize the projected expenditures of these components. The expenditures include allowances for overhead.

Table 5-48 Drinking water expenditures

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Variable costs		**12,396**	**13,663**	**15,066**	**16,619**	**18,338**	**20,067**	**21,963**	**24,044**	**26,127**	**28,394**	**64,122**	**168,188**
Liquid chlorine	000 RSD	798	849	902	960	1,020	1,083	1,150	1,221	1,297	1,377	2,442	4,720
Electricity	000 RSD	9,008	10,060	11,234	12,544	14,005	15,465	17,078	18,857	20,620	22,548	53,752	148,142
Fuel and lubricant	000 RSD	2,590	2,755	2,930	3,116	3,313	3,518	3,735	3,966	4,210	4,469	7,928	15,325
Fixed costs	000 RSD	**52,581**	**55,970**	**59,826**	**67,358**	**72,976**	**79,355**	**86,382**	**94,019**	**100,903**	**108,293**	**219,965**	**523,274**
Wages and Salaries	000 RSD	19,855	21,473	23,449	26,611	29,338	32,345	35,661	39,316	42,520	45,986	100,667	257,754
Employee benefits	000 RSD	3,645	3,942	4,304	4,885	5,385	5,937	6,546	7,217	7,805	8,441	18,479	47,314
Other materials	000 RSD	3,513	3,689	3,873	4,067	4,270	4,484	4,708	4,944	5,191	5,450	8,878	15,943
Transport services	000 RSD	16	17	18	20	21	23	24	26	28	30	56	121
Repair services	000 RSD	10,663	11,281	11,963	12,687	13,488	14,339	15,244	16,206	17,144	18,137	31,835	62,533
Other services	000 RSD	2,853	3,018	3,201	3,394	3,609	3,837	4,079	4,336	4,587	4,853	8,518	16,731
Taxes and fees	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation	000 RSD	3,500	3,534	3,577	3,766	3,766	4,003	4,315	4,607	4,886	5,170	7,969	12,709
Other costs	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Overhead costs	000 RSD	8,535	9,016	9,440	11,929	13,099	14,387	15,805	17,367	18,741	20,226	43,563	110,169
TOTAL	000 RSD	**64,977**	**69,633**	**74,892**	**83,977**	**91,314**	**99,421**	**108,345**	**118,063**	**127,030**	**136,686**	**284,086**	**691,462**

Table 5-49 Sewage collection system Vrbas city - expenditures

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Variable costs	000 RSD	**1,591**	**2,097**	**2,349**	**2,632**	**2,948**	**3,270**	**3,627**	**4,022**	**4,417**	**4,850**	**11,844**	**32,977**
Electricity	000 RSD	1,591	2,097	2,349	2,632	2,948	3,270	3,627	4,022	4,417	4,850	11,844	32,977
Fixed costs	**000 RSD**	**17,398**	**18,529**	**19,868**	**23,418**	**25,567**	**28,085**	**30,782**	**33,644**	**36,106**	**38,778**	**79,873**	**193,243**
Wages and Salaries	000 RSD	7,435	8,041	8,781	10,593	11,679	12,876	14,196	15,651	16,926	18,306	40,074	102,607
Employee benefits	000 RSD	1,454	1,572	1,717	2,071	2,284	2,518	2,776	3,060	3,310	3,579	7,836	20,063
Other materials	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Transport services	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Repair services	000 RSD	2,500	2,645	2,805	2,974	3,162	3,362	3,574	3,800	4,019	4,252	7,464	14,661
Other services	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Taxes and fees	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Depreciation	000 RSD	2,812	2,894	3,030	3,030	3,228	3,603	3,945	4,220	4,390	4,589	7,159	12,056
Other costs	000 RSD	-	-	-	-	-	-	-	-	-	-	-	-
Overhead	000 RSD	3,196	3,376	3,535	4,749	5,214	5,727	6,292	6,913	7,461	8,052	17,342	43,856
TOTAL costs	**000 RSD**	**18,988**	**20,626**	**22,217**	**26,050**	**28,515**	**31,355**	**34,409**	**37,667**	**40,523**	**43,628**	**91,717**	**226,220**

Total overhead costs are set out in the table below. Overhead is allocated to the various production departments pro-rata their share in total wages and salaries costs. Therefore, it is not entirely a "without project" cost.

Table 5-50 Overhead expenditures

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Wages and Salaries	000 RSD	10,237	11,072	12,090	16,235	17,899	19,734	21,756	23,986	25,941	28,056	61,416	157,254
Employee benefits	000 RSD	-	-	-	3,247	3,580	3,947	4,351	4,797	5,188	5,611	12,283	31,451
Other materials	000 RSD												
Energy (Electricity)	000 RSD	66	73	80	89	98	107	116	127	138	149	326	834
Transport services	000 RSD												
Repair services	000 RSD	45	47	50	53	56	60	64	68	72	76	133	262
Other services	000 RSD	908	961	1,019	1,080	1,149	1,221	1,298	1,380	1,460	1,544	2,711	5,325
Taxes and fees	000 RSD												
Depreciation	000 RSD	475	475	475	475	475	475	475	475	475	475	475	475
Other costs	000 RSD												
TOTAL	000 RSD	**11,732**	**12,628**	**13,715**	**21,179**	**23,257**	**25,543**	**28,061**	**30,834**	**33,274**	**35,911**	**77,345**	**195,601**

Starting in 2011, costs increase considerably for overhead, as a result of the start of operations of the new PUC. New positions are required and some positions cannot be shared with the existing PUC Standard and therefore require new staff. For example, the billing and collection will have to be managed independently from PUC Standard, which requires new billing & collection staff.

"With project" expenditures

Expenditures related to the "with project" situation consist of the above expenditures plus new operations for the waste water treatment plant, the sewage collection network in 5 Vrbas villages and incremental costs due to the connection of Carnex and Vital to the existing sewage collection network in Vrbas city.

Table 5-51 Carnex and Vital incremental operational costs

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Variable costs	**000 RSD**	**-**	**-**	**-**	**3,014**	**3,323**	**3,629**	**3,963**	**4,327**	**4,680**	**5,061**	**11,079**	**28,368**
Electricity	000 RSD	-	-	-	3,014	3,323	3,629	3,963	4,327	4,680	5,061	11,079	28,368

Table 5-52 Waste water treatment expenditures

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Variable costs		**-**	**-**	**-**	**30,099**	**32,810**	**35,137**	**37,643**	**40,345**	**43,060**	**45,969**	**88,567**	**197,764**
Use of chemicals	000 RSD				3,465	3,751	3,964	4,190	4,429	4,681	4,947	8,471	15,863
Electricity	000 RSD				8,957	10,180	11,191	12,301	13,521	14,719	16,024	36,874	98,454
Sludge transport	000 RSD				3,672	4,074	4,413	4,781	5,180	5,557	5,961	11,846	26,523
Effluent discharge fee	000 RSD				14,005	14,805	15,568	16,371	17,215	18,103	19,037	31,376	56,924
Fixed costs	000 RSD	**-**	**-**	**-**	**76,893**	**79,253**	**81,805**	**84,566**	**87,554**	**90,322**	**93,280**	**163,315**	**275,099**
Wages and Salaries	000 RSD				6,695	7,381	8,138	8,972	9,891	10,697	11,569	25,326	64,847
Employee benefits	000 RSD				1,339	1,476	1,628	1,794	1,978	2,139	2,314	5,065	12,969
Other materials	000 RSD												
Transport services	000 RSD												
Repair services	000 RSD				15,487	16,464	17,504	18,608	19,783	20,928	22,139	38,860	76,334
Other services	000 RSD				4,186	4,450	4,731	5,029	5,347	5,656	5,984	10,503	20,631
Taxes and fees	000 RSD												
Depreciation	000 RSD				46,186	46,186	46,186	46,186	46,186	46,186	46,186	72,600	72,600
Overhead	000 RSD	-	-	-	3,001	3,296	3,620	3,976	4,369	4,715	5,089	10,960	27,717
TOTAL incremental costs	**000 RSD**	**-**	**-**	**-**	**106,992**	**112,062**	**116,941**	**122,209**	**127,899**	**133,382**	**139,249**	**251,882**	**472,863**

Table 5-53 Sewage collection 5 Vrbas villages: expenditures

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Variable costs		**-**	**1,204**	**3,982**	**7,317**	**8,587**	**9,454**	**10,407**	**11,456**	**12,489**	**13,614**	**31,495**	**83,852**
Use of chemicals	000 RSD												
Electricity	000 RSD		1,204	3,982	7,317	8,587	9,454	10,407	11,456	12,489	13,614	31,495	83,852
Fixed costs	000 RSD	**-**	**6,923**	**21,002**	**37,707**	**38,828**	**40,041**	**41,355**	**42,779**	**44,093**	**45,500**	**67,840**	**121,473**
Wages and Salaries	000 RSD	-	561	1,839	3,347	3,691	4,069	4,486	4,946	5,349	5,785	12,663	32,424
Employee benefits	000 RSD	-	112	368	669	738	814	897	989	1,070	1,157	2,533	6,485
Other materials	000 RSD												
Transport services	000 RSD												
Repair services	000 RSD		1,515	4,634	7,837	8,331	8,857	9,416	10,011	10,590	11,203	19,664	38,627
Other services	000 RSD		206	630	1,066	1,133	1,204	1,280	1,361	1,440	1,523	2,674	5,253
Taxes and fees	000 RSD												
Depreciation	000 RSD	-	4,293	12,790	23,287	23,287	23,287	23,287	23,287	23,287	23,287	24,826	24,826
Overhead	000 RSD	-	236	740	1,501	1,648	1,810	1,988	2,185	2,357	2,544	5,480	13,858
TOTAL incremental costs	**000 RSD**	**-**	**8,127**	**24,984**	**45,024**	**47,415**	**49,495**	**51,762**	**54,235**	**56,582**	**59,113**	**99,335**	**205,325**

Note that for the new components, the relative share of depreciation is declining as a result of straight line depreciation at historical cost.

The table below summarizes the operational costs of all components and their percentage share. These costs do not include allowances for bad debt.

Table 5-54 Summary expenditures by component

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Expenditure by component													
Drinking water	000 RSD	64,977	69,633	74,892	83,977	91,314	99,421	108,345	118,063	127,030	136,686	284,086	691,462
Sewage collection Vrbas city	000 RSD	18,988	20,626	22,217	29,064	31,838	34,984	38,372	41,994	45,202	48,689	102,796	254,588
Waste water treatment	000 RSD	-	-	-	106,992	112,062	116,941	122,209	127,899	133,382	139,249	251,882	472,863
Sewage collection 5 Vrbas villages	000 RSD	-	8,127	24,984	45,024	47,415	49,495	51,762	54,235	56,582	59,113	99,335	205,325
Total		**83,965**	**98,386**	**122,093**	**265,056**	**282,629**	**300,842**	**320,689**	**342,191**	**362,196**	**383,738**	**738,099**	**1,624,238**
Drinking water	%	77%	71%	61%	32%	32%	33%	34%	35%	35%	36%	38%	43%
Sewage collection Vrbas city	%	23%	21%	18%	11%	11%	12%	12%	12%	12%	13%	14%	16%
Waste water treatment	%	0%	0%	0%	40%	40%	39%	38%	37%	37%	36%	34%	29%
Sewage collection 5 Vrbas villages	%	0%	8%	20%	17%	17%	16%	16%	16%	16%	15%	13%	13%
Total	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Expenditure by service													
water	000 RSD	64,977	69,633	74,892	83,977	91,314	99,421	108,345	118,063	127,030	136,686	284,086	691,462
sewage collection	000 RSD	18,988	28,753	47,201	74,088	79,253	84,479	90,134	96,228	101,784	107,803	202,131	459,913
wastewater	000 RSD	-	-	-	106,992	112,062	116,941	122,209	127,899	133,382	139,249	251,882	472,863
Total costs	**000 RSD**	**83,965**	**98,386**	**122,093**	**265,056**	**282,629**	**300,842**	**320,689**	**342,191**	**362,196**	**383,738**	**738,099**	**1,624,238**
going to water	%	77%	71%	61%	32%	32%	33%	34%	35%	35%	36%	38%	43%
going to sewage collection	%	23%	29%	39%	28%	28%	28%	28%	28%	28%	28%	27%	28%
going to wastewater	%	0%	0%	0%	40%	40%	39%	38%	37%	37%	36%	34%	29%
Total	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Depreciation													
water services	000 RSD	3,500	3,534	3,577	3,766	3,766	4,003	4,315	4,607	4,886	5,170	7,969	12,709
sewage collection	000 RSD	2,812	7,187	15,821	26,318	26,515	26,890	27,232	27,507	27,677	27,876	31,985	36,882
wastewater services	000 RSD	-	-	-	46,186	46,186	46,186	46,186	46,186	46,186	46,186	72,600	72,600
Depreciation	**000 RSD**	**6,312**	**10,721**	**19,398**	**76,269**	**76,467**	**77,079**	**77,733**	**78,300**	**78,749**	**79,232**	**112,554**	**122,191**
going to water	%	55%	33%	18%	5%	5%	5%	6%	6%	6%	7%	7%	10%
going to sewage collection	%	45%	67%	82%	35%	35%	35%	35%	35%	35%	35%	28%	30%
going to wastewater	%	0%	0%	0%	61%	60%	60%	59%	59%	59%	58%	65%	59%
Total	**%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

The project will more than double the expenditure of the PUC. New expenditures account for 58% of total expenditure in the year 2011, decreasing to 43% by the year 2039. Largest part is caused by the waste water treatment plant with 41% in 2011, whereas extension of the sewage collection system in 5 Vrbas villages accounts for 17%.

Presently, the water supply system accounts for almost 80% of total expenditure. However, this will change considerably as from the year 2011, when the water supply share of total expenditure will drop to 32%. During that year, sewage collection constitutes 27% of total expenditures and waste water treatment comprises 41%.

The effect of the new investments on the total depreciation charge is even more pronounced. As from the year 2011, 95% of the total depreciation charge goes to respectively sewage collection (35%) and wastewater (60%).

5.3.5 Unit cost prices

The unit cost price per m3 of drinking water invoiced and waste water delivered to the sewage network is calculated in such a way to cover at least the below mentioned costs. Full cost coverage is achieved if revenues generated by the applicable tariffs equals or exceeds total costs as calculated below.

- Operation & maintenance costs;
- Depreciation;
- (Provision for) bad debt;
- Interest payment;
- Working capital;
- Profit margin.

Depreciation is calculated at historical cost and by using a straight line depreciation methodology. The provision for bad debt is based on an improvement from the current 90% to 95% collection rate in the year 2009 for all customer groups. Since no debt financing is envisaged for this project, interest payment is nil. Finally, the profit level is set at 0%, in line with current practice in Serbia. Although this is not uncommon, it will constrain the possibility for the PUC to invest in other service improvements or system extensions, such as improvement of quality and quantity of drinking water supply.

Using this methodology, a cost price for each of the PUC's services is calculated as detailed in the tables below. Unit cost prices can be expressed in a number of different ways:

- Drinking water supplied and billed to consumers;
- Waste water delivered to the sewage collection system;
- Waste water delivered to the waste water treatment plant, including infiltration. This is the physical quantity of waste water treated by the waste water treatment plant.

In order to enable a meaningful comparison between the cost prices of each of the different services, prices are expressed in RSD per m3 of drinking water supplied and billed to customers. This does not fully reflect the actual situation, since some clients have their own water source and thus only pay for sewage collection and treatment services. However, the current tariff system is set up in such a way that customers are charged a tariff for sewage collection services for each m3 of drinking water consumed.

Table 5-55 Cost price drinking water

Financial year ending	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Cost to cover - water														
operating costs & depreciation	RSD m	61	65	70	75	84	91	99	108	118	127	137	284	692
increase in working capital	RSD m		0	2	(3)	(5)	0	2	1	1	1	1	2	4
bad debt	RSD m		6	6	4	4	4	5	5	6	6	7	14	34
Total Water Costs to cover	RSD m	61	72	78	76	83	96	106	115	124	134	144	300	730
Volume produced	'000 m3	3,591	3,638	3,685	3,732	3,780	3,828	3,871	3,914	3,958	4,002	4,046	4,406	4,743
Volume billed														
Domestic	'000 m3	2,282	2,298	2,314	2,330	2,346	2,362	2,374	2,385	2,397	2,408	2,420	2,530	2,656
Institutional users	'000 m3	175	186	197	208	219	230	240	251	262	273	284	370	443
Business	'000 m3	139	146	153	160	168	175	184	193	202	211	220	285	330
Total	'000 m3	2,596	2,630	2,664	2,698	2,732	2,767	2,798	2,830	2,861	2,893	2,925	3,185	3,428
Unit cost of water produced	RSD / m3	17	20	21	20	22	25	27	29	31	33	36	68	154
Unit cost of water billed	RSD / m3	23	27	29	28	30	35	38	40	43	46	49	94	213

The forecasted unit cost of drinking water billed in the year 2008 is RSD 27/m3. Annual increases are mostly in the order of 6% to 8%, which is above the forecasted dinar inflation rate. In other words, even with a rather modest investment program, the cost price of water is increasing above inflation. This trend also happened during the last several years, but even at a higher rate, mainly because of stagnating water quantities supplied, with an increasing cost base well above actual inflation.

Table 5-56 Cost price sewage collection Vrbas city

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Cost to cover													
operating costs & depreciation	RSD m	19	21	22	29	32	35	38	42	45	49	103	255
increase in working capital	RSD m	(1)	1	(0)	(1)	1	0	0	0	0	0	1	2
bad debt	RSD m	1	2	1	1	2	2	2	2	2	2	5	12
Total Waste Water costs to cover	RSD m	19	23	23	29	34	37	41	44	48	51	108	269
Volume billed (Vrbas town + villages)													
Domestic	'000 m3	1,272	1,729	2,097	2,111	2,126	2,136	2,147	2,157	2,168	2,178	2,277	2,390
Institutional users	'000 m3	102	130	144	151	157	166	174	182	190	198	257	297
Business - small	'000 m3	113	153	187	197	207	216	226	236	246	256	333	398
Business - large	'000 m3	-	-	-	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Total	'000 m3	1,487	2,012	2,428	4,156	4,187	4,216	4,244	4,272	4,301	4,330	4,564	4,783
Unit cost of wastewater	RSD / m3	13	11	9	7	8	9	10	10	11	12	24	56
Unit cost of wastewater of drinking w	RSD / m3	12	10	9	6	7	8	9	9	10	11	21	51

The unit cost price for sewage collection services is expressed both in waste water delivered to the sewerage system and drinking water supplied. It is estimated that 90% of the consumed drinking water ends up in the sewerage system. The unit cost of sewage collection in 2008 is RSD 12 per m3 drinking water consumed. This decreases to RSD 6 in 2011, as a result of increasing volumes delivered to the sewerage system. Especially the anticipated connection of large industries as from the year 2011 has a large impact on the unit price. In interpreting this number, it should be realized that the calculation is based on all waste water collected in the Vrbas municipality, including waste water originating from 5 Vrbas villages. This is done in order to clearly see what portion of the overall sewage collection unit cost price originates from the Vrbas city collection system and what portion originates from 5 Vrbas villages.

After 2011, unit prices increase moderately with 6% to 8%, in line with drinking water increases.

Table 5-57 Cost price sewage collection Vrbas villages

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Cost to cover													
operating costs & depreciation	RSD m	-	8	25	45	47	49	52	54	57	59	99	205
increase in working capital	RSD m	-	-	1	1	2	0	0	0	0	0	0	1
bad debt	RSD m	-	-	0	1	3	3	3	3	3	3	5	10
Interest and fee payment	RSD m	-	-	-	-	-	-	-	-	-	-	-	-
DSCR over depreciation	RSD m												
CAPEX injection	RSD m												
Total Waste Water costs to cover	RSD m	-	8	27	48	53	52	55	57	60	62	105	216
Volume billed (Vrbas town + villages)													
Domestic	'000 m3		1,729	2,097	2,111	2,126	2,136	2,147	2,157	2,168	2,178	2,277	2,390
Institutional users	'000 m3		130	144	151	157	166	174	182	190	198	257	297
Business - small	'000 m3		153	187	197	207	216	226	236	246	256	333	398
Business - large	'000 m3		-	-	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Total	'000 m3	-	2,012	2,428	4,156	4,187	4,216	4,244	4,272	4,301	4,330	4,564	4,783
Unit cost of wastewater discharged	RSD / m3		4	11	11	13	12	13	13	14	14	23	45
Unit cost of wastewater of drinking water su	RSD / m3		4	10	10	11	11	12	12	12	13	21	41

The unit cost price for the new sewage collection system in Vrbas villages amounts to RSD 10 per m3 of drinking water consumed, during the year 2010. Despite a large increase in demand during the year 2011, when the two main industrial consumers connect to the sewage collection system, unit cost price do not differ substantially. During the period after 2010, annual unit cost price growths with around 4% on average.

Table 5-58 Cost price waste water treatment

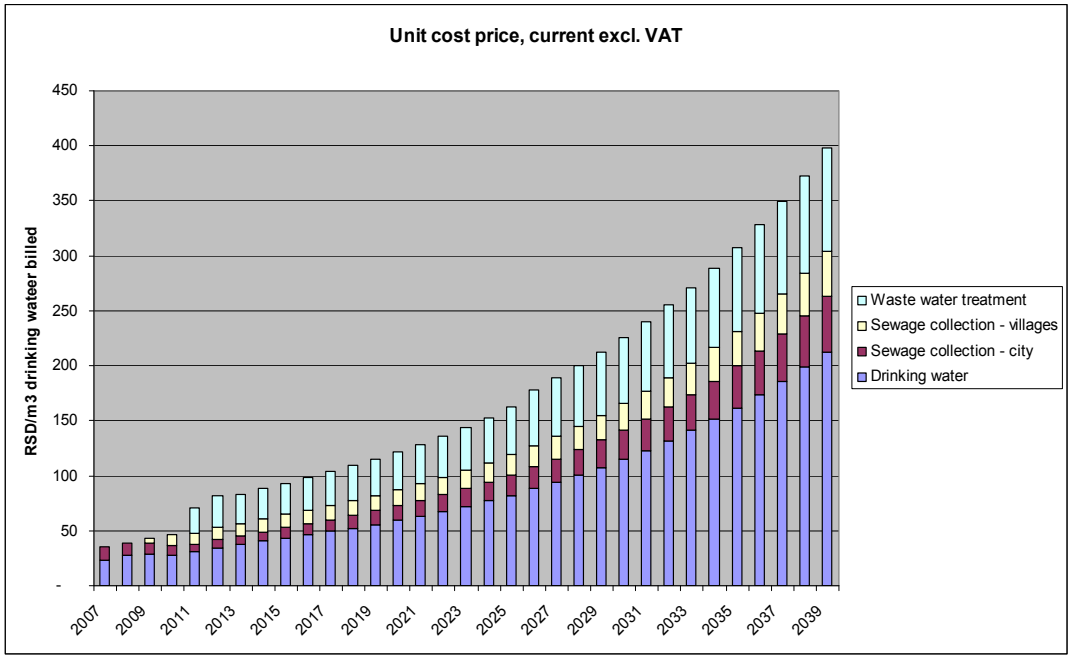
Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Cost to cover waste water treatment													
operating costs & depreciation	RSD m	-	-	-	107	112	117	122	128	133	139	252	473
increase in working capital	RSD m	-	-	-	-	13	0	0	0	0	0	5	2
bad debt	RSD m	-	-	-	-	6	6	6	7	7	7	12	23
Interest and fee payment	RSD m	-	-	-	-	-	-	-	-	-	-	-	-
DSCR over depreciation	RSD m												
CAPEX injection	RSD m												
Total Waste Water costs to cover	RSD m	-	-	-	107	131	123	129	135	141	147	270	498
Volume billed													
Domestic	'000 m3				2,111	2,126	2,136	2,147	2,157	2,168	2,178	2,277	2,390
Institutional users	'000 m3				151	157	166	174	182	190	198	257	297
Business - small	'000 m3				197	207	216	226	236	246	256	333	398
Business - large	'000 m3				1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Total	'000 m3	-	-	-	4,156	4,187	4,216	4,244	4,272	4,301	4,330	4,564	4,783
Unit cost of wastewater treated (incl. infiltrat	RSD / m3				19	23	22	22	23	24	25	44	78
Unit cost of wastewater delivered to collecti	RSD / m3				26	31	29	30	32	33	34	59	104
Unit cost of wastewater of drinking water su	RSD / m3				23	28	26	27	28	29	31	53	94

The unit cost for waste water treatment during the year 2011, the first operational year of the waste water treatment plant, amounts to RSD 23 per m3 of drinking water supplied. Annual increases thereafter are limited to 4% to 5% on average, at approximately the same rate as inflation.

