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Regional Report on Asset Management Practices

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1 BACKGROUND

The project “Asset management for water and sanitation sector in South-East Europe”, financed by GIZ/ORF, jointly implemented by Standing Conference of Towns and Municipalities (SCTM) and Network of Associations of Local Authorities in SEE (NALAS) is