The graph below summarizes the various cost prices for each of the services supplied by the PUC. The total unit cost price in 2007 per m3 of drinking water supplied amounts to RSD 35/m3 (€ 0.42/m3). This increases to RSD 71/m3 (€ 0.79/m3) during the year 2011, when the investments become operational. By the year 2020, unit cost prices have increased to RSD 121/m3 (€ 1.19/m3).

As can be clearly seen, the introduction of waste water treatment in the year 2011 causes the total unit cost price to increase with about 50%, compared to the previous year. Thereafter, unit cost prices increase with about 5% to 6% annually, which is slightly above inflation.

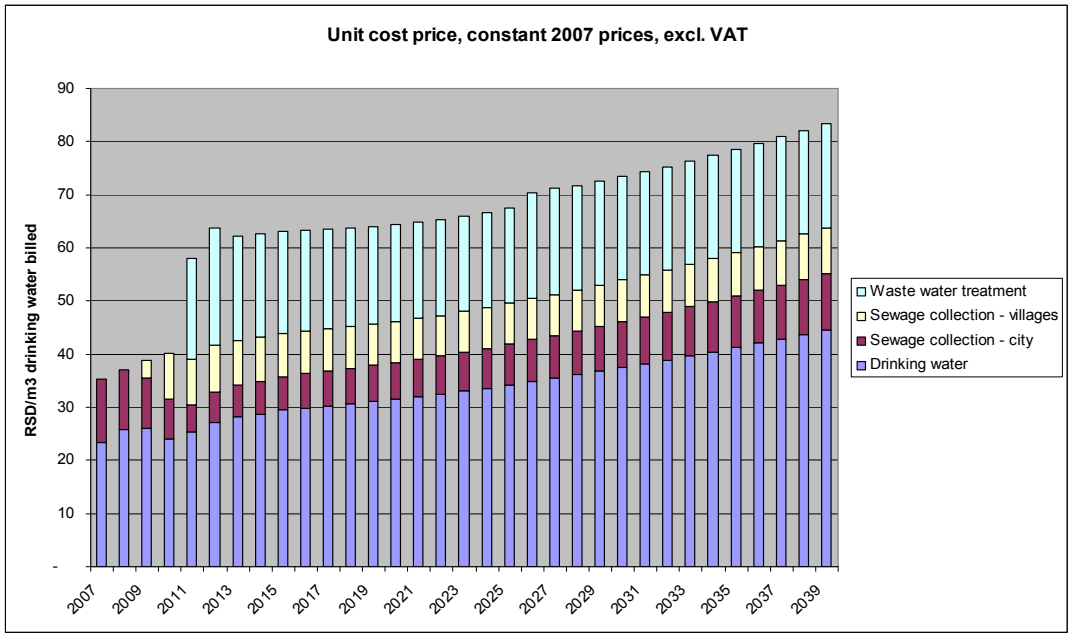
Graph 5-1 Unit cost prices (current prices)



The graph below summarizes the unit cost prices, however expressed in constant 2007 prices. By doing so, real increases in prices can be easily analyzed.

Not surprisingly, the introduction of waste water treatment in the year 2011 causes the real unit cost price to increase. Compared to the year 2007, the introduction of both waste water treatment and sewage collection in Vrbas villages, as well as increases in the current drinking water and sewage collection system causes the total unit cost price to increase with 65% in real terms, from RSD 35/m3 during 2007 to RSD 58/m3 in 2011. Thereafter, real unit cost prices increase with about 0.5% to 1.5% annually, to 137% cumulative by the year 2039. This latter increase is however driven by existing services (drinking water supply and sewage collection in Vrbas city), where real increases of the unit cost price amount to about 1.5 – 2.5% annually.

Graph 5-2 Unit cost prices (constant prices)



5.3.6 Tariffs

Having calculated the cost price for all different components for the water and waste water, a tariff and tariff policy for each client group can be proposed. The following principles, will serve as a basis for determining a suitable tariff and tariff policy:

- Tariffs are based on full cost coverage as defined above;
- Tariffs will be based on the polluter pays principle;
- Tariffs should not exceed maximum affordability levels;
- Tariffs should ensure financial sustainability;
- Steep tariff increases should as much as possible be avoided.

Furthermore, the current Government policy of regulated tariffs, which does not allow tariffs to increase more than estimated inflation levels, should be taken into consideration as well. It is expected that at least in the short term, this policy will be continued. Only in case of new services, like waste water treatment, a separate tariff can be introduced. Extension of services, however, is subject to existing tariffs. This is for example applicable for the extension of the sewage collection network in 5 Vrbas villages.

For this reason it is proposed to introduce, as from the year 2011, a new tariff for waste water treatment. Thus, the following tariffs will have to be determined for each user group:

- Drinking water;
- Sewage collection;
- Waste water treatment.

In order to be able to make a meaningful comparison, all tariffs are recalculated in m3 drinking water equivalent, in line with the current tariff methodology. This is also done for clients who only make use of sewage collection and waste water services, although it is recognized that in practice this will not be possible. The two large industries Carnex and Vital have their own private water sources. Obviously, a tariff based on actual waste water discharged into the sewage collection system will have to be set, instead of a drinking water based tariff. This separate waste water discharge tariff will be clearly disclosed in the summary at the end of this paragraph.

Furthermore, all tariffs are expressed in constant 2007 prices, to allow a meaningful comparison of tariff adjustments over time. Information on the effect of the proposed tariff policy on the current tariff – the tariff which clients will actually see on their invoice, will be outlined at the end of this paragraph.

Drinking water tariff

The current 2007 drinking water tariff structure is as follows:

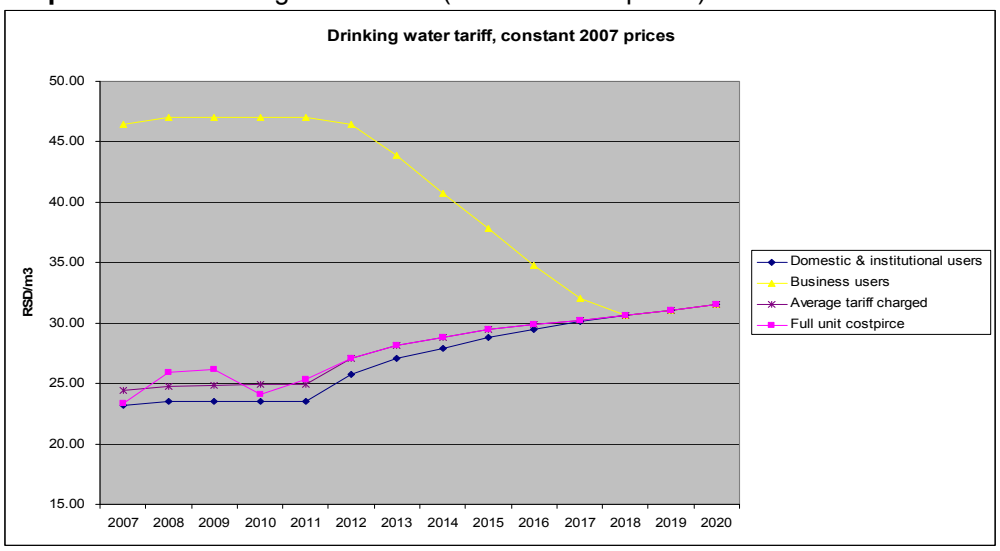
Table 5-59 2007 drinking water tariffs (without VAT)

Customer group	RSD/m3
Domestic	23.50
Institutional	23.50
Business	47.00

The tariff for business is twice as high as those for other user groups. This is not based on higher costs for delivery of drinking water services to businesses. Therefore, domestic and institutional tariffs are cross subsidized by business tariffs. The overall level of cross subsidy is limited, since businesses only account for 5% of total drinking water quantity invoiced. Therefore, it is proposed to gradually abolish the cross subsidy, starting from the year 2012, so that by the year 2018 the drinking water tariff is the same for all customer groups.

The real unit cost price of drinking water fluctuates until the year 2011, after which it increases with about 1.5% annually. For this reason and taking into consideration current Government policy, it is proposed to increase the current drinking water tariff with inflation only until the year 2011. From 2012, the average tariff will be based on the full unit cost price. The result of this policy is illustrated in the graph below.

Graph 5-3 Drinking water tariffs (2007 constant prices)



Sewage collection tariff

The current 2007 collection tariff is fixed at 50% of the drinking water tariff. The table below summarizes the current sewage collection tariffs.

Table 5-60 2007 Sewage collection tariffs (without VAT)

Customer group	RSD/m3
Domestic	11.75
Institutional	11.75
Business	23.50

Again, the business tariff is twice as high as those for domestic and institutional users, without a clear cost justification. Therefore, the business tariff is cross subsidizing the domestic/institutional tariffs. The overall impact is however rather small, since sewage produced by businesses only comprises 5% of total waste water flowing into the sewage network.

The connection of an additional 20,000 domestic clients and two large industries has a major impact on the required sewage collection tariff. On the one hand, large investments are required to extend the sewage collection network to 5 Vrbas villages. Also, operational costs to run this extension are substantial. This causes the average unit cost of sewage collection for the whole of the municipality to increase.

On the other hand, at a relatively small investment cost, two large industrial consumers can be connected to the sewage collection network. Incremental operational costs are also relatively small and consist mainly of additional electricity costs for pumping the additional waste water flows originating from the industries.

These factors taken together cause the average unit cost price of sewage collection in Vrbas municipality to rise with a relatively low 20% in real terms up to the year 2013, by which year the impact of the new investments and additional operational costs have settled. After this year, the real increase of the unit cost price is relatively stable and fluctuates from 0.5% to 1.5%. For this reason, but also bearing in mind current

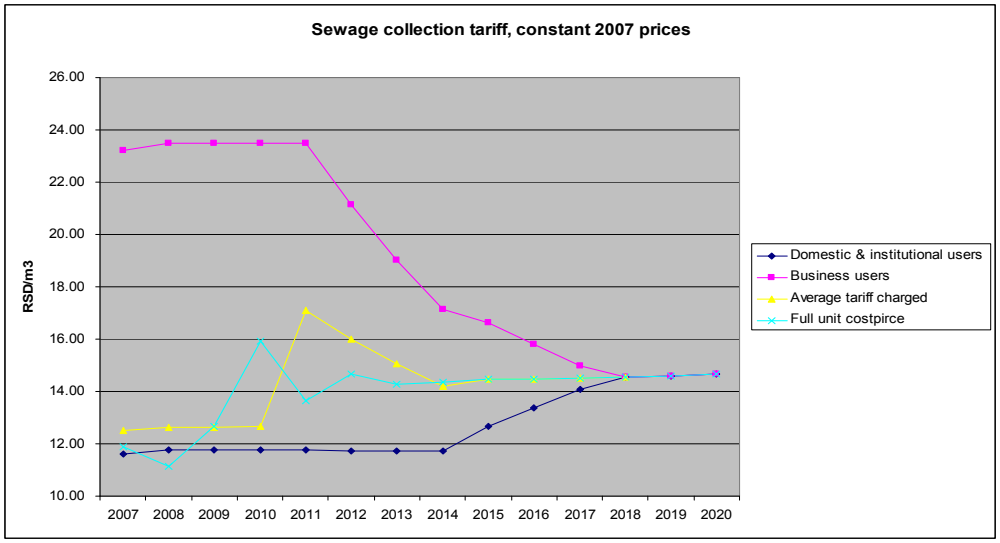
Government policy and the polluter pays principle, it is proposed to keep the domestic & institutional sewage collection tariff constant in real terms up to the year 2014 and thus to increase tariffs with inflation only.

The business tariff is also proposed to be constant at twice the domestic tariff up to and including the year 2011. As from the year 2012 to 2018, the real business tariff is proposed to decline until the year 2018 when all tariffs will be the same as the average unit cost price. The result of this policy is depicted in the graph below.

This policy has as an intended effect that as from the year 2014, *average* tariff charged is equal to average unit cost price.

Note that as a result of this policy, the *average* tariff charged up to the year 2014 exceeds the full unit cost price, with the exception of the year 2010.

Graph 5-4 Sewage collection tariffs (2007 constant prices)



Wastewater treatment tariff

The treatment of waste water is a new service in Vrbas municipality. It is expected that this service becomes operational as from the year 2011. Therefore, it is proposed to introduce a completely new tariff for waste water treatment, which also should be clearly distinguished on invoices sent to customers. The introduction of a new tariff would enable the PUC to cover its costs and would be in line with current Government policy, which allows the introduction of new tariffs for new services. A separate tariff for waste water treatment is not uncommon for those Serbian municipalities who have operational waste water treatment plants. The municipality of Subotica charges its customers a separate tariff for waste water treatment.

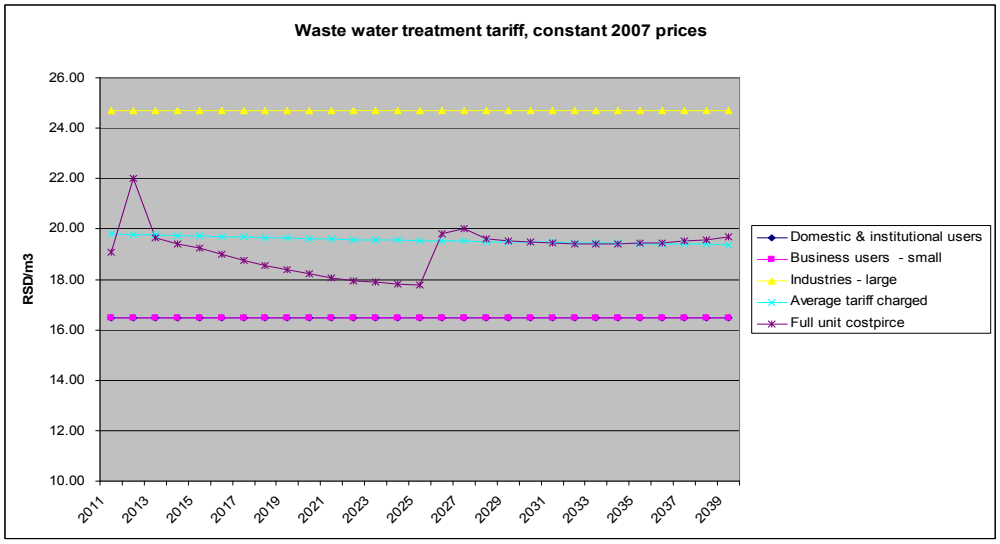
When analyzing the development of the unit cost price of waste water, it can be concluded that after the first operational year 2011, the real unit cost price decreases with around 0.5% to 1.0% until the year 2026. In the year 2025, large re-investment in mechanical and electrical equipment is required, which causes the real unit cost price to increase with 11.5% during the next year, back to the same tariff level as at the start of

operations. After this year, real unit cost prices fluctuate at around 0%, without a clear increasing or declining trend.

It is proposed to set the waste water tariff from the start at the full unit cost price at the same level for all customer groups, with one important exception. The two large industries Carnex and Vital are allowed in line with current Municipal decisions, to discharge waste water into the sewer with a maximum BOD content 50% higher than that for domestic sewage. The allowed pollution load of BOD for industries is 0.45 kg/m3 waste water, whereas the average communal BOD content is 0.30 kg/m3. In line with the polluter pays principle, it is therefore proposed to charge these two industries with a higher tariff for waste water treatment at 50% the tariff charged to other customer groups. It is however recognized, that an increase of pollution loading is not entirely linear with additional investment and operating costs. Thus, two separate tariffs are proposed.

Furthermore, it is proposed to set the tariff right from the year 2011 at full cost recovery level, without a gradual introduction. Although this will cause the overall tariff for domestic users to increase with about 50% during the year 2011, this is still well within average affordability levels as will be shown later on. Furthermore, it will have as an added advantage that real tariff increases are not required thereafter. Tariffs would only have to be adjusted for inflation.

Graph 5-5 Waste water treatment tariff (2007 constant prices)



Summary tariffs

The effect of the proposed tariff policy is summarized in the table below. The mentioned tariffs in this table are however expressed as current values. Thus, apart from real increases, tariffs are also corrected for inflation. This will be the tariff charged to customers. The base case macro economic scenario projects an inflation rate of 5% as from the year 2008 onwards. Therefore, if a tariff increases with 5%, no real increase in tariffs is proposed, but only an adjustment for inflation.

Table 5-61 Summary proposed tariff structure (current prices)

Financial year ending	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Tariff summary (excl. VAT)														
Drinking water														
Domestic	RSD / m3	23	25	26	27	29	33	36	39	43	46	49	94	213
Institutional users	RSD / m3	23	25	26	27	29	33	36	39	43	46	49	94	213
Business - small	RSD / m3	46	49	52	54	57	59	59	57	56	54	52	94	213
Waste water treatment														
Domestic	RSD / m3	-	-	-	-	20	21	22	23	24	26	27	44	78
Institutional users	RSD / m3	-	-	-	-	20	21	22	23	24	26	27	44	78
Business - small	RSD / m3	-	-	-	-	20	21	22	23	24	26	27	44	78
Sewerage														
Domestic	RSD / m3	12	12	13	14	14	15	16	17	19	21	23	42	91
Institutional users	RSD / m3	12	12	13	14	14	15	16	17	19	21	23	42	91
Business - small	RSD / m3	23	25	26	27	29	27	25	24	25	25	24	42	91
Total W&WW (RSD)														
Domestic	RSD / m3	35	37	39	41	63	69	74	79	86	92	99	180	382
Institutional users	RSD / m3	35	37	39	41	63	69	74	79	86	92	99	180	382
Business - small	RSD / m3	70	74	78	82	106	107	106	105	105	104	103	180	382
Total W&WW (€)														
Domestic	€ / m3	0.42	0.44	0.45	0.46	0.70	0.76	0.80	0.84	0.90	0.95	1.01	1.58	2.83
Institutional users	€ / m3	0.42	0.44	0.45	0.46	0.70	0.76	0.80	0.84	0.90	0.95	1.01	1.58	2.83
Business - small	€ / m3	0.84	0.87	0.90	0.92	1.18	1.18	1.15	1.12	1.10	1.08	1.06	1.58	2.83
Tariff summary - % increase year-on-year avg														
Drinking water														
Domestic	%	9%	6%	5%	5%	5%	15%	10%	8%	8%	7%	7%	7%	7%
Institutional users	%	9%	6%	5%	5%	5%	15%	10%	8%	8%	7%	7%	7%	7%
Business - small	%	9%	6%	5%	5%	5%	4%	-1%	-3%	-2%	-3%	-3%	7%	7%
Waste water treatment														
Domestic	%						5%	5%	5%	5%	5%	5%	5%	5%
Institutional users	%						5%	5%	5%	5%	5%	5%	5%	5%
Business - small	%						5%	5%	5%	5%	5%	5%	5%	5%
Sewerage														
Domestic	%	9%	6%	5%	5%	5%	5%	5%	5%	13%	11%	11%	6%	7%
Institutional users	%	9%	6%	5%	5%	5%	5%	5%	5%	13%	11%	11%	6%	7%
Business - small	%	9%	6%	5%	5%	5%	-6%	-6%	-5%	2%	0%	0%	6%	7%
Total W&WW														
Domestic	%	9%	6%	5%	5%	54%	10%	8%	7%	8%	7%	7%	6%	7%
Institutional users	%	9%	6%	5%	5%	54%	10%	8%	7%	8%	7%	7%	6%	7%
Business - small	%	9%	6%	5%	5%	30%	1%	-1%	-2%	0%	-1%	-1%	6%	7%

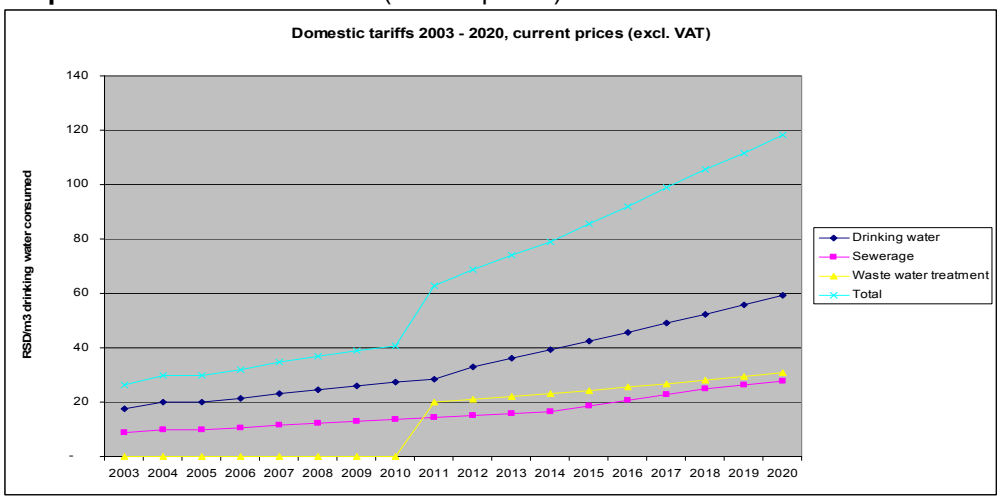
The two large industries Carnex and Vital do not make use of drinking water supply services, but only sewage collection and waste water treatment. They have their own drinking water source. The tariff therefore cannot be based on drinking water consumed, but should be based on waste water discharged into the sewer system. The table below summarizes the proposed tariffs for the two large industries.

Table 5-62 Summary proposed tariff structure large industries (current prices)

Financial year ending	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Tariff summary (excl. VAT)														
Waste water treatment														
Business - large dischi	RSD / m3	-	-	-	-	33	35	37	39	41	43	45	73	131
Sewerage														
Business - large dischi	RSD / m3	-	-	-	-	32	30	28	27	27	27	27	47	101
Total W&WW (RSD)														
Business - large dischi	RSD / m3	-	-	-	-	65	65	65	65	68	70	72	119	232
Total W&WW (€)														
Business - large dischi	€ / m3	-	-	-	-	0.73	0.71	0.71	0.70	0.71	0.72	0.73	1.05	1.71
Tariff summary - % increase year-on-year avg														
Waste water treatment														
Business - large	%						5%	5%	5%	5%	5%	5%	5%	5%
Sewerage														
Business - large	%						-6%	-6%	-5%	2%	0%	0%	6%	7%
Total W&WW														
Business - large	%						0%	0%	0%	4%	3%	3%	5%	6%

The effect over time of the proposed domestic tariff is depicted in the graph below. Note that this concerns current fees, including inflation.

Graph 5-6 Domestic tariffs (current prices)



5.3.7 Affordability

Domestic users/household

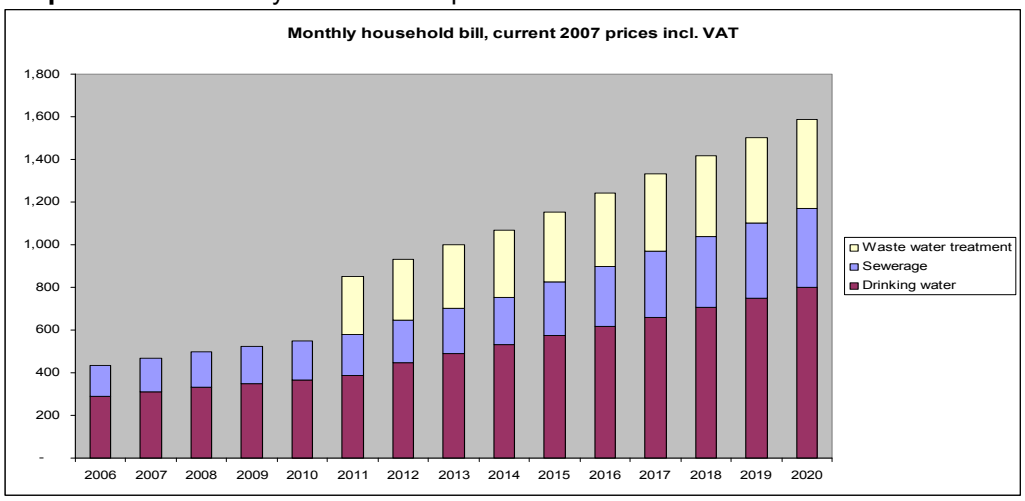
The proposed tariff policy causes the tariffs to increase substantially, especially during the year 2011. This is of course not very surprising given the scale of investments required. The question of affordability to domestic consumers is usually assessed by estimating the share of expenditures on water and waste water out of total available income in a single household. Chapter 2 of this report has elaborated on the household income trend as well as the maximum affordability, using a 4% maximum affordability ratio. In doing so, a maximum affordable household bill of RSD 1,593/month was calculated, for the year 2007. This is much higher than the actual 2007 bill for a household, which is estimated at RSD 468/month or 1.2% of household income.

In assessing future affordability, the following factors are taken into consideration:

- Consumption per capita will increase in accordance with the demand analysis elaborated upon in chapter 3. This will increase the overall household bill;
- The size of the households will decline with a rate similar to that realized during the period 1991 to 2002, i.e. with 0.3% per annum down to a minimum of 2.80 members per household. This will decrease the average household bill;
- Value added tax will be fixed at 8% throughout the analyzed period;
- Household income will grow with inflation and projected real wage increase;

The monthly average household bill, including VAT based on the proposed domestic tariffs is shown in the graph below.

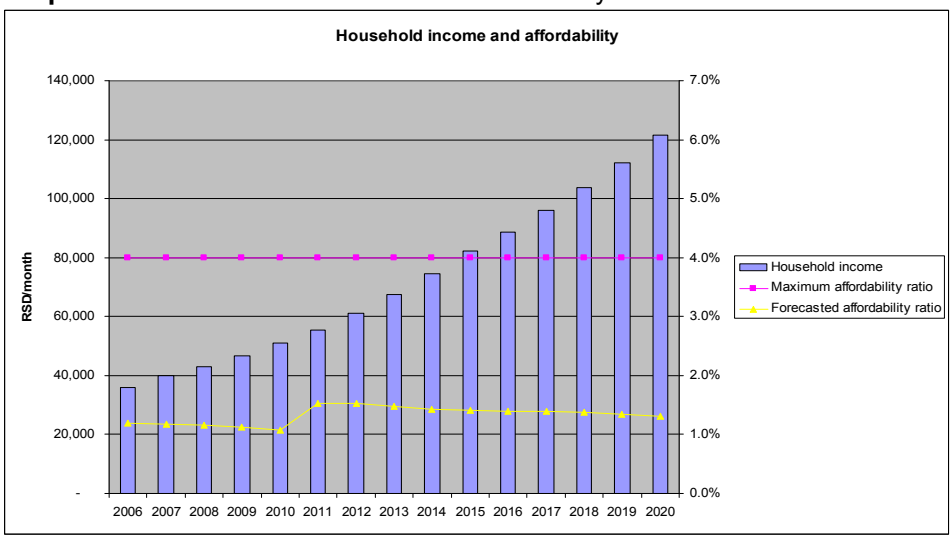
Graph 5-7 Monthly household expenditure on water & waste water



Next, the growth in household income is compared with both the forecasted and maximum affordability ratios. As can be seen in the graph below, the affordability ratio will peak during the year 2011 to 2013 at 1.5%, as a result of the introduction of a waste water treatment tariff. This increase, however, is well below the maximum affordability ratio of 4.0%. Conclusion therefore is that the proposed tariffs are on average affordable to domestic users. It should be realized however, that the calculations are based on average consumption patterns and average household income. A large low income family with above average consumption per capita will face a higher total monthly bill, while at the same time household income will be lower. On the other hand, pensioners are a recognized vulnerable group, but will most likely have smaller households and consequently lower consumption patterns and lower monthly bills to pay.

In any case, this could cause affordability constraints. It is suggested to identify cases where this might occur and build upon the existing social support program of Vrbas municipality.

Graph 5-8 Household income and affordability



Large industries

Currently, the 2 large industries in Vrbas, Carnex and Vital discharge substantial amounts of waste water directly into the Grand Canal, without any treatment. Wastewater discharge fees have to be paid to Vode Vojvodina by organizations directly discharging into the Grand Canal. Recently, these discharge fees have been increased substantially and are partly dependent upon pollution load.

In order to assess the magnitude of these amounts, discharge fees have been expressed as a percentage of total revenues earned. Carnex spends 0.8% of its 2006 revenue on discharge fees which is considerable. This ratio is much lower for Vital with 0.3%.

Table 5-63 2006 Discharge fees and revenues (RSD '000)

Organisation	Discharge fee	Revenues	%
Carnex	44,160	5,320,000	0.8%
Vital	14,185	5,340,368	0.3%

Once the waste water treatment plant is operational and the industries are connected to the sewage collection network, payment of discharge fees can be discontinued. Instead, Carnex and Vital will have to pay sewage collection and waste water treatment fees to PUC Vrbas.

To assess the magnitude of these fees, the total annual waste water bill is calculated and expressed as the share in total revenues. Total annual revenues are estimated by the escalating these with annual inflation and GDP growth. From the table it can be concluded that in the year 2011 when industries get connected to the sewage collection network, fees payable to PUC Vrbas are respectively 0.7% and 0.3% of total revenues. This ratio is slightly less than the 2006 discharge fees paid by industries to Vode Vojvodina. Thus, fees do not seem to be excessive. Furthermore, the ratio is rapidly declining, mainly as a result of declining sewage collection fees, constant waste water discharge and increasing revenues. The discharged waste water quantity for both

industries is assumed to remain constant over the years, as a combined result of optimized in-factory water usage and increase of production.

On the other hand, it should be realized that the overall cost of the waste water treatment to both companies is higher than just fees paid to PUC Vrbas. In order to meet the quality standards of effluent allowed in the municipal sewer system, investment in pre-treatment will have to be made. Still, the rather rapid decline in the industries' affordability ratio is providing some cushion to absorb these costs.

Table 5-64 Affordability large industries

Financial year ending	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Carnex revenues	RSD m	5,948	6,495	7,161	7,895	8,704	9,596	10,479	11,443	12,496	13,514	14,615	31,995	81,921
Vital revenues	RSD m	5,971	6,520	7,188	7,925	8,737	9,633	10,519	11,487	12,543	13,566	14,671	32,117	82,235
Carnex sewage charge	RSD m					60	57	54	52	51	50	49	50	54
Vital sewage charge	RSD m					22	21	20	19	19	18	18	18	20
Carnex affordability	%					0.7%	0.6%	0.5%	0.5%	0.4%	0.4%	0.3%	0.2%	0.1%
Vital affordability	%					0.3%	0.2%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.0%

5.3.8 Revenue forecast

After setting the tariffs, total revenues for the company can be calculated. A distinction will be made between "without" and "with" project revenues, which later on will be used in the cost benefit analysis.

The following revenue streams can be distinguished:
- Drinking water revenues;
- Sewage collection revenues;
- Waste water treatment revenues.

Drinking water revenues is entirely a "without" project revenue stream, whereas waste water treatment is entirely an incremental "with" project revenue stream. The sewage collection revenue stream consists of both "with" and "without" parts. To distinguish between the two, an incremental demand analysis is made, based on which revenue is differentiated.

Sewage connection fees chargeable to new consumers is not taken into account in the financial model, since the PUC's policy is only to charge new clients for the direct cost of making a connection from the household to the secondary network. Thus, sewer connection charges are cost neutral to the PUC. The new customer is responsible to finance and build the sewer network on his own premises. Currently, the sewer connection fee payable to the PUC amounts to RSD 12,000 (€ 150). The cost of making sewage infrastructure on domestic premises is estimate at € 300 on average, so that the total domestic consumer costs of connecting would be € 450.

<u>Drinking water revenues</u>
Drinking water revenues are estimated based on the tariff policy elaborated upon above. As can be seen from the table, revenues from domestic consumers are by far the largest source of revenues.

Table 5-65 Drinking water revenues

Financial year ending	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Water services - Revenues from sale														
Tariffs														
Domestic	RSD/m3	23	25	26	27	29	33	36	39	43	46	49	94	213
Business	RSD/m3	46	49	52	54	57	59	59	57	56	54	52	94	213
Institutional users	RSD/m3	23	25	26	27	29	33	36	39	43	46	49	94	213
Water charged (Vrbas town + villages)														
Domestic	'000 m3	2,282	2,298	2,314	2,330	2,346	2,362	2,374	2,385	2,397	2,408	2,420	2,530	2,656
Business	'000 m3	175	186	197	208	219	230	240	251	262	273	284	370	443
Institutional users	'000 m3	139	146	153	160	168	175	184	193	202	211	220	285	330
Revenue														
Domestic	RSD m	53	57	60	63	67	78	86	94	102	110	119	238	565
Institutional users	RSD m	3	4	4	4	5	6	7	8	9	10	11	27	70
Business	RSD m	8	9	10	11	12	14	14	14	15	15	15	35	94
Total	**RSD m**	**64**	**69**	**74**	**79**	**84**	**97**	**107**	**116**	**125**	**135**	**144**	**300**	**729**

Sewage collection revenues

Sewage collection revenues increase rapidly until the year 2011, caused by the connection of new clients. The connection of two large industries in the year 2011 causes this revenue stream to more than double. Revenues do not grow substantially after the year 2011.

The tariffs mentioned in the table are expressed in waste water discharged in the sewer system. This is done for calculation purposes. With the exception of large industries, the actual sewage collection fees are charged as a function of drinking water supplied.

Table 5-66 Sewage collection revenues

Financial year ending	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2039
Tariffs												
Domestic	RSD/m3	14	14	15	16	17	17	18	21	23	26	101
Institutional users	RSD/m3	14	14	15	16	17	17	18	21	23	26	101
Business - small	RSD/m3	27	29	30	32	30	28	27	27	27	27	101
Business - large	RSD/m3	-	-	-	32	30	28	27	27	27	27	101
Wastewater discharged												
Domestic	'000 m3	1,272	1,729	2,097	2,111	2,126	2,136	2,147	2,157	2,168	2,178	2,390
Institutional users	'000 m3	102	130	144	151	157	166	174	182	190	198	297
Business - small	'000 m3	113	153	187	197	207	216	226	236	246	256	398
Business - large	'000 m3	-	-	-	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Revenue												
Domestic	RSD m	17	25	32	34	35	37	39	45	50	56	242
Institutional users	RSD m	1	2	2	2	3	3	3	4	4	5	30
Business - small	RSD m	3	4	6	6	6	6	6	6	7	7	40
Busniess - large	RSD m	-	-	-	54	51	48	45	46	46	46	172
Total	**RSD m**	**22**	**31**	**40**	**96**	**95**	**94**	**94**	**101**	**107**	**114**	**485**

A demand analysis is made to estimate incremental revenues for sewage collection services. The incremental demand consists of:

- 20,000 additional domestic clients in 5 Vrbas villages;
- Additional clients from institutional and small business residing in 5 Vrbas villages;
- Carnex and Vital industries in Vrbas town

Having calculated the incremental demand, additional revenues can be estimated by multiplying this with the applicable tariff. The results are shown in the table below.

Table 5-67 Incremental sewage collection revenues

	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Without project														
domestic	000 m3/y	820	1,008	1,199	1,213	1,226	1,240	1,249	1,259	1,268	1,278	1,288	1,377	1,480
institutional users	000 m3/y	76	96	118	123	128	133	140	147	155	162	169	218	247
Industry -small	000 m3/y	76	96	118	123	128	133	140	147	155	162	169	218	247
industry - big	000 m3/y													
Total without project	**000 m3/y**	**972**	**1,200**	**1,435**	**1,459**	**1,482**	**1,506**	**1,530**	**1,553**	**1,578**	**1,602**	**1,626**	**1,814**	**1,973**
With project														
domestic	000 m3/y	820	1,272	1,729	2,097	2,111	2,126	2,136	2,147	2,157	2,168	2,178	2,277	2,390
institutional users	000 m3/y	76	102	130	144	151	157	166	174	182	190	198	257	297
Industry -small	000 m3/y	76	113	153	187	197	207	216	226	236	246	256	333	398
industry - big	000 m3/y	-	-	-	-	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Total with project	**000 m3/y**	**972**	**1,487**	**2,012**	**2,428**	**4,156**	**4,187**	**4,216**	**4,244**	**4,272**	**4,301**	**4,330**	**4,564**	**4,783**
Incremental demand														
domestic	000 m3/y	-	265	530	884	885	886	887	888	889	890	891	899	910
institutional users	000 m3/y	-	5	12	21	23	25	25	26	27	28	29	38	51
Industry -small	000 m3/y	-	16	35	64	69	74	76	79	81	84	87	115	152
industry - big	000 m3/y	-	-	-	-	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Total incremental demand	**000 m3/y**	**-**	**286**	**577**	**969**	**2,674**	**2,682**	**2,686**	**2,690**	**2,695**	**2,699**	**2,703**	**2,750**	**2,810**
Revenues														
Sewage existing	RSD m	14	18	22	24	26	27	28	30	34	38	42	85	200
Sewage incremental	RSD m	-	4	9	16	70	68	66	64	68	70	72	128	285
Total revenues	**RSD m**	**14**	**22**	**31**	**40**	**96**	**95**	**94**	**94**	**101**	**107**	**114**	**213**	**485**

Waste water treatment revenues

Waste water treatment revenues are considered to be entirely incremental, since this is a new service extended not only to new sewage collection customers, but also to existing consumers in Vrbas city. Without the project, this tariff would not be charged at all. The two large industries account for half of the revenues generated for waste water treatment, although slightly decreasing over time.

The tariffs mentioned in the table below are again expressed as waste water discharged into the sewer system for calculation purposes.

Table 5-68 Waste water treatment revenues

Financial year ending	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Tariffs														
Domestic	RSD/m3	-	-	-	-	22	23	25	26	27	28	30	49	87
Institutional users	RSD/m3	-	-	-	-	22	23	25	26	27	28	30	49	87
Business - small	RSD/m3	-	-	-	-	22	23	25	26	27	28	30	49	87
Business - large	RSD/m3	-	-	-	-	33	35	37	39	41	43	45	73	131
Wastewater charged														
Domestic	'000 m3	-	-	-	-	2,111	2,126	2,136	2,147	2,157	2,168	2,178	2,277	2,390
Institutional users	'000 m3	-	-	-	-	151	157	166	174	182	190	198	257	297
Business - small	'000 m3	-	-	-	-	197	207	216	226	236	246	256	333	398
Business - large	'000 m3	-	-	-	-	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
Revenue														
Domestic	RSD m	-	-	-	-	47	50	52	55	58	61	65	110	208
Institutional users	RSD m	-	-	-	-	3	4	4	4	5	5	6	12	26
Business - small	RSD m	-	-	-	-	4	5	5	6	6	7	8	16	35
Business - large	RSD m	-	-	-	-	57	59	62	65	69	72	76	123	222
Total	**RSD m**	**-**	**-**	**-**	**-**	**111**	**118**	**124**	**131**	**138**	**146**	**154**	**263**	**491**

5.3.9 Profit & loss, balance sheet and cash flow statement

This paragraph presents one of the final outputs of the financial model: forecasted financial statements of Vrbas PUC water & waste water. Full printouts of the model, both in RSD as well as Euro, are included in the annexes.

The following statements are presented and briefly discussed:

- Profit & loss statement;
- Balance sheet;
- Cash flow statement.

These financial statements include the financial effects of the project on the company. Thus, it helps to assess whether the project can be carried out in a financially sustainable way, i.e. without jeopardizing the financial viability of the company.

Profit & loss statement

With the proposed tariff policy, the company breaks even for most of the years during the analyzed period. A loss in the year 2010 is followed by several years with slight positive results. Also, towards the end of the analyzed period, minor losses are forecasted. The next to zero profit is a direct result of the tariff setting policy, which does not include a margin above costs.

Table 5-69 Profit and loss statement (RSD million)

Financial year ending	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Revenue												
Drinking water	69	74	79	84	97	107	116	125	135	144	300	729
Sewerage service	22	31	40	96	95	95	94	101	107	114	213	485
Waste water treatment	-	-	-	111	118	124	131	138	146	154	263	491
Other	-	-	-	-	-	-	-	-	-	-	-	-
Subsidies	-	-	-	-	-	-	-	-	-	-	-	-
Total	**91**	**105**	**119**	**292**	**310**	**326**	**341**	**365**	**388**	**412**	**775**	**1,705**
Expenditure												
Variable costs	14	17	21	60	66	72	78	84	91	98	207	511
Chemicals	1	1	1	4	5	5	5	6	6	6	11	21
Electricity	11	13	18	34	39	43	47	52	57	62	145	392
Fuel & lubricant	3	3	3	3	3	4	4	4	4	4	8	15
Sludge transport	-	-	-	4	4	4	5	5	6	6	12	27
Effluent discharge fee	-	-	-	14	15	16	16	17	18	19	31	57
Fixed costs	64	71	81	129	140	152	165	180	193	207	418	991
Wages and Salaries	27	30	34	47	52	57	63	70	75	82	179	458
Employee benefits	5	6	6	9	10	11	12	13	14	15	34	87
Other materials	4	4	4	4	4	4	5	5	5	5	9	16
Transport services	0	0	0	0	0	0	0	0	0	0	0	0
Repair services	13	15	19	39	41	44	47	50	53	56	98	192
Other services	3	3	4	9	9	10	10	11	12	12	22	43
Taxes and fees	-	-	-	-	-	-	-	-	-	-	-	-
Other costs	-	-	-	-	-	-	-	-	-	-	-	-
Overhead costs	12	13	14	21	23	26	28	31	33	36	77	196
Operating costs	**78**	**88**	**103**	**189**	**206**	**224**	**243**	**264**	**283**	**305**	**626**	**1,502**
Depreciation	6	11	19	76	76	77	78	78	79	79	113	122
Bad debt	7	5	6	15	15	16	17	18	19	21	39	85
Total costs	**91**	**104**	**128**	**280**	**298**	**317**	**338**	**360**	**382**	**404**	**777**	**1,709**
Net Operating Income	**0**	**2**	**(9)**	**12**	**12**	**8**	**3**	**5**	**6**	**8**	**(2)**	**(5)**
Interest charges	-	-	-	-	-	-	-	-	-	-	-	-
FX loss (gain)	-	-	-	-	-	-	-	-	-	-	-	-
Net Income before Tax	**0**	**2**	**(9)**	**12**	**12**	**8**	**3**	**5**	**6**	**8**	**(2)**	**(5)**
Income tax	-	0	-	0	1	1	0	0	1	1	-	-
Net Income after Tax	**0**	**1**	**(9)**	**12**	**11**	**8**	**3**	**4**	**6**	**7**	**(2)**	**(5)**

Balance sheet

The balance sheet is healthy, with a high share of equity out of the balance sheet total and a slow conversion of fixed assets into cash. By the end of the analyzed period, the company will have build up substantial cash reserves available for necessary re-investment in infrastructure. The quick ratio is well above minimum standards.

Table 5-70 Balance sheet (RSD million)

Financial year ending	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Fixed assets	379	1,358	2,346	2,274	2,209	2,145	2,079	2,009	1,940	1,871	2,070	861
Current assets												
Inventories	0	1	1	1	1	1	1	2	2	2	4	8
Receivables	24	23	21	44	47	51	54	57	61	64	124	273
Cash	4	15	24	92	165	236	304	376	450	526	419	1,561
Total	**28**	**38**	**45**	**137**	**214**	**288**	**359**	**435**	**513**	**592**	**546**	**1,842**
Non-operating	-	-	-	-	-	-	-	-	-	-	-	-
Total assets	**408**	**1,396**	**2,391**	**2,410**	**2,423**	**2,433**	**2,438**	**2,445**	**2,453**	**2,463**	**2,617**	**2,703**
Equity bf	185	395	1,382	2,376	2,388	2,400	2,408	2,411	2,416	2,422	2,556	2,564
Retained earnings	0	2	(9)	12	12	8	3	5	6	8	(2)	(5)
Grants	209	986	1,003	-	-	-	-	-	-	-	-	-
Equity cf	**395**	**1,382**	**2,376**	**2,388**	**2,400**	**2,408**	**2,411**	**2,416**	**2,422**	**2,430**	**2,554**	**2,559**
Long term liabilities												
Equity	395	1,382	2,376	2,388	2,400	2,408	2,411	2,416	2,422	2,430	2,554	2,559
Long-term liabilities	5	5	5	5	5	5	5	5	5	5	5	5
Total	**400**	**1,387**	**2,381**	**2,393**	**2,405**	**2,413**	**2,416**	**2,421**	**2,427**	**2,435**	**2,559**	**2,564**
Current liabilities												
Payables	8	9	10	17	19	20	22	24	26	28	57	139
Overdraft	-	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-	-	-
Total	**8**	**9**	**10**	**17**	**19**	**20**	**22**	**24**	**26**	**28**	**57**	**139**
Non-operating	-	-	-	-	-	-	-	-	-	-	-	-
Total liabilities	**408**	**1,396**	**2,391**	**2,410**	**2,423**	**2,433**	**2,438**	**2,445**	**2,453**	**2,463**	**2,617**	**2,703**

Cash flow

Cash flow generation of the project is sufficient to finance all necessary investments after the initial investment. This means that no further capital subsidy from either the municipalities or state level is required, so that the PUC finances are sustainable.

The most substantial follow on investments are required during the year 2024 and 2025 when the electrical-mechanical equipment of the waste water treatment plant and sewage pumping station will need to be replaced. Although this will cause the cash flow of 2025 to become negative, accumulated cash flow from previous years is sufficient to finance the total required investment. The cumulative cash flow is positive for each of the years during the analyzed period. Thus, at company level, the project is financially sustainable.

Table 5-71 Project cash flow statement (in RSD million)

Financial year ending	2008	2009	2010	2011	2012	2013	2014	2015	2024	2025	2039
Cash bf	2	4	15	24	92	165	236	304	1,022	1,054	1,473
Overdraft bf	-	-	-	-	-	-	-	-	-	-	-
Net cash bf	**2**	**4**	**15**	**24**	**92**	**165**	**236**	**304**	**1,022**	**1,054**	**1,473**
Revenue											
Water sales	69	74	79	84	97	107	116	125	241	259	729
Sewerage service	22	31	40	96	95	94	94	101	175	187	485
Waste water treatment	-	-	-	111	118	124	131	138	225	237	491
Less bad debt	(7)	(5)	(6)	(15)	(15)	(16)	(17)	(18)	(32)	(34)	(85)
Total	**84**	**100**	**113**	**277**	**294**	**309**	**324**	**347**	**608**	**649**	**1,619**
Costs											
Variable costs	14	17	21	60	66	72	78	84	166	179	511
Chemicals	1	1	1	4	5	5	5	6	9	10	21
Electricity	11	13	18	34	39	43	47	52	113	123	392
Fuel & lubricant	3	3	3	3	3	4	4	4	7	7	15
Sludge transport	-	-	-	4	4	4	5	5	10	10	27
Effluent discharge fee	-	-	-	14	15	16	16	17	27	28	57
Fixed costs	64	71	81	129	140	152	165	180	338	363	991
Wages and Salaries	27	30	34	47	52	57	63	70	141	153	458
Employee benefits	5	6	6	9	10	11	12	13	27	29	87
Other materials	4	4	4	4	4	4	5	5	8	8	16
Transport services	0	0	0	0	0	0	0	0	0	0	0
Repair services	13	15	19	39	41	44	47	50	83	87	192
Other services	3	3	4	9	9	10	10	11	18	19	43
Taxes and fees	-	-	-	-	-	-	-	-	-	-	-
Other costs	-	-	-	-	-	-	-	-	-	-	-
Overhead costs	12	13	14	21	23	26	28	31	61	66	196
Total	**78**	**88**	**103**	**189**	**206**	**224**	**243**	**264**	**504**	**542**	**1,502**
Working capital required	(2)	2	3	(16)	(2)	(2)	(2)	(2)	(3)	(3)	(9)
Operating cash flow	**4**	**15**	**13**	**72**	**86**	**84**	**79**	**81**	**101**	**104**	**109**
Capex subsidy	209	15	12	-	-	-	-	-	-	-	-
Capex	209	986	1,003	-	-	-	-	-	58	910	-
Discretionary capex	2	4	4	4	12	13	11	9	12	12	20
Investment cash flow	**2**	**974**	**995**	**4**	**12**	**13**	**11**	**9**	**69**	**922**	**20**
Credit / overdraft interest											
Debt drawdown	-	-	-	-	-	-	-	-	-	-	-
Grants	-	971	991	-	-	-	-	-	-	-	-
Financing cash flow	**-**	**971**	**991**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Cash for debt service	**2**	**11**	**9**	**68**	**74**	**71**	**68**	**72**	**32**	**(818)**	**88**
Capital repayment	-	-	-	-	-	-	-	-	-	-	-
Interest and fee payment	-	-	-	-	-	-	-	-	-	-	-
Total debt service	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net change in cash	**2**	**11**	**9**	**68**	**74**	**71**	**68**	**72**	**32**	**(818)**	**88**
Cash cf	4	15	24	92	165	236	304	376	1,054	236	1,561
Overdraft cf	-	-	-	-	-	-	-	-	-	-	-
Net cash cf	**4**	**15**	**24**	**92**	**165**	**236**	**304**	**376**	**1,054**	**236**	**1,561**

5.3.10 Financial cost benefit analysis

A financial cost-benefit analysis has been carried out based on the assumptions set out in previous paragraphs. The purpose of the financial cost benefit analysis is to assess the financial feasibility and viability of the project and to determine the maximum possible EU grant assistance. The analysis is carried out in accordance with the "Guide to cost-benefit analysis of investment projects" (EC DG Regio, 2002). The output of the analysis is:

- Calculation of the project financial net present value (FNPV/C) and internal rate of return (FIRR/C) of the total investment, in order to assess financial feasibility and need for (grant) assistance;
- Assessing the financial sustainability of the project by calculating the projects' financial and cumulative cash flow, including financing;
- Calculating the financial net present value of invested capital (FNPV/K) and internal rate of return of invested capital (FIRR/K). This analysis calculates financial feasibility from the viewpoint of the recipient and only takes into consideration the total invested public capital;
- Sensitivity and risk analysis. This analysis identifies and assesses the sensitivity of the project to key input variables;
- Economic cost benefit analysis. Assessment of the economic feasibility of the project from the viewpoint of society as a whole.

EU grant assistance

The EU grant assistance is calculated using the so called funding gap method calculate by means of the "modified formula". The rationale behind this methodology is to identify the financial needs of a project (funding gap) and to provide grant assistance in order to make them financially feasible.

The formula used is defined as:

Grant rate = DIC / (DIC + DNR)

Where DIC = discounted investment cost and DNR is discounted net revenues. Under the current ISPA regulation, this grant rate can be up to 75% and in exceptional cases 85%. This study assumes that the maximum grant rate under IPA is 75%.

Subsequently, the maximum EU grant can be calculated by multiplying the grant rate with the total eligible investment cost (excluding amongst others VAT and land acquisition costs).

It should be noted however, that the methodology to determine the level of grant assistance of ERDF and Cohesion fund assistance projects for the 2007 – 2013 programming period differs from the "modified formula" elaborated upon above. A special methodology is developed for revenue generating projects, such as projects in the water & waste water sector.[2] This methodology leads to substantially lower grant amounts. For the sake of completeness, this different grant calculation methodology is also applied. The methodology is as follows:

[2] *Council regulation (EC) 1083/2006 dated 11 July 2006, article 55 "revenue generating projects"*

Step 1: determination of funding gap rate (R):

R = Max EE/DIC

Where

Max EE is the maximum eligible expenditure = DIC-DNR
DIC is the discounted investment cost
DNR is the discounted net revenue = discounted revenues – discounted operating costs + discounted residual value

Step 2: calculating the "decision amount" (DA):

DA = EC*R

Where

EC is the eligible cost

Step 3: find the (maximum) EU grant:

EU grant = DA*Max CRpa

Where

Max CRpa is the maximum co-funding rate fixed

Discount rate

In the absence of a national Serbian discount rate, a discount rate as applied in EU-ISPA financed projects in neighboring countries is used, which is also recommended by the EU guide to Cost-Benefit Analysis of Investment Projects[3]. This discount rate amounts to 6% in real terms. Since the analysis is carried out in current prices, a nominal discount rate of 8% is applied, after adjusting the real rate for 2% inflation.

It is recognized that the most recent guidance from the EU concerning ERDF and Cohesion Fund financed projects during the programming period 2007 – 2013 recommends a lower real discount rate of 5%[4]. However, this is to be applied for countries which have acceded into the EU already and which have more advanced financial markets and a lower financial risk profile than Serbia. For this reason, a slightly higher discount rate is used which reflects this higher cost of capital.

Assumptions

As elaborated upon in the previous paragraphs, a distinction between the "without" and "with" project is made. Incremental costs and revenues are defined as the difference between "with" and "without" cost and revenue estimate. These incremental costs are a direct result of the project intervention.

[3] *EU guide to Cost-Benefit Analysis of Investment Projects (EU Commission 2002), available at http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide02_en.pdf*
[4] *Working document 4: Guidance on the methodology for carrying out Cost-Benefit Analysis, available at http://ec.europa.eu/regional_policy/sources/docoffic/2007/working/wd4_cost_en.pdf*

In doing so, consultants have made the following assumptions:

- Drinking water revenues and costs can be entirely contributed to the "without project" situation;
- Sewage collection revenues and costs can be divided in:
  - Vrbas city sewage collection network. These costs are considered to be "without project". Incremental costs caused by the extension of the main sewer collector to Carnex meat factory and incremental electricity costs caused by the additional hydraulic load as a result of connection of Carnex and Vital industries are incremental costs and will be identified as such;
  - Extension of sewage collection network in 5 Vrbas villages. These costs are entirely incremental.

  Incremental sewage revenues will be calculated by first estimating incremental demand for sewage collection services. Next, this incremental demand will be multiplied with the proposed sewage collection tariffs, in order to calculate incremental revenues.
- Waste water treatment revenues and costs are entirely incremental, since this is considered to be a new service. Thus, waste water treatment tariffs charged to both new and existing customers is considered to be incremental revenue.

Further considerations are:

- Net present values and internal rate of return are calculated back to base year 2007, with a project period starting in 2008 up to the year 2039 (32 years);
- Only phase I investments and related re-investments are included in the financial cost benefit analysis;
- Non-eligible costs for EU financing are included in the discounted cash flow analysis, since these present a real outflow for the company. Thus, non-reimbursable value added tax and land acquisition costs are included in the investment cost. However, in calculating the potential EU grant, these non-eligible costs are excluded;
- Residual investment value is included at the end of the project period. The residual value is calculated simply as the remaining book value at the end of the year 2039. The calculation ignores exchange rate losses. The residual value thus calculated has been compared with the net present value of future cash flows generated by these remaining assets, assuming the same trend in net cash flow continues for the remaining useful lifetime and disregarding any new reinvestments (although these would be required for the proper functioning of the WWTP). The net present value of future cash flows does not materially differ from the remaining book value of the project.

Full printouts of the financial cost-benefit analyses are included in the annexes.

The results of the analysis are, assuming a base case macro – economic scenario:

<u>Financial cost benefit analysis total invested capital</u>

- During the 32 year analysis period, the nominal internal rate of return (FNPV/C) is 0.3%;
- The financial net present value (FNPV/K) is negative and amounts to € -14,446K
- Therefore, EU grant assistance is required to make the project financially feasible, which is calculated below.

Table 5-72 Financial cost benefit analysis total invested capital

	Units		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Sewage collection	€ 000		49	102	177	786	750	717	687	711	722	734	1,132	2,105
Waste water treatment	€ 000		-	-	-	1,240	1,291	1,344	1,398	1,454	1,513	1,575	2,315	3,626
Residual value	€ 000		-	-	-	-	-	-	-	-	-	-	-	8,600
Incremental revenues	**€ 000**		**49**	**102**	**177**	**2,025**	**2,041**	**2,061**	**2,085**	**2,165**	**2,236**	**2,309**	**3,447**	**14,331**
Sewage collection	€ 000		-	49	150	309	333	353	375	401	424	449	801	1,624
Waste water treatment	€ 000		-	-	-	740	788	834	881	932	979	1,029	1,697	3,140
Incremental operational costs	**€ 000**		**-**	**49**	**150**	**1,049**	**1,122**	**1,187**	**1,256**	**1,333**	**1,404**	**1,479**	**2,498**	**4,763**
Sewage collection	€ 000		2,341	4,770	4,770									
Waste water treatment plant	€ 000		-	5,906	5,886									
Supervision	€ 000		122	695	695									
Subtotal investment costs	€ 000		2,462	11,371	11,351	-	-	-	-	-	-	-	-	-
Re-investment costs	€ 000		-	-	-	-	-	-	-	-	-	-	-	-
Incremental investment costs	**€ 000**		**2,462**	**11,371**	**11,351**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Net cash flow	**€ 000**		**(2,413)**	**(11,318)**	**(11,324)**	**977**	**920**	**874**	**828**	**832**	**832**	**830**	**950**	**9,568**
Cumulative cash flow	€ 000		(2,413)	(13,732)	(25,056)	(24,079)	(23,160)	(22,285)	(21,457)	(20,625)	(19,792)	(18,962)	(18,822)	1,527
Discount rate (nominal)	%	8.0%												
FNPV/C	€ 000	(14,446)												
FRR/C	%	0.3%												

The maximum EU grant, using the modified formula, is calculated to amount to € 18,560K (current prices) as set out in the table below. The calculated grant rate is 76.1% and exceeds the assumed maximum of 75%.

Table 5-73 EU grant calculation, modified formula

NPV incremental revenues		
Sewage collection	€ 000	8,555
Waste water treatment	€ 000	16,337
Residual value	€ 000	733
Subtotal incremental revenues	**€ 000**	**25,625**
NPV incremental operational costs		
Sewage collection	€ 000	5,403
Waste water treatment	€ 000	11,417
Re-investment	€ 000	2,211
Subtotal incremental operational costs	**€ 000**	**19,031**
Discounted net revenues (DNR)	**€ 000**	**6,594**
NPV investment costs (DIC)		
Sewage collection	€ 000	10,043
Waste water treatment plant	€ 000	9,736
Supervision	€ 000	1,260
Subtotal investment costs (DIC)	**€ 000**	**21,039**
Grant rate, calculated DIC/(DIC+DNR)	%	76.1%
Grant rate, applied (max 75%)	%	75.0%
Eligible investment cost (current prices)	€ 000	24,747
EU grant (maximum)	**€ 000**	**18,560**

The funding gap methodology applicable to ERDF/CF financed project during the programming period 2007 – 2013 leads to a substantially lower maximum grant level of € 12,743K, assuming a maximum co-financing rate of 75%. In case the discount rate would be set at 5% in real terms (7% current) as required for ERDF/CF financed projects during the programming period 2007 - 2013, the maximum EU grant would amount to € 12,071K.

Table 5-74 EU grant calculation, ERDF/CF 2007-2013

Step 1: funding gap rate		
Discounted net revenues (DNR)	€ 000	6,594
Discounted investment costs (DIC)	€ 000	21,039
Eligible expenditure EE (DCI-DNR)	€ 000	14,446
Funding gap rate R (EE/DIC)	**%**	**68.7%**
Step 2: decision amount		
Eligible investment costs EC (current prices)	€ 000	24,747
Decision amount DA (R x EC)	**€ 000**	**16,991**
Step 3: maximum EU grant		
Maximum co-funding rate Crpa	%	75%
EU grant (maximum)	**€ 000**	**12,743**

Financial sustainability

The cash flow statement of the company as set out in paragraph 5.3.9 already showed that at company level no cash flow problems arise. Cumulative cash is in any single year positive. Large reinvestments in especially the electrical-mechanical equipment of the waste water treatment plant can be completely financed from internally generated cash, i.e. from the tariffs charged to customers.

In order to assess financial sustainability of the project as such, a separate calculation is made which only includes incremental costs, revenues, investments as well as the all financing sources available.

The table below shows that the project is also financially sustainable, since in any one year cumulative cash flow is positive. Although cash flow in the year 2025 is negative as a result of large reinvestments, accumulated cash during previous years is sufficient to finance this.

Table 5-75 Project financial sustainability

	2008	2009	2010	2011	2012	2013	2014	2015	2024	2025	2039
Total financial sources	2,462	11,371	11,351	-	-	-	-	-	-	-	-
Revenues	49	102	177	2,025	2,041	2,061	2,085	2,165	3,046	3,178	5,731
Total inflows	**2,511**	**11,473**	**11,528**	**2,025**	**2,041**	**2,061**	**2,085**	**2,165**	**3,046**	**3,178**	**5,731**
Total operating costs	-	49	150	1,049	1,122	1,187	1,256	1,333	2,134	2,249	4,763
Total investment costs	2,462	11,371	11,351	-	-	-	-	-	531	8,263	-
Interest on loans	-	-	-	-	-	-	-	-	-	-	-
Retirement bonus	-	-	-	-	-	-	-	-	-	-	-
Loan principal repaymenrt	-	-	-	-	-	-	-	-	-	-	-
Taxes	-	-	-	-	-	-	-	-	-	-	-
Total outflows	**2,462**	**11,420**	**11,501**	**1,049**	**1,122**	**1,187**	**1,256**	**1,333**	**2,664**	**10,512**	**4,763**
Total cash flow	**49**	**53**	**27**	**977**	**920**	**874**	**828**	**832**	**382**	**(7,334)**	**968**
Cumulative cash flow	**49**	**102**	**128**	**1,105**	**2,024**	**2,899**	**3,727**	**4,560**	**11,806**	**4,472**	**18,111**

Financial cost benefit analysis invested capital

A third analysis is made to determine the net present value and rate of return of the public funds invested on the project. In this project, the national contribution consists of funds provided by:

- Municipality of Vrbas;
- Ministry of Agriculture, Forestry and Water, DG Water

The analysis reveals that:

- Financial internal rate of return of invested capital (FIRR/K) is 9.4%, slightly above the discount rate of 8%;
- Financial net present value (FNPV/K) is positive and equals € 878K.

Therefore, it can be concluded that with the EU grant, the project is financially feasible from the perspective of Serbia, without creating excessive returns on national capital invested.

Table 5-76 Financial cost benefit analysis invested national capital

Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
Revenues	49	102	177	2,025	2,041	2,061	2,085	2,165	2,236	2,309	3,447	5,731
Residual value	-	-	-	-	-	-	-	-	-	-	-	8,600
Total revenues	**49**	**102**	**177**	**2,025**	**2,041**	**2,061**	**2,085**	**2,165**	**2,236**	**2,309**	**3,447**	**14,331**
Total operating costs	-	49	150	1,049	1,122	1,187	1,256	1,333	1,404	1,479	2,498	4,763
Re-investment financed from internal cash flow	-	-	-	-	-	-	-	-	-	-	-	-
Interest on loans	-	-	-	-	-	-	-	-	-	-	-	-
Retirement bonus	-	-	-	-	-	-	-	-	-	-	-	-
Loan principal repaymenrt	-	-	-	-	-	-	-	-	-	-	-	-
Private equity	-	-	-	-	-	-	-	-	-	-	-	-
Total national public contribution	2,462	2,091	2,071	-	-	-	-	-	-	-	-	-
Total expenditures	**2,462**	**2,140**	**2,221**	**1,049**	**1,122**	**1,187**	**1,256**	**1,333**	**1,404**	**1,479**	**2,498**	**4,763**
Net cash flow	**(2,413)**	**(2,038)**	**(2,044)**	**977**	**920**	**874**	**828**	**832**	**832**	**830**	**950**	**9,568**
Cumulative cash flow	**(2,413)**	**(4,451)**	**(6,495)**	**(5,519)**	**(4,599)**	**(3,725)**	**(2,896)**	**(2,064)**	**(1,232)**	**(402)**	**(261)**	**20,087**

Discount rate	%	8.0%
FNPV/K	€ 000	878
FIRR/K	%	9.4%

5.3.11 Sensitivity analysis

A sensitivity analysis is conducted to analyze the impact of:

- Variations in the macro-economic environment;
- Identify the sensitivity of the model to changes in some key input factors.

Macro-economic scenarios

The table below summarizes the results of the sensitivity analysis for changes in the macro-economic environment. Revenues have been fixed at the level as proposed for the base case scenario.

Table 5-77 Sensitivity analysis macro-economic assumptions

Description	FIRR/C	FNPV/C (€ '000)	Remarks
Base case	0.3%	-14,444	Cashflow negative 2025, cumulative cashflow positive
Optimistic case	2.0%	-11,812	Cashflow negative 2025, cumulative cashflow positive
Pessimistic case	-1.8%	-17,913	Cashlfow negative 2025, cumulative cashflow negative 2025 to 2030

Conclusion is that the project is not very sensitive to changes in the macro-economic environment: the internal rate of return varies between -1.8% and 2.0% for respectively the pessimistic and optimistic macro economic scenario. PUC operations would be financially sustainable under an optimistic and base case macro economic scenario, since cumulative cash flow is positive in every single year of the analyzed period. This would, however, not be the case under a pessimistic macro economic scenario. A pessimistic macro economic scenario causes the cumulative cash flow at company level

to become negative during the years 2025 to 2030. This means that the PUC would have to look for external finance to bridge this gap.

Key input variables

A number of key input variables are identified and varied with respectively +/- 1%, 2%, 3% and 5%, in order to assess the sensitivity of the project to such changes. If a change of 1% in an input leads to an increase of more than 5% of the net present value (FNPV/C), the variable is considered to be a key risk factor and a more in depth risk analysis is required.

The following key input variables are identified:

- Discount rate
- Demand: unit consumption of water/waste water
- Investment cost (total)
- Operation & maintenance cost (total)
- Revenues: water & waste water tariff

The discount rate is changed with 1% percentage in *absolute* terms. For example, +1% would mean a discount rate of 8% + 1% = 9%.

The other variables are changed *relative* to the base value, while keeping the other input variables fixed. Variations are only added to the base value of a single year, so that changes are *not* cumulative. The tariff is also fixed at the base level, although underlying costs would change as a result of variations, which in turn would prompt a different level of tariffs, following the full cost price setting policy proposed in this study.

Variations will be carried out assuming a base case macro economic scenario.

Table 5-78 Sensitivity analysis key input variables

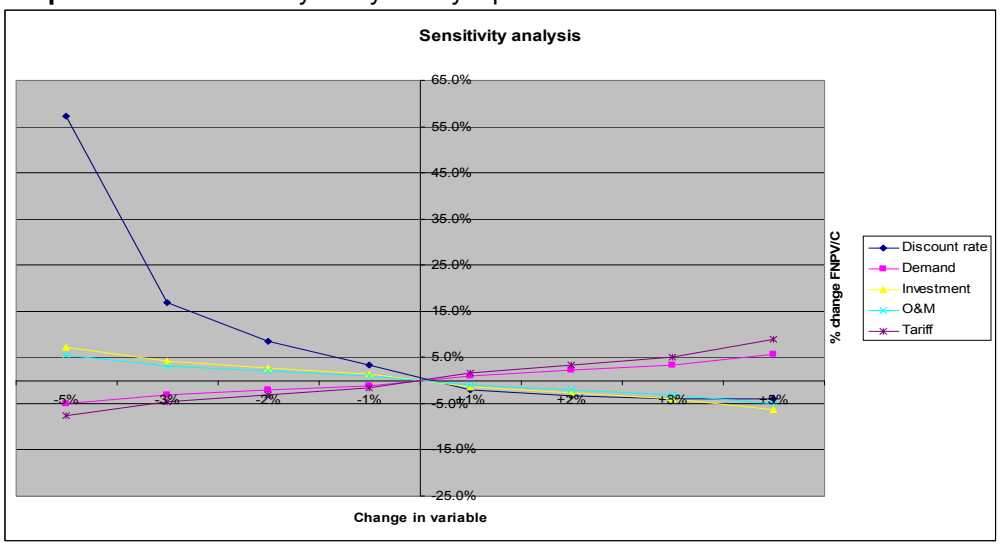
		Change in value FNPV/C				
Description	**Change in variable**	**Discount rate**	**Demand**	**Investment**	**O&M**	**Tariff**
Change in variable of	+5%	-4.0%	5.7%	-8.5%	-4.9%	8.9%
Change in variable of	+3%	-3.9%	3.4%	-5.3%	-3.0%	5.2%
Change in variable of	+2%	-3.3%	2.2%	-3.6%	-2.0%	3.4%
Change in variable of	+1%	-2.1%	1.1%	-1.8%	-1.0%	1.7%
Change in variable of	-1%	3.3%	-1.1%	1.9%	1.1%	-1.6%
Change in variable of	-2%	8.6%	-2.1%	3.9%	2.1%	-3.2%
Change in variable of	-3%	16.9%	-3.1%	5.9%	3.2%	-4.7%
Change in variable of	-5%	57.3%	-5.1%	10.3%	5.5%	-7.6%

A change of +/- 1% of any of the identified key input variables does not cause the FNPV/C to change with more than 5%. Therefore, none of the key input variables are critical to the financial outcome, although of course they do impact the financial result. Therefore, no further risk analysis of these variables will be carried out.

The FNPV/C value is clearly most sensitive to changes in the discount rate and in particular to lower discount rates. A lower discount rate would rapidly increase the financial net present value of the project. The level of the discount rate has been discussed and justified already in paragraph 5.3.10.

Changes in tariff and costs of investment also cause considerable variations in the FNPV/C value, as shown in the graph below.

Graph 5-9 Sensitivity analysis key input variables



5.3.12 Economic cost benefit analysis

In this paragraph, an economic analysis of the Vrbas sewerage and waste water treatment plant is carried out. The analysis builds upon the financial analysis and model as elaborated upon in the previous paragraph. The analysis is conducted following the methodological guidelines as presented in the Guide to cost-benefit analysis of investment projects (European Commission - Evaluation Unit, DG Regional Policy, & European Commission, Brussels 2002)

Approach and methodology

The main objective of an economic analysis is to analyze the cost and benefits of the proposed project to society as a whole. It differs from a financial analysis, which only takes actual money flows into consideration, accruing to or to be paid by the investor of the project. However, the financial analysis and specifically the financial cost-benefit analysis, forms the basis on which the economic analysis is conducted.

An economic analysis usually consists of:

- A qualitative assessment of the external benefits and costs of a project to society as a whole;
- A quantitative economic analysis, in which first external effects are quantified and subsequently monetized. However, environmental, social, health and economic external benefits are often difficult to quantify, let alone monetize. Usually, only part of all identified benefits and costs can be quantified and monetized. For that reason, the qualitative assessment complements the quantitative analysis and improves the overall quality of the analysis. The main output of the quantitative economic analysis is an estimate of the economic internal rate of return (EIRR), the economic net present value (ENPV) and the Benefit-Cost ratio, all of which are to be judged against certain minimum thresholds. The minimum threshold of the Benefit-Cost ratio is 1, which means that the overall benefits to society are higher than its costs.

The analysis is carried out in nominal terms during the 32 year project period, i.e. from 2008 to 2039, equivalent to the financial analysis referred to above.

In the absence of an official Serbian economic discount rate, a nominal rate of 7% is used, comprised of 5% real and 2% inflation. This social discount rate is commonly used to evaluate EU-ISPA co-financed projects and is also proposed to be used in the Guide to cost-benefit analysis of investment projects. It is recognized however, that this rate differs from the social discount rates to be used by ERDF/CF financed projects during the 2007-2013 programming period[5]. The latter proposes a social discount rate of 5.5% for cohesion countries (meaning most regions in Eastern European EU countries) and 3.5% for other countries within the EU.

For the quantitative analysis, the following steps are carried out:

- ***Fiscal corrections***. All financial prices in the financial analysis should be net of all indirect taxes/subsidies and other transfers, like value added tax. Direct taxes (income taxes) however, are to be included in the analysis;
- ***Corrections for externalities***. External costs and benefits which are not priced in the financial are to be quantified and valued. Waste water treatment plants usually have large external benefits, such as increased health benefits;
- ***Conversion of market prices to accounting prices***. Market prices are distorted because of imperfect markets. An example of market distortions, which is also valid for this study, is legally enforced minimum wages in countries with high unemployment figures. To convert market prices to accounting prices or economic prices, corrections are made by means of:
  - Standard conversion factors to estimate marginal cost. Standard conversion factors are calculated as follows:

    (M + X) / ((M + Tm) + (X – Tx)), where:

    M = total imports
    X = total exports
    Tm = import taxes
    Tx = export taxes
  - Shadow wages. The shadow wage is calculated to assess societies' true marginal cost of labor. This is especially relevant in Serbia, where high unemployment exists. The shadow wage is calculated as follows:

    SW = FW*(1-u)*(1-t)

    SW is the shadow wage
    FW is the financial (market) wage
    u is the regional unemployment rate
    t is the rate of social security payments and relevant taxes

    This shadow age will only be applied to unskilled labor, since this is in abundant supply. Skilled labor, however, is assumed to be properly priced, since the market for this is competitive.

[5] *Working document 4: Guidance on the methodology for carrying out Cost-Benefit Analysis, available at http://ec.europa.eu/regional_policy/sources/docoffic/2007/working/wd4_cost_en.pdf*

Qualitative economic analysis

In summary, the project would generate the following economic benefits:

Health

Waste water and sewerage projects have major health benefits due to the prevention of water borne diseases caused by pollution of surface and groundwater. Economic benefits arise from prevention of medical costs, but also prevention of lost production hours due to illness and improved work efficiency. These benefits not only accrue to people living in Vrbas municipality, but also extend to downstream municipalities, such as Srbobran (17,000 inhabitants). In the absence of detailed medical statistics, it is difficult to quantify these benefits in the case of Vrbas, but is clear that:

- Construction and operation of the waste water treatment plant will significantly reduce the pollution of the Grand Canal of untreated waste water originating from Vrbas city (26,000 residents), which is currently being discharged directly into the surface water;
- Construction of the sewage collection network in 5 Vrbas villages and subsequent connection to the waste water treatment plant of 20,000 residents will significantly reduce pollution of groundwater caused by current disposal of sewage in septic tanks. In addition, emptying of septic tanks and subsequent discharge of sewage will reduce health risks due to reduced transport and elimination of disposal of raw sewage in surface water, landfill or elsewhere.
- Construction of the sewage main collector to Carnex meat industry and subsequent connection and treatment of industrial wastewater of Carnex and Vital will prevent major pollution of and thus radically improve water quality of the Grand Canal.

Resource benefits, costs and savings

- Improvement of groundwater and surface water quality would lower the cost of treatment or enable the use of these sources for drinking water or agricultural or industrial (cooling water) purposes;
- Connection to the sewer system would mean elimination of costs to residents related to the construction of septic tanks and especially costs related to emptying, transport and disposal of sewage from septic tanks;
- Improvement of surface water quality increases the potential of the canal as a fishing resource;
- Improvement of the water quality of the Grand Canal would increase the value of property in Vrbas town (the Grand Canal is flowing through the centre of Vrbas town). Real estate prices will also increase in 5 Vrbas village, after connection to the sewage collection system;
- The waste water treatment plants' sludge treatment process generates electricity, which means a saving on the costs of primary electricity generation. This saving is already included in the financial analysis. However, the current electricity price is significantly below regional electricity prices, suggesting that prices are set at below market prices. This study uses a 2007 price of € 0.06/kwh, while regional prices are closer to € 0.11/kwh. This of course also depends on the cost electricity generation in each country, so the real resource saving is difficult to estimate;
- Related to the above, conversion of methane gas into electricity and reduction of methane gas emissions by properly storing sludge reduces the adverse effects of these gases on global warming due to the greenhouse effect;
- Use of land for the waste water treatment plant would mean loss of agricultural production.

Social and development benefits

- Improved water quality of the Grand Canal will improve the potential for recreation and encourage tourism. This is a specifically anticipated result of the project by the Municipality of Vrbas;
- A related, but different value is increased bio-diversity and nature preservation;
- Reduced levels of bad smells and odours in Vrbas city will significantly improve the quality of life;
- Construction of the project will generate significant employment opportunities, especially for unskilled labor;
- Amenity benefits: improvement of the water quality of the Grand Canal would increase the value of property in Vrbas town (the Grand Canal is flowing through the centre of Vrbas town). Real estate prices will also increase in 5 Vrbas village, after connection to the sewage collection system;
- Disamenity costs are minimal, since there are no houses near the waste water treatment plant.

Quantitative economic analysis

Starting from the financial cost benefit analysis and using the economic analysis methodology elaborated upon above, the following corrections are made:

Fiscal corrections.

A correction is made for value added tax included in the investment cost estimate of the project.

Furthermore, the financial analysis includes costs related to effluent discharge fees payable to Vode Vojvodine. Despite significantly improved effluent quality, greatly reduced but still sizable fees will need to be paid, since part of the current tariff setting formula is related to design capacity and hydraulic load of the installation in use by the polluter. The waste water treatment plant produces significant quantities of treated waste water, which will be discharged into the Grand Canal. It is assumed that these fees are needed to offset costs Vode Vojvodine incurs for operation and maintenance of the DTD canal system, and thus are in addition to other identified (economic) costs and benefits. Therefore, this cost is not eliminated in the economic analysis.

External corrections

Although many external benefits have been identified in the qualitative assessment, proper quantification and monetization of these effects is difficult or very time consuming. Different techniques are available to estimate external benefits, such as:

- Willingness to pay studies (contingent valuation). A survey is conducted in which people are asked what they would want to pay in order to achieve certain results, for example reduced odour levels, better recreational/swimming/angling opportunities because of improved surface water quality etc. This method is time consuming and beyond the scope of this study;
- Direct estimation of reduced health costs as a result of the project. In order to be able to estimate these effects, detailed statistical information of the project area on incidence of illness and associated costs would be required. Furthermore, a precise dose-response relation would need to be researched, i.e. what is the relation between effluent quality improvements caused by the project on improved water quality and ultimately reduced illnesses and associated costs. The detailed

statistical information is not available, nor is a primary study on dose-response relations within the scope of this project;
- A simpler approach is to use existing (primary) studies or approaches which resemble project circumstances: the benefits transfer method. This method is selected to estimate external benefits for this project.

In several Eastern European countries, national guidelines exist to estimate external environmental effects of water quality improvement projects. These guidelines are specifically used for the preparation of ISPA and CF financed projects.

The Czech Republic uses as a proxy for estimating environmental external benefits € 35 for each person connected to a waste water treatment plant (2006 prices). Social benefits are estimated at CZK 0.064 to 0.142 per household connected to the sewer system per kilometre of river per year.

Poland's National Fund for Environmental Protection and Water Management uses a different approach. It provide guidelines for estimating external benefits for each unit quantity of pollutant not discharged into the environment as follows:
- € 0.84 for each kg of BOD removed;
- € 0.34 for each kg of COD removed;
- € 0.11 for each kg of suspended solids removed.

In Romania, a similar approach is used in ISPA financed projects, although at a lower rate: € 0.60/kg BOD removed.

This studies uses an amount of € 0.60/kg BOD removed (2007 prices), as is done in Romania. It should be noted that this results in significantly lower estimates of environmental benefits compared to the approaches used in the Czech Republic and Poland. It is recognized that the absolute valuation of external benefits in Poland and Czech Republic will be higher than those in Serbia, since price levels will be higher. However, even after this correction, net benefits are still higher. An estimate of € 0.60/kg BOD removed is therefore on the low side, something which should be taken into consideration when evaluating the results of the economic analysis.

As identified in the qualitative economic analysis, property prices in Vbras municipality are likely to increase as a result of decreased levels of odour and smell (Vrbas city) and connection of premises to the sewage collection network in 5 Vrbas villages. An attempt is made to valuate this by estimating the prevented costs of transport of sewage from septic tanks. The cost saving would arise from the fact that Vrbas municipality might enforce unconnected residents to build septic tanks and transport sewage to the waste water treatment plant. Resident which are connected would be able to prevent these costs.

This benefit, or more precisely cost saving, would only accrue to residents living in 5 Vrbas villages, since they are to be connected to the sewage system as a result of the project. PUC Standard currently offers a service to empty septic tanks and to dispose off the sewage. The 2007 charge is RSD 4,500 per truck, which is able to transport 5m3 per trip. Assuming that an average septic tank will have to be emptied twice per year, a household would have to pay RSD 9,000/year for emptying and transport of waste water. This translates into a charge of RSD 67/m3 (€ 0.80/m3) of generated wastewater, which will be used in this study.

Conversion of market to economic prices

Based on National Bank of Serbia statistics for the year 2006, the standard conversion factor for Serbia is 0.97, assuming an export tax rate half of the average import tax rate. Conversion of market prices to economic/accounting prices is summarized in the table below:

Description	SCF
(Re) Investment – domestic costs	0.97
(Re) Investment – foreign costs	1.00
Revenues	0.97
Operation & Maintenance	0.97
Residual value (mainly civil works)	0.97
Operation & Maintenance	0.97

Finally, a large benefit to society is the creation of additional jobs, assuming these would be recruited from the ranks of the unemployed. This is a likely assumption, especially in light of high unemployment in the project area of 22%.

During the construction phase, large civil works are carried out which are labor intensive. It is estimated that 30% of the value of civil works is spent on labor. Total incremental employment generated during operation of the sewage collection and waste water treatment is limited to 15 new jobs (10 staff for the waste water treatment plant and 5 for the new sewage collection system).

Economic net present value

As elaborated upon above, the project will have high environmental, social and economic benefits. After correction for some of the external benefits, as well as fiscal adjustments and conversion of market to economic prices, the project gives a return of 13.2%, generates a positive economic net present value of € 14,858K and a benefit cost ratio of 1.39. The conclusion therefore is that the project is feasible from the point of view of society as a whole. It should further be noted that the overall benefit to society will probably be higher, since not all external benefits have been monetized.

Table 5-79 Economic cost benefit analysis

	CF	NPV 7.0%	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2027	2039
correction VAT on investment		362	106	155	155	-	-	-	-	-	-	-	-	-
Fiscal corrections		**362**	**106**	**155**	**155**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Environmental effects of BOD reduction		11,924	-	-	-	910	933	957	981	1,011	1,041	1,072	1,380	1,820
Prevention of transport costs of septic tanks		12,221	234	480	823	846	870	891	913	935	958	981	1,251	1,677
External benefits		**24,145**	**234**	**480**	**823**	**1,756**	**1,803**	**1,848**	**1,894**	**1,946**	**1,999**	**2,053**	**2,631**	**3,498**
Revenues	0.97	28,858	47	99	171	1,965	1,981	2,000	2,023	2,100	2,169	2,240	3,344	13,901
Residual value	0.97	957	-	-	-	-	-	-	-	-	-	-	-	8,342
Operational costs	0.97	(19,031)	-	(47)	(145)	(1,018)	(1,088)	(1,151)	(1,219)	(1,293)	(1,362)	(1,434)	(2,423)	(4,620)
Investments, domestic	0.97	(16,841)	(2,283)	(8,713)	(8,694)	-	-	-	-	-	-	-	-	-
Investments, imported	1.00	(4,137)	(108)	(2,388)	(2,388)	-	-	-	-	-	-	-	-	-
Reinvestment, domestic	0.97	(1,023)	-	-	-	-	-	-	-	-	-	-	-	-
Reinvestment, imported	1.00	(1,511)	-	-	-	-	-	-	-	-	-	-	-	-
correction unskilled labour during construction		2,320	369	1,169	1,169	-	-	-	-	-	-	-	-	-
correction unskilled labour during operations		760	-	4	14	33	36	39	42	46	49	52	99	213
Conversion from market to economic prices		**(9,648)**	**(1,975)**	**(9,877)**	**(9,873)**	**980**	**928**	**888**	**846**	**853**	**856**	**858**	**1,020**	**17,836**
Total cash flow		**14,858**	**(1,635)**	**(9,241)**	**(8,895)**	**2,736**	**2,731**	**2,735**	**2,740**	**2,799**	**2,855**	**2,911**	**3,651**	**21,334**
Cumulative cash flow			(1,635)	(10,876)	(19,771)	(17,035)	(14,304)	(11,568)	(8,828)	(6,029)	(3,173)	(262)	24,288	91,176
Discount rate	7.0%													
ENPV	14,858													
EIRR	13.2%													
B/C ratio	1.39													

6 INSTITUTIONAL ANALYSIS

6.1 Introduction

In this chapter, the following issues are addressed:

- The overall regulatory framework including: I) roles and responsibilities of city and state authorities in the respective sector, ii) how is supervision and enforcement involved in the respective sector, and iii) description of how fees are determined and approved;
- An analysis of the relationship between the (new) W/WW Company and the city. This analysis shall include a specification of the rights and responsibilities of the company and to what extent it operates at an “arms-length” basis from the city. A description of the legal status of the company and its statutory documents; and
- A proposal of measures for improvement/strengthening the institutional position of the company.

6.2 Regulatory Framework

6.2.1 Legislative framework

General background

In 2004, Serbia has launched an ambitious program to modernise its environmental management and harmonise its environmental legislation with EU Directives. In addition, there are a number of water sector specific regulations which are also in the process of being amended.

Legislative, executive and judicial powers are mostly practiced through the legally prescribed scope of competencies of the Authorities of the Republic. According to the law, certain competences are delegated to the Autonomous Province of Vojvodina and the Local Government.

Environmental legislation includes laws and regulations on planning and construction; mining; geological survey; water, soil and forest protection; flora and fauna; national parks; fishery and hunting; waste management; production and trade of chemicals; trade and transport of explosive and hazardous materials; protection of ionizing and non-ionizing radiation; nuclear safety etc. A list of relevant legislation is given in Annex 6.1.

Environmental Protection Law (OGRS No. 135/04)

This Serbian Environmental Protection Law was adopted in December 2004. Its content was harmonized with the relevant EU legislation. It provides:

- Protection of soil, water, air, forest, biosphere and biodiversity, plants and animals;
- Mandatory environmental monitoring: the programmes have to be adopted and performed every second year (including air monitoring);
- Responsibility of the Serbian Government to establish criteria for environmental measurements and regular reporting of the results to the Serbian Parliament annually;
- The important obligation to pay tax amounting to 1% of the value of the investment on all new facilities that could possibly be the sources of environmental pollution, and which shall be used for environmental protection and promotion.

Water Law (OGRS No. 46/91, 53/93, 67/93, 48/94 and 54/96)

The Water Law of the Republic of Serbia is the most important legal basis for the protection of water bodies, water use, and water management. It governs the conditions for design, construction, operation and financing of water management activities. The law applies to all surface water and groundwater, including drinking water and thermal/mineral waters (Art. 1). The Law on Water of the Republic of Serbia regulates the protection of waters; the protection from the detrimental effects of waters such as flooding, utilisation of and management of water; the conditions and ways of carrying out the water management and inspection over the implementation of regulations of this law. The regulations of this law address all surface and ground waters, including drinking water, thermal and mineral water, as well as the boundary and trans-boundary water courses between the Republic of Serbia and other countries in the vicinity. The law stipulates that waters can be used only in a way that does not threat their natural characteristics, does not endanger the life and health of people, does not peril the wild plant and animal species, natural wealth and immobile cultural wealth.

Water management permits have to be obtained for the construction, modification and enhancement of sewage disposal facilities (collection, channelling, treatment, and discharge of wastewater). Water management permits are not required for discharge of unpolluted rainwater and domestic household wastewater (Art.15). The prerequisite for a water management permit is a “Declaration of Consent”, which is granted by the public authority that sets the requirements, i.e:

- The Ministry responsible for water management, or
- The Municipality for small structures and properties.

The Declaration of Consent from the Ministry of Health and the Ministry of Environment is also necessary for sewage disposal facilities. Construction of the facility must begin within two years after the receipt of the Declaration of Consent. The permit also confirms that water management requirements are complied with.

The funding of water-related activities is outlined in Paragraph IX of the Water Law. Funding is provided from the following: fees for use of water, protection of waters, drainage, irrigation, fees for material extracted from water flows and fees for use of water management facilities and other services as well as the means of the budget of Republic of Serbia allocated for operations of public interest.

Funds acquired from fees for use of waters, fees for water protection and fees for material extracted from water flows shall be paid to a dedicated account of the Ministry in charge for water management issues while funds acquired form drainage fees, irrigation fees and other services shall be the revenues of a water management company.

In line with the Water Law, a Decree on level of fees for use of waters, protection of waters and fees for material excavated from water flows is issued annually by the Ministry of Agriculture, Forestry and Water Management. The Decree for 2007 envisages incentives ranging from 20% to 70% for decrease of pollution achieved by primary treatment and 50% to 90% for decrease of pollution achieved by secondary treatment.

Fees set by the Decree are paid to a dedicated account of the Ministry in charge for water management issues. Fees collected in the territory of Vojvodina are revenues of the budget of Autonomous Province of Vojvodina.

Communal services

Water supply and waste water collection are defined as a communal activity (Law on Local Self-government) which belongs in the realm of the Municipality. The Municipality may create to this purpose either a Public Utility Company (PUC) or entrust the activity to another enterprise. However, there are no examples of the latter in the Serbian water or waste water sector.

The exploitation and development of public utility activities are financed from the sales of the products and services of the public utility. Other possibilities include compensations for the development and utilisation of construction land, voluntary local taxes, and other legally possible sources (grants and subsidies).

Public utility activities may be organised for two or more municipalities together. In this case the municipalities will regulate their internal rights and commitments in a separate agreement.

Public Companies

The set-up of a PUC is regulated in the Law on Public Companies and Activities of Common Interest ("Official Gazette of the RS", no. 25/2000, 25/02, 107/05). The Law deals with the establishment, the internal organisation, and the operation of Public Companies. A Company shall be established by a Founding Act and duly registered with the Serbian Business Registers Agency. Company regulations shall be defined in the Articles of Association/ Company Statute and any other documents required by Law.

Management is assured by a Manager who reports to the Management Board, which is the highest decision making body in the Company. The Management Board is supervised by a Supervisory Board who monitors the functioning of the Company, in particular the financial documents such as the annual report and proposals for the allocation of profits, and advises the Founders (the Municipality) accordingly.

The Law contains a numbers of provisions to protect the general interest in a Public Utility Company. The Municipality, in practice the People's Assembly, must approve the statute (and eventual changes) and major policy issues, i.e. tariffs, disposal of company assets, capital investments, etc, and nominates the Management of the PUC, i.e. Supervisory Board, Management Board, and the Manager.

The Ministry of Finance may send instructions to limit the annual increase in salary mass and tariffs. The annual accounts are submitted to the National Bank of Serbia and audited by external auditors. The Ministry of Finance through its Treasury sector controls financial aspects of the work of Public Utility Companies, which are indirect budget users.

The collection fees are set to cover for operational expenditures yet do not provide for full cost recovery which would enable investments. There is no tariff setting formulae and the increase of tariffs has been under Governmental control as of 2006 and the PUC's are obliged to set tariffs upon the projected increase in prices and salaries as determined by the Government of Serbia for the following year. Tariffs are also subject

to the approval of the Municipality. The maximum annual increase for communal services is limited by the following acts: the Law on Public Companies and Performance of Operations of Public Interest, Article 22, and 22a and 22b; the Decree on Temporary Discontinuation of Proceedings regarding the Transfer of Budgetary Funds of the Republic of Serbia to Local Self-government Units, (Official Gazette 06/2006, from 23 January 2006); and the Decree on manner and control of calculation and payment of salaries in public companies (Official Gazette RS 5/06). According to the instruction no. 023-0263/2006, issued by the Ministry of Finance on 6th February 2006, the fees could be increased by 9.3% cumulatively for the whole year of 2006. In year 2007, the limit is set at 7.5% for tariffs and 9% for salaries. In the event of introducing new activities, the salaries for the newly recruited staff must not exceed the average salary levels in the Municipality.

The limitation on tariff increase is still present even in event of additional investments. A possible solution is to charge separately for waste water treatment and have increase of this amount subsequently limited at annual level, or to partially use tax for environmental protection, which in line with the Law on Environmental Protection (RS Official Gazette, 135/04 can be introduced by municipalities.

6.2.2 Policy framework

National level

National environmental strategy and action plan

The draft National Environmental Strategy (NES) and the corresponding National Environmental Action Plan (NEAP) were prepared by the Directorate for Environmental Protection in 2005. The most relevant elements of the NES and NEAP which have a bearing on Vrbas WWTP Project comprise amongst others:

- **Legislative**: the harmonisation of National water and waste water legislation with the EU Water Framework Directive (2000/60/EC) and the Urban Wastewater Treatment Directive(91/271/EEC);
- **Economic instruments**: to adjust wastewater charges to reflect full cost recovery; introduction of volumetric charges;
- **Monitoring**: to review monitoring plan with optimum design of the network of station dealing with water quality analysis;
- **Financing**: to ear-mark environmental and water revenues, allocate state and municipal funds, provide loans from commercial banks;
- **Institutional**: to establish inter-ministerial coordination group, increase HR capacity in water management and water protection;
- **Infrastructure**: to provide primary and secondary waste water treatment in agglomerations above 100,000 population equivalent [6] and extend sewerage systems to cover 90% of their population; upgrade or renew operation of existing municipal waste water treatment plants;
- **Industry**: to expand treatment of industrial wastewater by reconstruction or building of new industrial WWTP's.

[6] *Vrbas WWTP project is in the range of 125,000 – 145,000 equivalent out of which 50,000 relates to the population and 75,000 equivalent to the industry*

The NEAP component dealing with protection of waters for the period 2005 – 2009 identifies the Improvement of water quality in Veliki Bački Kanal (Vrbas) a specific activity in the water sector.

Water Management Master Plan

The Water Management Master Plan, in 2001 developed by the Ministry of Agriculture, Forestry and Water Management, stipulates three levels of priority activities which are in compliance with the Vrbas project. These are:

Level 1:

- Rehabilitation of existing industrial and municipal WWTP;
- Construction of WWTP at industries with toxic wastewater, regardless of the type of recipient (these being water flows or sewage);
- Construction of facilities for large polluters which have a bearing on the quality of waters in "sensitive areas" , and
- Construction of WWTP's for large and medium size sources of pollution (population equivalent >15,000) whose wastewaters has a major impact on downstream waters.

Level 2:

- Construction of WWTPs for polluters whose wastewater have a considerable impact on direct recipients.

Level 3:

- Construction of all other WWTP's for settlements larger than 5,000 and all smaller settlements which have centralised water supply and a sewage collection system in place.

In line with the aforementioned priorities, Vrbas is listed in the Water Management Master plan as first level source of pollution.

Provincial level

Decrease of pollution of DTD canal at location Vrbas-Bezdan and Bečej-Bogojevo: Action Plan

The Public Company Vode Vojvodine is in charge of water management in the Province of Vojvodina. In 2006, due to the high levels of pollution of the DTD Canal, Vode Vojvodine along with the key stakeholders, including public administration, polluters, municipalities and their public utility companies prepared the Action Plan for the municipalities of Kula, Vrbas, Srbobran and Crvenka. The action plan is an integrated approach encompassing legal, financial and enforcement measures and specifies duties and responsibilities of each of the parties involved.

Major targets to be reached are the following:

1. Preparation of final designs for WWTP (planned for July 2007, party responsible: polluters)
2. Construction of WWTP (planned for July 2009, party responsible: polluters)
3. Cleaning and rehabilitation of the Canal (July 2010 onwards, party responsible: Vode Vojvodine)

Endorsement of the Action Plan was followed by signing bilateral Agreements with Vode Vojvodine (see Annex 6.3 for copies of Agreements of Vrbas and Kula main polluters) ,

in which their responsibilities were stipulated. It was envisaged that individual Action Plans leading to fulfillment of the Agreement would be submitted to Vode Vojvodine within two months following the day when the Agreement was signed. The meat factory Carnex has submitted the Action Plan in May 2007. No Action Plans have been submitted by other polluters yet.

Action plan: penalties, incentives and enforcement

In line with the Law on Environmental Protection (RS Official Gazette 135/04) and 'polluters pay' principle, fees are imposed on polluters of Dunav-Tisa-Dunav Canal. The fees are collected by the Public Company Vode Vojvodine and are determined in line with the Methodology for calculation of fees paid for use of water management facilities used for discharge of waste water (RS Official Gazette No3/95), which was endorsed at provincial level by Decision to approve level of fees paid for use of water management facilities and other services (AP Official Gazette No 3/95). The basis of calculation is quality and quantity of water used and waste water discharged.

The fees collected by Vode Vojvodine for canal pollution include a fixed (presently 20% of the total) and a variable component. The fixed part is related to the volume of discharged water while the variable component is subject to the level of pollution of discharged wastewater. As an incentive, polluters who fulfil stipulations of the Action Plan and the signed Agreements would be obliged to pay the fixed part of the fees only. On the other hand, Vode Vojvodine may file a complaint to the Inspectorate for Environmental Protection with the provincial Directorate for Environmental Protection, in the event that the polluters refuse to act in line with the Action Plan and the Agreements signed. Authorities of the Inspectorate are presented in section 6.2.4.

In addition to financial and legal consequences, possibility of launching a media campaign against polluters is included in Agreements of Vode Vojvodine with the polluters.

An overview of activities foreseen in the Action plan as well as those stipulated in the Agreements along with the fees paid to Vode Vojvodine by polluters relevant for the feasibility study is given in Annex 6.2.

Local level

The Local Environmental Action Plan (LEAP) was developed in the Municipality of Vrbas in 2005. First priority listed in the plan is to build sport and recreation facilities on the part of Vrbas-Bezdan Canal (to revitalize and improve the Canal). Steps leading to fulfilment of the first priority are fully in compliance with those described in the provincial Action Plan developed with the PUC Vode Vojvodine. The planned time horizon for implementation is 1-5 years starting as of 2005. Implementation of LEAP is coordinated and monitored by the LEAP Office which operates with the Department for Urbanism and communal, housing and environmental affairs of the Municipality of Vrbas,

6.2.3 Institutional Framework

National Level

The Ministry of Agriculture, Forestry and Water Management is responsible for the entire water sector in Serbia. The Directorate for Water is part of the Ministry, and consists of the following departments:

- Department for Analytical Studies and Administrative Tasks in Water Management;
- Department for Water Supply and Protection;
- Department for Water-Related Inspections.

Supervision of the disposal of industrial wastewater is a task of the Ministry of Agriculture and Water Management. The Ministries of Health, Capital Investments, Energy and Mining, and Administration and Local Self-Government are also indirectly involved in water supply and treatment: The Directorate for Environmental Protection, within the new Ministry of Environment, is responsible for environmental protection in connection with water body and water management activities.

The Public Companies and State Aid Sector of the Treasury Department (Ministry of Finance) monitor the performance of the PUC's. The PUC's are monitored for salary levels and are given instructions on their annual plans.

Investments can be provided through the Ministry of Agriculture, Forestry and Water Management with their Directorate for Waters and Wastewater. In 2006, the Ministry of Finance launched the National Investment Fund that is coordinated by line Ministries and the Ministry of Local Governments with its Municipal Infrastructure Agency in the sector of municipal infrastructure.

The Standing Conference on Towns and Municipalities (SCTM) serves as a Professional Association for all municipalities in the country. The members pay an annual fee in accordance with their size and their budget. The SCTM acts as a platform for exchange of best practices and advocacy. Municipal Water and Wastewater operators are united in professional associations, namely the Association for water technology and sanitary engineering and Waterworks Association.

Regional level

The role of Government at Regional Level is mainly coordinative and very limited. At the country level, there is only one regional water supply system "Rzav" in the region of Uzice, encompassing 5 municipalities. The system is operated by a regional Public Utility Company founded by the participating municipalities.

Provincial level

The Provincial government has its Directories in areas of local government and water management. Considerable authorities are passed from Republican level to provincial authorities. Authorities of the Autonomous Province of Vojvodina is defined in the Law on defining Competence of the Autonomous Province of Vojvodina ("Official Gazette of the RS", No 6/2002). It stipulates that the provincial government, on on its territory and through its agencies, is responsible for management of environmental issues in compliance with applicable laws. This includes creation of environmental protection and development programs as well as issuing certificates for building and operational permits for certain facilities (including regional landfills serving more than 200,000 inhabitants).

Coordination of activities is assured through respective ministries at national level.

Directorate for Environmental Protection of Autonomous Province of Vojvodina
The Directorate was established in 2002 (Article 35 of APV Official Gazette, 21/02) and is responsible for supervision of application of environmental legislation at provincial level. In the Directorate 10 inspectors-advisors and one executive inspector are employed. The Directorate is in charge of environmental issues in the province, in event that the provincial bodies are responsible for issuing permits, which will be the case with the future Vrbas project. Authorities of the Directorate do not include inspection of hazardous materials.

Vojvodina Capital Investment Fund
In December 2006, the Vojvodina Capital Investment Fund was founded by the Autonomous Province parliament following the endorsement of Serbian Constitution. In line with Article 184 of the Constitution, the Province is entitled to 7% of the Republic of Serbia budget, of which 3/7 must be used for capital investment. It is expected that in 2007, Vojvodina Capital Investment Fund would allocate nearly 220 million Euro for 24 projects which is 3 in each of the eight sectors identified.

Public Company Vode Vojvodine
The Public Company Vode Vojvodine founded by the Provincial Government is in charge of water management in the province of Vojvodina. Its scope of work includes monitoring, control, construction, maintenance and rehabilitation of water management facilities.

Vode Vojvodine collects fees from the polluters for the discharge of untreated wastewater and for the use of canals.

Local level
Municipalities are headed by elected Mayors and controlled by an elected Municipal Council. The Municipality is responsible for communal services and usually handles this by founding Public Utility Companies (PUCs), which may offer combined or sector-specific services. The PUCs usually are able to cover its costs of direct operation and maintenance, but have to rely on funding from the Municipality for investments. The Council will need to ratify the major decisions of the PUC, most notably tariffs.

6.2.4 The roles and responsibilities of Public Administration in Water and Waste Water Sector

Planning
Policy development by its very nature is the prerogative of the National Government. This applies for legislative and regulatory activities. The Ministry of Agriculture and Water Management is responsible for the Republic of Serbia Water Resources Development Master Plan and specifies water-related requirements by identification of main water resources in the country and allocation of water resources to the areas with limited water resources. Planning of water supply/waste water services to and from the consumers is the responsibility of municipalities in their respective territories. The government may participate in investments in the sector through their Directorate for Waters by 50% while Municipalities provide for the other 50%, however, the republican funds are rather limited.

Operations

Municipalities are responsible for provision, operation, maintenance and investment for water supply and sanitation services. Municipal water supply and wastewater systems are operated and maintained by local Public Utility Companies (PUCs). PUC's are basically state-owned companies, founded and managed by the Municipalities. The Public Utility Companies are responsible to the Municipalities for their performance.

Supervision and enforcement

The Republican Directorate for Waters has its inspectorate with 4 field offices covering the total of 19 regions with 18 inspectors. Authorities of water management and sanitary inspectors are defined in the Water Law. While sanitary inspectors are in charge of control of potable water, water management inspectors are responsible for supervision and control of existing and new water management facilities including functioning and efficiency of waste water treatment facilities, as well as the inspection of polluters. In the event that hazardous elements exceed limits set by Rule book on hazardous elements in waters (RS Official Gazette 31/82), inspectors may order closure of enterprises until the limits are met. The latter one is not a popular measure due to economic reasons and is applied only in event of accidents.

In the municipality of Vrbas, Republican water management inspectors monitor primary treatment in industries and main gravity sewer while communal inspectors are in charge of small enterprises and collection network. Presently there are no water management inspectors at provincial level.

Conclusion

The consultant has concluded that the project and its institutional setting are in line with relevant legislative framework in Serbia, in compliance with national strategies and policies and involves institutions that will continue to exercise their legal rights and duties in respective sectors such as water, waste water sector, environmental protection and provision of communal services. Compliance of environmental and technical documentation with legal requirements is reflected in chapters 3 and 4.

However, due to lack of funds for investment, implementation of action plans and policies may be delayed. In event of substantial provision of funds for construction of WWTP, enforcement could be properly executed to make the system sustainable.

6.3 PUC's legal status and relations with the Municipality

Public Utility Company Standard, ID No 08057982, was founded by the Municipality of Vrbas and is 100% state owned. Therefore, the Founder exercises its rights in line with those described in paragraph 6.2.1 section Public Companies. The Treasury Department at local Level is in charge of controlling its performance on behalf of the Ministry of Finance.

The existing PUC provides combined services. For the purpose of the project, founding of a new PUC for Water and Wastewater services is envisaged by separation of water supply and wastewater department from the existing PUC (see chapter 7). The founder of such company would be the Municipality of Vrbas. No legal actions have been taken yet in order to found a new company and these would include: registration, preparation of statutory documents (Articles of Association and the Founding Act), establishment of bodies responsible, namely the Management Board, Supervisory Board and the

appointment of a PUC Manager. Roles and responsibilities of corporate governing bodies are described in chapter 7.

Statutory documents of a Public Utility Company

The Law on Public Utility Companies (Official Gazette of the RS No. 25/2000, 25/2002 and 105/1005) envisages that the PUCs must have a Founding Act and the Statutes and defines its contents.

The **Founding Act** shall be the agreement to establish and operate the W/WW System by which the company rights and obligations to the Founder are defined. The Founding Act shall define (i) the purpose of the Company, (ii) the resources (capital) put at the disposal of the Company, (iii) the rights and obligations of and to the Founder, (iv) decision making, and (v) eventual profit sharing (vi) measures for environmental protection

The **Statutes** are more detailed and determine roles and responsibilities of governing bodies of the PUC, lists general enactments of the Company such as rule books, books on procedures and role of labour unions.

The statutory documents have to be ratified by the municipal parliament.

Prior to drafting a Founding Act and the company registration, the new company assets have to be defined. Presently, the assets in the water and waste water sector are registered with the Directorate for construction which was founded by the municipality, by the PUC Standard, and also by the Municipality.

The Consultant recommends the following process of assets transfer:

- Identifying a body responsible for transfer of assets
- Transfer of assets from the municipality and the Directorate for construction to the existing PUC Standard;
- Transfer of identified assets from the PUC Standard to the new PUC.

Agreements on PUC operations

The set of abovementioned documents is prescribed by law, and is prerogative for the start of company operations, however it does not set targets for operational performance of the company for which the company would be responsible to its Founder. Legal background that may enable introduction of additional agreements relevant for PUC operations is stipulated in the Law on Public Utility Companies (Official Gazette of the RS, no. 25/2000, 25/2002 and 105/1005, hereinafter: the Law), which states in Article 8 that in addition to the Founding Act and the Statutes a contract may be concluded between a public utility company and a local self-government unit. The Contract may contain specifically provisions regarding:

- Work and operations of the company;
- Rights and obligations regarding utilizing of the funds in state ownership for performing of the activities of common interest, in accordance with the Law;
- Company obligations regarding provision of conditions for continuous, tidy and quality satisfying of the consumers' needs for products and services;
- Mutual rights and obligations in case that economic and other conditions for performing of the activities of common interest have not been met;
- Rights and obligations in case of disturbances in company operations;

- Other rights and responsibilities deriving from the provisions of the Law regulating performance of individual activities of common interest and of this Law;
- Other questions important for resolving and protection of the common interest.

Although there is a legal possibility for this type of contract to be prepared, this is not common practice in Serbia. Internationally, defining financial, operational and managerial requirements in a contract is usually done through a management contract or a Service Level Agreement (SLA). Experience with a SLA has been gained in Serbia with the PUC of Subotica for drinking water and wastewater.

Contractual relations with the industries

Implementation of the first phase of the project shall enable major industries in the municipality of Vrbas namely vegetable oil factory Vital and meat factory Carnex to get connected to the main collector and thus to the WWTP,

The Consultant recommends that individual contracts are prepared with the industries. The contracts should include conditions of acceptance of waste water, planned dates, level of tariffs and terms and conditions of payment.

Municipal Decisions

Communal activities are further specified in municipalities by a set of municipal Decisions which define duties, responsibilities and authorities of communal services providers as well as their users. The municipal Decisions are in line with national legislation and are legally binding documents in municipalities in which they are endorsed.

To ensure project sustainability, it is recommended that the Municipal Decisions are amended in a way to ensure:

a. Obligation to use service of the WWTP;
b. Define conditions by which users may be connected to the WWTP and sewage collection system;
c. Define penalties and authorities of inspectors.

Municipal Decision on sanitary-technical conditions for discharge of waste waters

The Municipal Decision on sanitary-technical conditions for discharge of waste waters in the sewage system endorsed on June 14 2007 sets conditions that have to be met before the wastewater is discharged into the sewage system. The obligation of all real estate owners and tenants (legal entities and natural persons) to connect to the public sewage system was included at the request of the consultant (Article 2 of the Decision, see Annex 3.5)

Municipal Decisions on Communal Activities

The Decisions on Communal Activities (hereinafter: the Decisions) form legal grounds for implementation, supervision and inspection of all communal activities in the territory of municipalities in which they are enacted by municipal parliaments.

It is recommended that the existing Municipal Decision of Communal Activities (MoV Official Gazette 23/2001) is amended so as to include the following:

- Authorise the new PUC for waste water collection and treatment in the territory of the municipality
- Enforce connection to the sewage system within 6 months from the construction of the sewage for both legal and physical persons;
- Define authorities of inspectors and penalties.

Conclusion and follow up

Founding of the new PUC has its legal grounds while its position should be strengthened by preparation/amendments of a number of legally binding documents.

In order to assure appropriate follow up of activities in between preparation of the feasibility study and start of operations of the PUC, the consultants recommends a Project Implementation Unit to be set up by the Municipality of Vrbas which follow up implementation of the aforementioned recommendations. A proposed institutional development plan is given in chapter 8.

7 OPERATIONAL EFFICIENCY

7.1 Introduction

With the intended extensions in the wastewater facilities of Vrbas town, its surrounding villages and to local industries, this chapter gives an evaluation of the existing Public Utility Company of Vrbas, known as Javno Komunalno Preduzeće "Standard", Vrbas. This evaluation will consist of an operational and financial assessment of the company, an assessment of the organisation and management of the company, and an assessment of the administrative systems and procedures. For each topic a description is given for the current situation and future (additional) requirements. An assumption was made that presently used systems and procedures would be transferred from the existing to the new PUC regarding current water and waste water operations. A set of recommendations was given on improvement of existing systems as well as on efficiency of future system.
The final paragraph gives a recapitulation of all recommendations of the foregoing paragraphs.

7.2 Assessment of financial and operational performance of PUC

This section gives the result of the assessment of the financial and operational performance of JKP Standard Vrbas in the current situation, and an overview of the future situation when additional activities and responsibilities are foreseen. For the financial data reference is made to chapter 5, where the complete financial analysis has been presented.

In the last section, the conclusions and recommendations of this paragraph are presented.

7.2.1 Current situation

7.2.1.1 Financial operation and systems of JKP Standard Vrbas

In chapter 5, a financial analysis has been made of the financial position of the city council of Vrbas and the Pubic Utility Company Standard along with the indicators relevant for financial operations of the company. Main findings on accounting, billing and collection and financial management system are given below:

<u>Accounting system</u>

- PUC Standard has a software based general accounting system in place;
- The current accounting system cannot differentiate between different services. There is no cost centre based financial management system;
- In relation to this, budgets (and budget control) is centralized at the director's level. There is no decentralized budget management system in place.
- Fixed assets are not revaluated regularly. In an inflationary environment, as has been the case in Serbia, this leads to the understatement of the asset base in the balance sheet, but also to the understatement of the depreciation charge and might lead to tariffs being set at below cost recovery levels.
- The PUC does not make *provisions* for doubtful debts. Instead, uncollectible debt is written off directly, but also this happens irregularly. The last time old debts were written off was during the year 2002.

As a result, the average number of days accounts receivable are outstanding increased from 65 days during the year 2003 to 139 days during the year 2006;

Billing & collection system

- A software based billing system is in place;
- Bills are issued in three monthly intervals, based on actual meter reading (if water meters are available);
- Current practice is that customers make down payments against each bill. At the end of the year, the PUC calculates the total amount due and sends a total amount due to customers. If these statements are not settled the PUC starts press charges via the court;
- Billing system cannot automatically calculate interest;

Financial management system

- The PUC prepares annual plans and budgets, in conformity with guidelines provided by the Ministry of Finance;
- There is no multi year (investment) planning, integrated with this annual planning & budgeting cycle;
- In relation to this, budgets (and budget control) is centralized at the Director's level. There is no decentralized budget management system in place.
- There is no tariff setting formula or procedure, since it is currently national policy to cap tariff increase with the estimated inflation for the next year;

7.2.1.2 Operational performance of JKP Standard Vrbas

In chapter 3 an assessment has been made of the operational performance of JKP.

The company offers combined services and of interest here are the responsibilities of the Operational Unit for Water Supply and Wastewater which are the following:

- The operation and maintenance of well fields consisting of in total 23 groundwater wells of which 10 exclusively for drinking water production of the town of Vrbas. The remaining 13 wells are producing drinking water for the villages belonging to the Municipality of Vrbas. The groundwater from the wells is partially treated. Water from the shallow wells (4) is treated by filtration; water from all wells is chlorinated before being pumped into the distribution network.
- Maintenance of the drinking water distribution network: repair of the asbestos pipes which make up 80% of the distribution network of Vrbas town. The networks in the smaller villages are mainly made of PVC pipes.
- Replacement and repair of failing water meters.
- Maintenance of existing sewer network and expansion to new areas. Currently more than 50% of houses of Vrbas town are connected to the existing sewer. The smaller villages are planned to be connected to a sewer system in the short term.

The technical responsibilities and activities consist mainly of civil works: repair and extension of sewers (concrete) and water pipes (Asbestos, PVC) and mechanical-electrical works: well pumps, booster pumps, filter and chlorination units.

In terms of quality of the drinking water supply the following information was obtained:
The PUC reports a supply consisting of relatively good quality drinking water (source groundwater), at a guaranteed minimum pressure of 2,5 bar at the limits of the distribution network of Vrbas. Bacteriological quality is guaranteed by chlorination; chemical quality is improved by applied filtration.

Unaccounted for percentage for 2006 can be found in Annex 7.1. probably because of higher delivery pressure of the water in the town of Vrbas, losses are larger in Vrbas than in the surrounding villages. The percentages of both technical and administrative losses of water for Vrbas is reported as more than 33%, while in the surrounding villages this varying between 10 and 25%.

The Operational Unit for Water Supply and Wastewater is supported by staff from the Commercial Sector on meter reading, billing and collection.

The Operational Unit for Water Supply and Wastewater is supported by staff from the Sector of Development and Investments for general data collection and the preparation of management information reports.

7.2.2 Future situation

Expected changes for financial operations and accounting, billing and financial management system

Financial operations of the new company are based upon full cost recovery which requires attention for (i) tariff setting, (ii) payment discipline, (iii) cost control. Tariff setting should consider the investment requirements of the water and wastewater system should therefore be based on **full cost price**. It should be structured in such a way as to stimulate regular payments. It is essential that client groups pay their bills strictly and promptly and in particular large industries.

Based on the findings on the present practise summarised in 7.2.1 above, the following changes are proposed, with a view of improving the financial performance of the company:

<u>Accounting system</u>
- The system shall recognize cost centres and contain a budgeting module;
- The system shall be linked to a Management Information System to allow monitoring of defined benchmarks/performance indicators;
- Fixed asset register shall be updated/verified with physical assets available;
- Fixed assets to be re-valued on an annual basis;
- Bad debt policy to be introduced. One time clean up of accounts payable register;

<u>Billing & collection system</u>
- Introduction of monthly billing, with final settlement once per year based on actual meter reading;
- Introduction of automatic reminders and penalties system in case of late payments (interest, administrative charges)
- Introduce financial incentives to invoice collectors, by linking cash collected to remuneration;

- Establish a clear disconnection and reconnection policy, backed by the Municipality and Council.

Financial management system

- Improve current financial management system by establishing a cost centre based financial management system;
- In relation to this, establish a more decentralized budgeting and financial management system;
- Based on the improved financial management system, agree on a cost based tariff setting formulas or procedures. This is also useful if tariffs continue to be capped, since it serves as facts based information on the required level of tariff;
- Establish a long term financial planning system and integrate this with the annual planning & budgeting cycle;

Expected changes for operations

Effective operations and maintenance concern the assets of the drinking water and wastewater systems and will be extension of the assets currently in use. Extension will mainly exist of wastewater facilities (extension of sewers, new WWTP), see below.

While presently reactive activities are recognized practice in (waste-) water companies, the PUC Vrbas will have to develop plans for the operation and maintenance strategies covering also proactive activities. The activities shall include operational efficiency control, proactive maintenance, the monitoring of wastewater, residue quantity and quality of treatment plant(s), troubleshooting and development of documentation. The documentation may include job descriptions, operating instructions, test records and records of maintenance.

In the previous section the activities of the Operational unit for water supply and wastewater are described. With the proposed extension the work load of the Unit (or the new PUC) will be the following:

- A new wastewater treatment plant will have to be operated, meaning technically and technologically a more demanding responsibility for the PUC;
- A larger wastewater collection system with specifically longer transport mains from the smaller villages will be in operation in the short term;
- Some large industries will be connected to the existing sewer system, meaning that in addition to the domestic wastewater, dealing with industrial wastewater and quality monitoring of this wastewater will be new duties for the PUC;
- As further extensions of the sewer network to neighbouring villages are foreseen on the middle long term, this will require additional attention for planning, design, tendering, construction of extensions and administrative changes;
- The PUC is preparing an integrated drinking water system for all villages belonging to the Municipality. This means additional deep groundwater wells (next to the existing 6), possibly a centralised treatment plant (aeration, filtration, chlorination) and distribution from a limited number of booster station to all consumers within the Municipality. Improved efficiency, guaranteed quality of the distributed drinking water (shallow wells have high concentrations of iron and ammonium, in some villages the arsenic concentration are elevated) and a more rational system are the main objectives of this upgrading of the water supply. The new system will have a capacity of up to 250 liters/second.

- Initiatives have been taken to reduce unaccounted for water even more. From the Management Information System there is considerable knowledge on technical and administrative losses. The following actions are foreseen: gradual replacement of outdated asbestos pipes by PVC pipes, installations of leakage detection devices, installation of sector meters, etc. Unfortunately the availability of funds for these initiatives restricts swift action.

In section 3.2 the technical changes and phasing of the extensions have been described. The changes in work load are the direct consequence from these activities.
In brief it can be concluded that:

- Requirements to technical qualifications of technicians working in the field of drinking water will not change substantially with the new centralised treatment plant for groundwater. The Consultant concludes: experience is available within current organisation and no specific training or qualified personnel is needed;
- The technical qualifications for the technicians who will be working in the operation and maintenance of the WWTP will be higher than available with current experience. Currently only experience with civil works (construction, modification and repair of sewers) and to a lower degree with mechanical-electrical (booster pumps, valves) works. Operational, technical and process knowledge will have to be acquired or by specific training, before putting in operation of the WWTP and on regular intervals after its introduction, and by contracting specialised personnel.

7.2.3 Conclusion

Based on the assessment made of the operational and financial work of the current Operational unit for water supply and wastewater of PUC Standard, the Consultant has formulated the following conclusions and recommendations:

Financial activities:

- Transfer of knowledge and existing practise is expected from existing PUC to the new PUC through on the job-training;
- Improved financial management systems shall built upon the existing systems. External training of key staff is required in the field of accounting practise as prescribed by the law;
- The following should be developed through external consultancy services: internal management accounting system that would be linked to the MIS, multi-year long-term financial/investment planning system and tariff setting;
- Bad debt policy, monthly billing and penalties and incentives in the area of billing and collection can be set up by the new PUC management and with the support of the Municipality.

Operational activities:

- In the field of drinking water: no specific need for acquiring experience in this field as in the nearby future no major changes in water treatment are foreseen;
- As not enough funds are available for sector meters and water leakage devices the Consultant recommends to incorporate a fixed item in the annual budget for leakage reduction;

- We recommend to send selected staff to specific courses for leakage reduction programs and for improved measurements by sector metering;
- In the field of wastewater: as more operational, technical and process knowledge needs to be acquired staff should be involved in trainings. Before construction and putting into operation specific training should be offered to the staff at different levels according to the position of staff members. After start-up of the new WWTP, staff should receive regularly get training in the fields of efficiency improvement, new techniques, problem solving.

7.3 Assessment of administrative systems and procedures

This section gives an overview of record keeping and the management information system in use PUC Vrbas. In relation to the future developments of the PUC and the required changes. In the last paragraph some recommendations have been formulated.

7.3.1 Current situation

7.3.1.1 Record keeping and management information system at J.K.P. Standard, Vrbas

Management Information System and Planning

The Sector of Development and Investments is responsible for the preparation of the planning (investments, year plans) and for the development and maintenance of the information system. Based on the available data different kind of reports can be put together for the needs of the various departments within the PUC and/or the Municipality. The used program for the database is Oracle version 8.0. Some 15 people work with data collection and data input into the system. Some 40 people have access to the database for using the available information. According to the manager of the IT department the program performs satisfactorily and the available data could be shared with a future (new) PUC for water. The only weakness mentioned did not have to do with the system itself but with the demand for information, which was reported as not being regular nor standard. So, to answer request for information, more time than necessary is spend on finding the relevant information.

Based on the available data and needs of the PUC, the department develops the planning with input from the technical development department. The plans are developed for three years period and are based upon the technical needs. Implementation of such plans is however subject to the approval of the Founder and availability of funding.

Annual operational programs are prepared as prescribed by the Ministry of Finance.

Quality Control Systems

The quality of the distributed drinking water is controlled on a daily basis, and also at the raw water intake by using a portable laboratory. The quality of the water is controlled at the raw water intake for Vrbas, and before and after filtering. For the nearby villages there is no filtration – only chlorination followed by distribution to the consumers. Concentrations of iron, manganese, ammonia and residual chlorine are checked.
Occasional check analyses are done by the Institute for Health Protection in Subotica. The sampling is done at 15 points in town, at 3 to 4 points in the villages and at the raw water intake point. Control intervals are 15 days in Vrbas and 30 days in the villages.

The quality of the water is controlled according to the Rulebook on hygienic soundness of drinking water for human consumption.

According to the law, the laboratory sends the results of the analysis to the Sanitary Inspectors and to the water supply company which takes further actions depending on the analysis results. If any irregularity is found, the Institute suggests how to solve it. Samples are taken by the Institute representatives and by the laboratory technician from the PUC Standard in Vrbas.
Sanitary inspectors can ask for supplementary controls.

7.3.2 Future situation

In the future situation a new PUC will be responsible for all activities related to the provision of drinking water and the collection and treatment of wastewater. This requires a small support unit able to collect all necessary data for planning, reporting and billing of the services provide by the new PUC.

7.3.2.1 Expected changes for record keeping and management information system

Management Information System and Planning
In the new PUC the responsibility for the preparation of the planning (investments, year plans) and for the development and maintenance of the information system will be with the Financial-commercial department. A staff of about 5 people will be responsible for billing and collection fro the services, see Annex 7.2.
A parallel Information system will be created to operate independently and parallel to the existing system at the current PUC. Option for exchange of information between the two databases should be foreseen.
The Management Information System should combine financial, technical, and commercial information, both short-term and long-term. It should be structured as a Business Plan with clearly defined operational targets and monitored regularly (monthly) for its realisation. The system should allow benchmarking and will facilitate the application of performance-based incentive schedules for core staff members.

The department will have to develop and apply adequate models for financial planning which will be able to cope with capital planning as well as revenue planning. Development of multi-year financial plans is required. All information shall have to be prepared by management to both the Supervisory Board and the Management Board.

Quality Control Systems
It can be foreseen that the volume of sampling will have to be increased. Not only more intensive sampling of wastewater is to be foreseen, but also it can be foreseen that at the National level requirements for quality control will be tighter in the future.
This probably means for the quality control of the distributed drinking water, the same frequency of sampling but possibly more samples from more sampling points. Also the total number of individual analysis probably will have to be increased. At least bacteriological analysis will be necessary, and probably also more chemical parameters (maybe up to 20 individual).
For wastewater sampling, not only the quality of collected, untreated wastewater is important, as is the quality of treated, to-be-discharged water, but also sampling of water at different stages of treatment will be necessary for control and adjustment of the

several unit operations. This will also lead to a larger volume of both samples and analysis.

7.3.3 Conclusion

Based on the assessment made of the administrative systems and procedures of the current PUC and the Operational unit for water supply and wastewater, the Consultant hasformulated the following conclusions and recommendations:

Record keeping and management information system System

- Make sufficient staff available for a billing and collection system for the new PUC exclusively;
- Make a data base system available for the new PUC with updating links to the existing data base, with included options for Business Plan uses and performance indication;
- Improve financial planning, in order to pursue on the (middle-) long term full cost recovery and financial independence from the Founder.

Quality Control Systems

- Improve the laboratory facilities both in terms of facilities and in human capacity.

7.4 Assessment of organization and management of JKP Standard Vrbas

This section gives an overview of the organisational structure of PUC Standard of Vrbas. It assesses the organisation and the capabilities of management and staff, in relation to the future developments of the PUC. Furthermore, required changes in both organisation and management are discussed and in the last paragraph recommendations have been formulated.

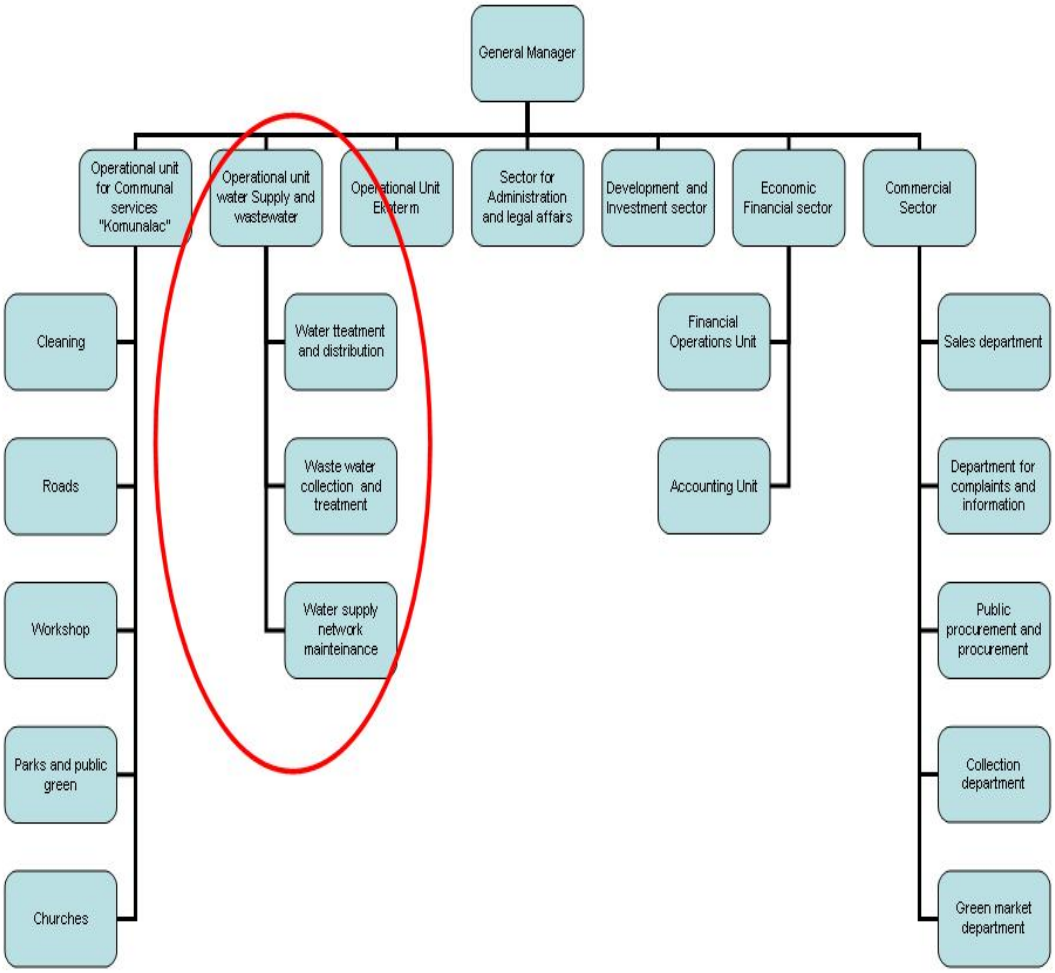
7.4.1 Current situation

7.4.1.1 Organization of JKP Standard Vrbas

Management of JKP Standard Vrbas has provided the organization chart as presented below. The Unit currently responsible for drinking water production and distribution, for wastewater collection and discharge onto surface water and for maintenance of the water supply distribution network has been indicated in this chart. The Unit consists of three sections:

- Water treatment and distribution;
- Wastewater collection (and treatment);
- Water supply network maintenance.

Figure 7-1 Organisation chart of JKP Standard of Vrbas



The different departments (both operational units and sectors) of JKP Standard Vrbas have the following duties:

The **Operational Unit for Communal Services Komunalac** consists of five sub-units and has the following scope of work: solid waste management, maintenance of parks, graveyards, local roads and parking lots and maintenance and repairs of vehicles and machinery;

The **Operational Unit Water Supply and Waste Water** is responsible for water treatment and distribution, for maintenance of the drinking water distribution network as well as for the collection and discharge of rainwater and wastewater;

The **Operational Unit Ekoterm** is in charge of the provision of district heating and system maintenance;

The **Administrative and Legal Affairs Sector** is responsible for human resource management, legal and general administration operations for the whole PUC;

The **Sector of Development and Investments** prepares plans for development and maintenance of information systems, installment , design and maintenance of databases of the PUC as well as preparation and standardization of investments programmes, the preparation of short term and long term plans, the preparation of operational programs of the PUC and analysis of their implementation;

The **Economic and Financial sector** is in charge with accounting, financial operations and planning. The sector has two sub-units;

The **Commercial Sector** is in charge of sales of services, the reception of and dealing with complaints and provision of information, billing and collection, public procurement and purchase and maintenance of vegetable and vegetable/fruit markets. The sector is divided into five sub-units.

Information on numbers and educational level of the employed staff within the different units is given in the table below.

Table 7-1 Overview of staff per operational unit

Category	**2007**	
	No.	**%**
General Director	1	0,4
Komunalac operational unit	97	40,2
Water supply and wastewater operational unit	55	22,8
Ekoterm operational unit	15	6,2
Administrative-Legal sector	31	12,9
Development-investment sector	4	1,7
Economic-financial sector	12	5,0
Commercial sector	26	10,8
Total	**241**	**100**

Source: J.K.P. Standard, Vrbas

The educational level in the Operational Unit for Water supply and Wastewater is indicated in the following table:

Table 7-2 Education Level of OU Water Supply and Waste Water of J.K.P. Standard Vrbas, March 2007

Education level	**VSS**	**VS**	**VKV**	**SSS**	**KV**	**PKV**	**NKV**	**Total**
Operational Unit Drinking water & wastewater	3	1	-	16	18	5	12	55

Source: J.K.P. Standard, Vrbas, legend : VSS = University; VS = College; VKV = secondary school; SSS = 4 years of secondary school; KV = 3 years of secondary school; PKV = primary school; NK = primary school.

From the figures provided by the Municipality we observe that a direct working force of some 55 people is involved in the sector of drinking water provision and wastewater collection and indirectly some 25 people from the administrative departments (mainly billing, collection, accountancy, data collection). Of the 55 staff involved in the day-to-day technical and practical operations there is a logical balance between staff with a higher education level and practical level (unschooled labour), given the current duties of mostly practical and technical character. The equipment to be operated and maintained is found is the groundwater wells (filters screens, pumps, electrical wiring), the drinking water booster station (pumps), the pumping stations for wastewater (pumps, valves) and the networks for water distribution and wastewater collection (valves, meters).

With the future inclusion of more sophisticated equipment, techniques and tasks, there will undoubtedly need for staff with better qualifications and specific knowledge and abilities as outline in the previous sections.

7.4.1.2 Management of J.K.P. Standard, Vrbas

Presently JKP Standard is managed by the General Manager and seven heads of their respective functional departments. Bodies of the PUC companies and their authorities are described in the previous section. So far, the PUC works under direct responsibility of the Mayor's office. The position of the General Director is mainly executive and partly advisory to the Mayor's office. His position is linked to the political party in charge of the Mayor's office.

7.4.2 Future situation

The main objectives of this investment project are the following:

- To construct a new wastewater treatment plant (WWTP) for treatment of both domestic and industrial wastewater, at a capacity of 2/3 of its final capacity;
- To extend the existing sewerage system to the Vrbas-area industries and to the villages at the East and Southeast of Vrbas by main transport sewers;
- To construct primary and secondary sewer network and sewerage pumps in Vrbas villages (Kucura, Zmajevo, Backo Dobro Polijo, Savino Selo and Ravno Selo);

These operations result from implementation of the project expanding the existing waste water collection system and to construct a new waste water treatment plant (and partly renovate the existing infrastructure). The waste water treatment plant will be constructed assuming acceptance of waste water from domestic and industrial users in the Vrbas municipality as well as in the future from other municipalities and their industries.

7.4.2.1 Expected changes for J.K.P. Standard, Vrbas organisation

The Memorandum on Budget and Economic and Fiscal Policy for 2007 with projections for 2008 and 2009 issued by the Ministry of Finance (November 2006) envisages structural changes in Public Utility Companies which would inter alia include reorganisation, staff downsizing, separation of core from non core activities and possible privatisation of the latter ones. In practise this would mean that Public Utility Companies offering combined services may be in position to form separate entities for core activities

such as water supply and waste water treatment while activities such as maintenance of green markets and cemeteries may be offered to private contractors.

Due to the operational changes, the choice of an adequate organisational set-up imposes itself and is necessary to:

- Define the power structure of the undertaking (final decision-making, mandate of the Management, role of the Owner/Local Government);
- Ensure accountability of the management and transparency;
- Limit the liability of the founders;
- Enable effective relations with external parties.

Extensive discussions have been held with representatives of the Vrbas Municipality and the General Director of the present PUC. The two following options have been considered for management of a combined drinking water and wastewater Public Utility Company as the most realistic:

- To incorporate wastewater activities into the existing Vrbas PUC by forming a new department (next to the existing ones);
- To found a separate drinking water and wastewater PUC.

In both cases the Public Utility Company would be operating the drinking water and wastewater infrastructure and managing the WWTP. Communal services in Serbia are managed by Public Utility Companies in accordance with the Law on Communal Services (Official Gazette 16/97 and 42/98) and the Law on Public Utilities (Official Gazette RS 107/05), see also chapter 6.

For the purpose of managing the drinking water and wastewater tasks, the Consultant assessed the two mentioned options using the following criteria:

- Costs, initial and on middle-long term;
- Decision making;
- Applicability.

The following observations can be made (and were discussed with the Local Authority of Vrbas):

Costs:
Concerning the costs difference between a new department within the existing PUC and the creation of a new local PUC a distinction should be made between the initial costs and the operational costs on the (middle-) long term.
Included in the initial costs should be the costs for recruitment of new personnel, new offices (as far as not included in the design for the new WWTP), and new office equipment. In the case of a new department within the existing PUC, these costs will be limited as most staff and office space and equipment will remain in use by the same staff and new staff will be included in the existing structures. A new PUC would most probably justify extra costs for staff and office. So, costs for a new PUC are somewhat less favourable. Costs for training and preparation of the staff for new operational and technical tasks relatred to the new WWTP will be more or less equal for both situations.
On the (middle) long term it can be foreseen that the new PUC can operate with a relatively smaller staff (initially with some 90 employees, against the 213 of the current PUC). Therefore control of expenditures and full cost recovery by the set tariffs should be easier achievable than with the current PUC. Currently, profits or losses made in one

sector or department of the PUC are not directly reflected in the financial balance of the same sector/department, as there is one financial department, and account, for all departments within the PUC. Furthermore different costs are included in the consumer's invoice but not separately brought into the accounts of the departments. The public service invoice of JFK Standard includes costs for drinking water, wastewater, centralised heating and solid waste collection.

Decision making:
Concerning the differences in the decision making process between the situation of new department/sector within the existing PUC or a new local PUC the following can be observed:
the decision making process in relation to the Founder (Municipality of Vrbas) would be the same in both cases. However, a new local PUC has an advantage over the existing PUC, as it would offer specialised services and therefore focus on sector specific needs in their operational plans, resulting in less divergent decisions to make. Furthermore, a new PUC would be in more favourable position to set appropriate base tariffs for new services before the government sets limits to the increase.

Applicability:
The existing local PUC offers combined services. The Government of the Republic announced future separation of core from non core activities. Founding a new specialised drinking water and wastewater company would therefore be in line with the government policy as stipulated in the Memorandum on budget and economic and fiscal Policy for 2007 with projections for 2008 and 2009.. Furthermore, the new organisation would be in better position to negotiate expansion into a regional PUC in event of need for co-financing by other municipalities at later stages or to offer specialised services through a management contract to other municipalities.

The most important conclusions from the comparison between the two discussed options are summarized in table 7.3 and 7.4.

Table 7-3 Criteria comparison between two options for a future PUC for drinking water and wastewater

	Existing combined local PUC*	**New local PUC**
Initial Costs	++	+
(Middle) long term costs	++	+++
Decision making	++	+++
Applicability	+	+++

* + less favourable, ++ neutral, +++ more favourable

Table 7-4 Relative advantages and disadvantages between two discussed options for a future PUC, drinking water and wastewater

Criteria	**Advantages**	**Disadvantages**	**Observations**
Option 1: Including operational responsibilities for WWTP into existing PUC			
Costs	No separate overhead		Existing practise in smaller municipalities, so as for Vrbas
Decision-making		Municipal assembly has to approve major decisions. Sector specific needs may be hard to address	
Applicability	Staff already	Need to set up a new	

Criteria	Advantages	Disadvantages	Observations
	available and working on wastewater collection	organisation through separation of core activities may arise shortly	
Option 2: New local PUC manages the Drinking water and wastewater sector			
Costs		Initial costs probably higher as results of new staff, offices and facilities (Middle-) long term operational costs can be better managed and controlled.	In line with the government policy
Decision-making	Focus on sector specific needs	Municipal assemblies have to approve major decisions	
Applicability	Stable structure for future needs		

The option of founding the new local PUC of Vrbas has been retained as the most appropriate option and will be further developed in the following sections.

The Governing organs in a new PUC will comprise a Supervisory Board, a Management Board, and the General Manager. The management of the Company will be ensured by the General Manager and the Management Board (the Administration). The Statutes clearly define the mandates of both the General Manager and the Management Board. Day-to-day management, including personnel management is handled by the General Manager. The Management Board decides among others on general policies, approves financial reports, budgets, investments, and tariffs, decides on the allocation of profits c.q. coverage of losses (considering the advice of Supervisory Board), and strategic planning (long term as well as medium term). The Management Board comprises members nominated by the Municipality and could also include a representative of the Employees.
The General Manager will be appointed by the Management Board based on a to-be-established procedure for the appointment of new staff. This will include a detailed job description.

The Supervisory Board monitors on behalf of the Founders the general functioning of the Company and ensures that the Company operates within the Law. The Board advises on the allocation of profits. The decision of the Management Board, however, is binding. Major decisions, i.e. annual report, budgets, and tariff revisions have to be ratified by the Assemblies of all Municipalities.

In the future when merging of PUC's of two or more Municipalities would become more likely, a system will have to be developed for one Regional or multi-Municipal Company where members will have a qualified vote based on the shares of each Municipality.

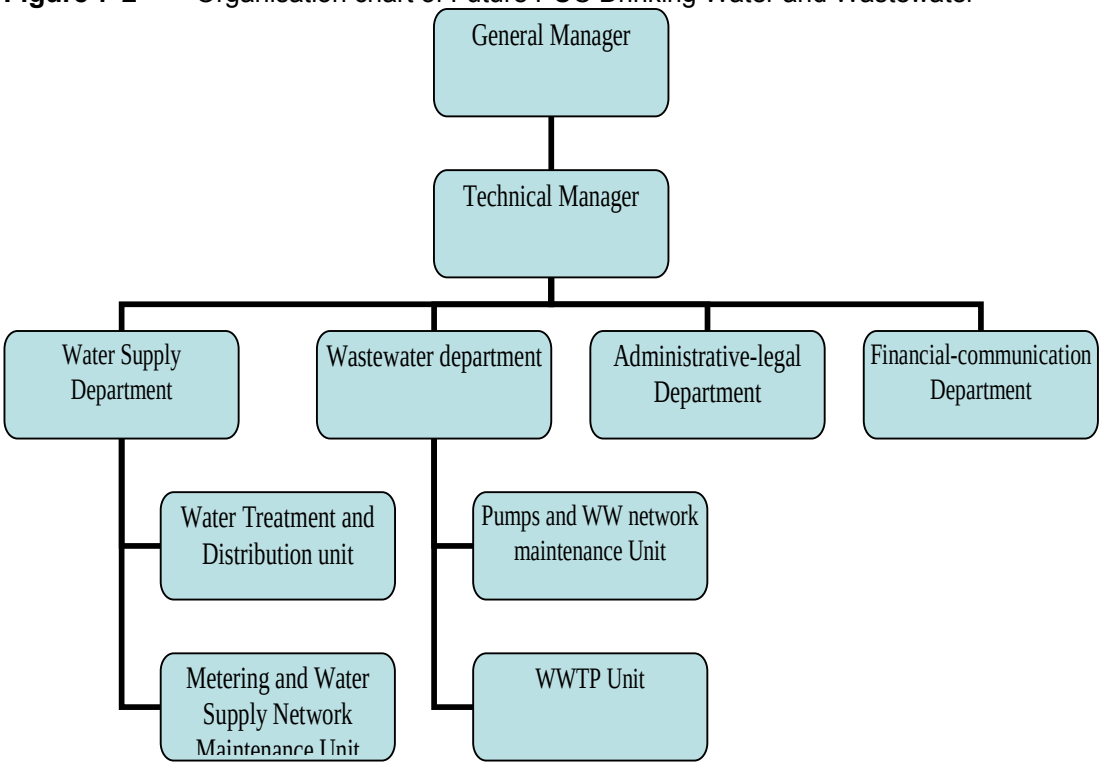
The introduction of a service level contract between the Municipality and the (future) PUC has not yet been subject to discussion but could be a future solution. It will assist in defining with increasing degree of detail the level of service to be provided by the PUC, and gradually stricter operational criteria can be achieved. The latter one refers to higher efficiency of the processes and stricter quality criteria of both drinking water and treated wastewater in the future.

The following assumptions have been made:

- Working hours of the system shall be limited to 8 hours per weekday (40 hours in total);
- For all positions in the new PUC job descriptions will have to be made;
- A Municipal assembly decision has to be made on the selection procedure for the staff for the new PUC. At one extreme we observe a transfer of all staff from the current Operational Unit to the new PUC, on the other extreme we observe the possibility of current staff that will have to apply for the positions of the new PUC. A balanced decision will have to be made on how staff will be appointed at the new PUC.
- In principle all Employees of the existing Operational Unit will be transferred to a new one and for those positions where there is a lack of employees or specific qualifications not currently available at the current Unit, new staff will have to be appointed.

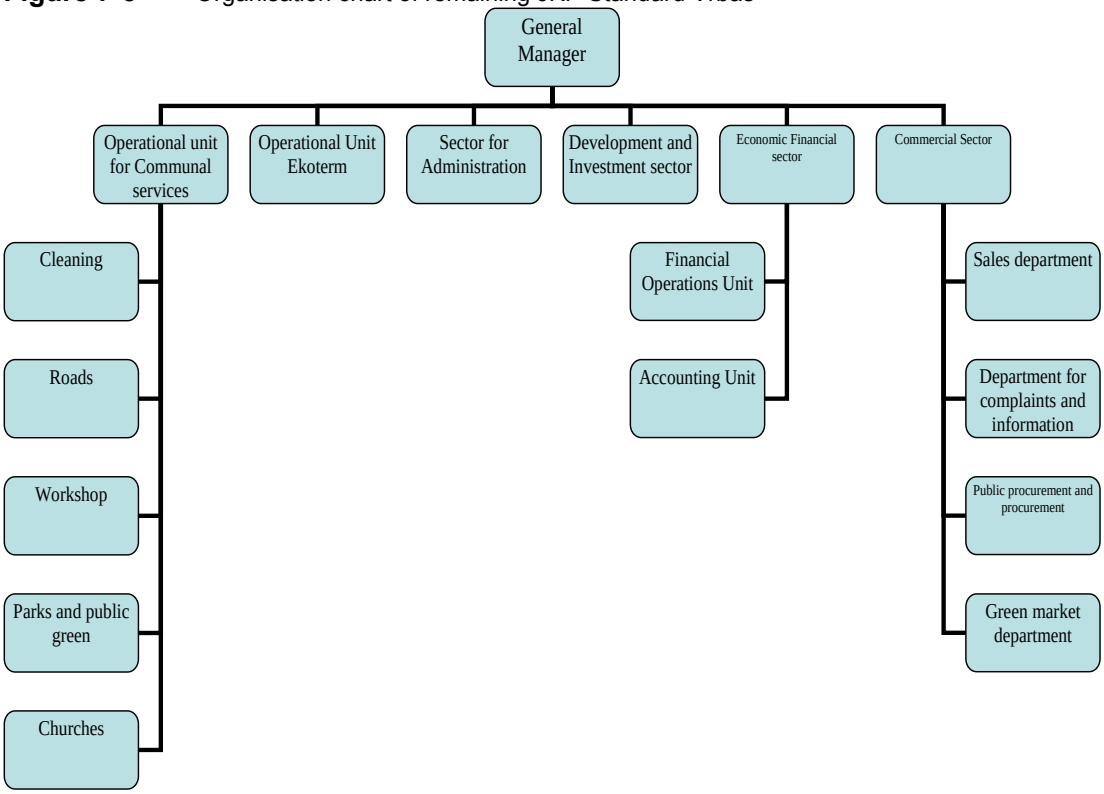
The proposed organisation of a new PUC is as follows:

Figure 7-2 Organisation chart of Future PUC Drinking Water and Wastewater



The remaining PUC, without the drinking water and wastewater Operational Unit, would be as depicted in the figure below. With respect to possible future divisions into core and non core activities this organisation setup would ask for further optimisation and possibly further division into two or more smaller PUC's. A smaller PUC with so-called non core responsibilities could in the future be dissolved when their tasks would be privatised.

Figure 7-3 Organisation chart of remaining JKP Standard Vrbas



7.4.2.2 Expected changes for J.K.P. Standard, Vrbas management

In the new PUC, management shall be ensured by the General Manager, appointed by the political party in charge of the mayor's office. He will be supported by a Technical Manager who will direct the Heads of departments, of Water Supply, of Wastewater, of Administrative-Legal affairs and of the Financial-Commercial department.

- **General Manager**: responsible for general management, external relations, corporate planning, will be appointed by the Board of Management, or in case there is only one Municipality involved by the Mayor's office;
- **Technical Manager**: deputy to General Manager, specifically responsible for the departments of Water Supply and Wastewater and will guide the departments of Administrative-Legal affairs and of the Financial-Commercial affairs;
- **Head of Water Supply department**: responsible for production, treatment and distribution of drinking water, and maintenance of drinking water distribution network and water meters;
- **Head of Wastewater department**: responsible for collection and transport to WWTP of domestic and industrial wastewater, operation and maintenance of WWTP, and maintenance and repair of sewer network;
- **Head of Financial-Commercial Department**: responsible for all financial operations, i.e. accounting, customer relations (billing and collection), planning and budgeting, sales of services, the reception of and dealing with complaints and provision of information;

- **Head of Administrative-Legal Department**: responsible for legal operations of the company, compliance with environmental regulations, human resources issues and support services

The required management system should focus on quality management, financial management and also effective management of environmental issues all of which should be included in an integrated management system in various fields such as:

Appropriate operation and maintenance of assets (including depreciation and planning);
Management of resources (human resources, equipment, financial);
Information system (keeping records, management information system);
Customer relations (billing, collection, complaints, public relations);
Activities and processes (policy making, internal and external relations);
Management of environmental issues (alignment with legal requirements and policies).

These functions can further be organized in the following areas:

- Managerial: general management, external relations, contracting, planning;
- Technical: water distribution and treatment and waste water collection, treatment and discharge, network maintenance, quality control of both drinking water and treated wastewater;
- Financial-commercial: accounting and customer relation (billing and collection and complaints), financial planning, budgeting;
- General operations: administration, legal, personnel.

Technical Service
Final responsibility for the technical operations will be borne by the Technical Manager. He will be supported by two supervisors, responsible for the two departments, namely the Water Supply and the Wastewater Department.

Water Supply department
All operational activities in the field of drinking water supply will be carried out under the responsibility of the Head of the water supply department. There will be supervisors of the two proposed units. Possibly the units will be divided unto functional groups directed by a group leader or a foreman. The following duties will be executed: groundwater pumping, well maintenance and cleansing, water treatment, water distribution, metering and water supply network maintenance.

Wastewater department
All operational activities in the field of wastewater will be carried out under the responsibility of the Head of the wastewater department. There will be supervisors of the two proposed units. Possibly the units will be divided unto functional groups directed by a group leader. The following duties will be executed: wastewater collection and transport, operation and maintenance of the WWTP, maintenance of sewage pumping stations and sewers, extension and rehabilitation of sewer system.

Laboratory for water quality
Although not included in the organisation chart of the new PUC, laboratory facilities will have to be included in the new PUC. It is not of direct importance under which department (Drinking water of Wastewater) this facilities fall, as long as it is included in the organisation. A combined laboratory for both drinking water and wastewater

sampling and analysis has efficiency advantages, as long as both sections are physically well separated. Possibly the new laboratories at the WWTP can be made suitable for both kinds of analytical work. A laboratory team of 4 to 5 laboratory technicians would be enough.

Administrative-Legal Department

The administrative-legal operations will be directed by the Head of Administrative-Legal Department and will comprise the following operations:

- establishment and control of legal operations of the company;
- preparation of contracts with external parties;
- preparation of legal set-up of environmental legislation compliance;
- supervision of human resource policies;
- general support.

The staff will include the following positions:

- Head of department;
- IT-expert;
- HRM assistant;
- Assistant on Environmental protection and safety measures;
- Administrative assistant.

Financial – Commercial department

The administrative operations shall be directed by the Head of the Financial-Commercial department and will comprise the following operations:

- Accounting/planning;
- interface with the existing accounting system and the activities here will consist of collecting information, billing and collection, planning and tariff setting, verification and consultation/reporting for the MIS, the reception of and dealing with complaints and provision of information.
- Commercial sector will also include activities on handling and customer complaints.

The staff will consist of:

- Head of department;
- Planner
- Accountants;
- Complaints/information officer.

An overview of staff for the new PUC distinguishing between existing PUC staff and additional staff is given in the table below: For more detail, reference is made to Annex 7.2.

Table 7-5 Number of staff for new PUC for drinking water and wastewater

Position	Current staff	To be appointed staff for new PUC	Staff to be recruited
General Manager	-	1	1
Technical Manager	1	1	-
Heads departments	3	4	1
Unit Supervisors	2	4	2
Foremen	2	2	-
Technicians	38	50	12
Support staff	13	16	3
IT Expert	-	1	1
HR Assistant	-	1	1
Safety measures, environmental protection Assistant	-	1	1
Administrative assistant	1	1	-
Planner	1	1	-
Accountant	2	2	-
Complaints/information officer	1	1	-
Billing/collection officers		4	4
Total	**64**	**90**	**26**

Management of the new wastewater treatment plant (WWTP) is a new component of the existing operations in the wastewater sector in Vrbas. The demands on the managerial skills of the management are high and there is always the possibility of interference of the founders in the day-to-day management.

The following points need special attention:

- Training should be provided to management in WWTP operations to be provided by the contractor or by having staff members taking specialised courses;
- Training or consultancy provided by a qualified advisor on specific fields of interest: sludge digestion and handling, introduction of maintenance programs, etc.
- Separation of management from the ownership through a Service Level Agreement or a Management Contract.

7.4.3 Conclusion

Based on the assessment made of the organisation and staff of the current PUC and the Operational unit for water supply and wastewater, the Consultant has formulated the following conclusions and recommendations:

Organisation:
After elaborate discussion we propose to establish a new PUC for the provision of services for Water Supply and Wastewater management. Initially this will be a PUC fully owned by the founder, the Municipality of Vrbas, but in the future it could be extended towards a multi-municipal or regional company. A proposal for the new organisation can be found in this chapter.

Management and staff

Based on the job descriptions of the current Operational Unit for water supply and wastewater, an analysis has been made, taking as starting point the transfer of all current staff. According to our analysis of the new PUC the Consultant foresees a need of some 26 staff, mostly technical staff for the extended scope of services.

Appointment of staff should be upon individual job descriptions (see also current Rule book on organization with job descriptions, 2004). For the drinking water sector, most staff is already available. For the wastewater sector new staff has to be appointed both in terms of numbers and in terms of capabilities.

We foresee the appointment of a new general Director of the new PUC for water. As the current PUC will be split up into two future PUC's (the remains of the current PUC, and the PUC for water), two general Directors will be needed.

There is a need for additional training for running a WWTP which should be provided by the contractor and for extended laboratory services.

8 PROJECT IMPLEMENTATION PLAN

8.1 Subprojects and procurement

The following phasing and timing of completion of related activities is proposed:

Phase I:
Construction of two lines of the CWWTP with a total capacity of 98.000 PE (app. 80% of the originally planned capacity of app. 125.000 PE): to be completed by the end of 2010.

In relation to this phase, however, important for the overall project success is the completion of the following activities:

- Construction of the Southern and Western transmission mains and associated lifting pumping stations to the CWWTP: to be completed by the end of 2009;
- Construction of local sewage networks in the five villages of the municipality of Vrbas: to be completed by the end of 2010;
- Construction of the main gravity sewer connecting Cranex meat industry with Vrbas sewage collection network: to be completed by the end of 2010.

Completion of Phase I will practically enable local sewage collection, sewer mains connection and treatment of household and industrial wastewater from Vrbas, the surrounding villages and its industry.

Phase II:
Completion of the construction of the CWWTP with additional 49.000 PE (app. 39% of the originally planned capacity of app. 125.000 PE): to be completed by the end of 2012.

In relation to this phase, however, important for the overall project success is the completion of the following activities:

- Construction/extension of the local sewage collection system in Kula:
  - extension to 50% sewer population coverage: to be completed by mid 2009;
  - extension to 75% sewer population coverage: to be completed by the end of 2010;
  - extension to 90% sewer population coverage: to be completed by the end of 2011;
  - extension to 100% sewer population coverage: to be completed by the end of 2012;
- Construction of the main gravity sewer from Kula to Vrbas: to be completed by the end of 2011;

Completion of Phase II will practically enable local sewage collection, sewer main connection and treatment of household and industrial wastewater from Kula.

Phase III:
Extension of the CWWTP with de-nitrification facilities: to be completed by the end of 2022.

Completion of Phase III will practically enable higher degree of treatment (de-nitrification) of regional household and industrial wastewater of Vrbas, surrounding villages and Kula town, as defined in the design conditions. The proposed technology

and capacity phasing is interrelated and dynamic. The completion of specific project phases depends on the project commitments and practical involvement of the two municipalities of Vrbas and Kula. The proposed phasing offers flexibility in terms of rationalizing investments and O&M costs. Namely, in Phase II the necessity and related investments (planning) for the extension of the CWWTP and the possible rehabilitation/extension/upgrade of the old WWTP of Vrbas are clearly related to the progress made regarding:

- extension of the local sewer network in Kula;
- completion of the sewer main between Kula and Vrbas;
- status of the industry of Kula and related discharges.

In this light it is recommended to include clear milestones in the project planning/phasing. The achievement of such milestones should be the prerequisite for further related investments and construction activities. Such an approach will ultimately result in optimisation of investment and O&M costs.

Sub projects

Based on the aforesaid discussions, the following sub-projects are distinguished (only for the proposed first stage of implementation):

- Collection networks and transmission pipelines in the rural settlements and extension main gravity sewer to enable connection of Carnex meat industry
- Construction of the first phase (2/3 capacity) of the CWWTP
- Technical Assistance

These major activities also include all necessary:

- Investigation works
- Design and documentation
- Permitting
- Construction supervision

Due to timing differences in financing, it is proposed to split the collection networks and transmission pipelines into two works contracts. One smaller works contract to be carried out during the year 2008. This contract will be financed by Vrbas municipality or other non EU international or national funding sources mobilized through the municipality. The second contract will be mainly funded from EU-IPA funds during the period 2009 to 2010. Corresponding supervision/technical assistance will have to be split as well.

Construction of the CWTP will be procured in one single contract, with funding sourced from the Ministry of Agriculture, Forestry and Water and EU-IPA funds.

Table 8-1 sets out the proposed procurement plan.

Table 8-1 Procurement plan

In Euro '000

Description	Cost estimate /1	Type	Procurement method	Financed by				
				Municipality	MAFW	EU-IPA	Un-identified	Total
Waste Water Treatment Plant								
Waste water treatment plant	11,611	Plant & equipment	EU-PRAG (Fidic yellow book)		3,870	7,741		11,611
Land acquisition	20	n.a.	Local procurement	20				20
Subtotal	**11,631**			**20**	**3,870**	**7,741**	**-**	**11,631**
Sewage collection								
Sewage collection year 1	2,341	Works	Local procurement	2,341				2,341
Sewage collection year 2 & 3	9,725	Works	EU-PRAG (Fidic red book)	271		9,454		9,725
Subtotal	**12,066**			**2,612**	**-**	**9,454**	**-**	**12,066**
Supervision year 1	122	Services	Local procurement	122				122
Supervision year 2 & 3	1,366	Services	EU-PRAG	-		1,366		1,366
Subtotal	**1,487**			**122**	**-**	**1,366**	**-**	**1,487**
Total priority investment plan	**25,184**			**2,753**	**3,870**	**18,560**	**-**	**25,184**

Technical Assistance

Furthermore, the Feasibility Study has identified the following Technical Assistance (TA) elements:

- Financial and operational performance improvement project (FOPIP). This TA is to assist with setting up the new public utility company and to support it in defining organisation and human resources, technical, operational, financial and planning systems and procedures aiming at establishing a modern and professional utility. It is also to assist the PUC with institutional aspects such as support in tariff policy, contractual issues (customer contracts) and drafting and agreeing a service level contract or management contract with the municipality. An overall institutional action plan is set out in Table 8-2.
- TA to support EIA recommendations of this report:: support with devising a waste and sludge management strategy and plan, monitoring plan and HSE plan
- TA to assist the PUC in a public awareness campaign. This is needed in support of introduction of new waste water treatment services and introduction of new and higher tariffs.

Table 8-2 Institutional action plan

Action	Body responsible	Deliverable output	Time frame
Set up Project Implementation Unit (PIU)	Municipality of Vrbas	Authorised body established	ASAP
Draft amendments to Municipal Decisions related to enforced connections	PIU, Municipality	Endorsed Decision	10 months before planned start of operations
Identification of assets to be transferred to the new PUC	PIU, Municipality	Assets of the new PUC Identified	Start ASAP to be finalised before Founding Act is prepared
Prepare legally binding documentation related to regional PUC set-up	PIU, Municipality	Prepared and endorsed: -Founding Act -Articles of Association	10 months before planned start of operation

Action	Body responsible	Deliverable output	Time frame
Registration of a new PUC	Municipality	-Appointed Management Board and Managing Director	6 months before planned start of operations
Prepare and sign contracts with Vital and Carnex	PUC Manager	Contracts signed	1 -3 months before start of the operations
Recruit staff, start operations of the PUC	PUC Manager	Staff recruited	1-3 months before planned start of operations
Conduct training of PUC staff	Contractor, consultants as per need, staff employed in existing PUC	Staff trained	As of start of trial run, 12 months for WWTP training by Contractor, 3 months before staff transfer to new PUC training by existing senior staff
Draft Service Level Agreement (SLA), endorse SLA (optional)	External Consultants, Municipality, PUC	SLA endorsed and being implemented	6 months after the start of operations

Table 8-3 summarizes the identified TA packages

Table 8-3 TA elements identified in the MIASP feasibility study

Project	Time frame	Assessed costs (€x1000)
Vrbas FOPIP new PUC Financial and operational performance improvement of the new PUC Financing unidentified	Jan 2010 – Dec 2011	300
Vrbas EIA follow up Assistance for mitigating identified gaps in EIA Financing unidentified	Jan 2008 – Dec 2008	100
Vrbas public awareness campaign Assistance in designing and executing a public awareness to introduce new waste water treatment service and related tariff policy Financing unidentified	Jan 2010 – Jun 2011	100

8.2 Time schedule

A preliminary time schedule of the above sub-projects is shown in Annex 8.1

9 RISK ANALYSIS

Table 9 -1 summarizes the most important financial, environmental, operational, institutional and socio-economic risks associated with the project and the project implementation. The probability that these risks will occur has been assessed, the severity of the effects has been indicated and mitigation measures have been proposed.

Table 9-1 Risk matrix

Risk	**Category** Financial, Environmental, Operational, Institutional Socio-economic	**Probability** H: High M: Moderate L: Low	**Adverse effect** From: 1 (Severe) To: 5 (None)	**Mitigation measures** (for effects 1, 2 and 3 only)
PROJECT PREPARATION				
Acquisition of the remaining land for the waste water treatment plant unsuccessful	Institutional/ Socio-economic	Low	1	Follow closely the pending land acquisition process and assist municipality where possible
Ministry fails to allocate funds for the project	Financial	Low	1	Reconfirm written commitment made based on financing plan of feasibility study
Public acceptance of project low (especially treatment of waste water)	Socio-economic	Moderate	2	Initiate, stimulate and enhance pro-actively the public consultation process. Make additional TA support available
PROJECT IMPLEMENTATION				
Limited management capacity available	Operational/ Institutional	High	1	Capacity enhancement programs
Setting up new public utility company delayed	Institutional	Low	2	Make TA support available
Large industries fail to invest in pre-treatment facilities	Institutional/ Financial	High	1	Closely follow up with Vode Vojvodina and provide support to Municipality in legal/contractual enforcement

Large industries fail or refuse to sign sewage connection contracts; disagreement about tariff level	Institutional/ Financial	High	1	Closely follow up with Vode Vojvodina. Ensure support from relevant Serbian authorities. Provide support to Municipality in legal/contractual enforcement
Residents in Vrbas villages refuse to connect to new sewage collection system	Financial	Low	3	Provide TA support for public awareness campaign; make connection attractive by increasing tariffs for septic tank emptying and/or adopt municipal degree forcing unconnected residents to transport sludge from septic tanks to the WWTP
Construction delays may occur due to longer than expected unworkable winter periods	Operational	Moderate	4	-
OPERATION				
Continued untreated waste water discharge in surface water	Institutional/ Environmental	Moderate	3	Adopt municipal degree with reward/penalty system and enforce this
Inadequate sludge & waste management practices at WWTP	Environmental	Moderate	3	Provide TA support to set up appropriate plans and measures
Inadequate tariff policies and payment discipline	Institutional/ Financial	Moderate	2	Provide public awareness and fopip TA; ensure adequate tariff policy in EU-IPA financing agreement.

Limited waste water treatment management experience	Institutional	High	1	Strengthen the PUC by means of FOPIP TA; provide operational support form contactor during defects liability period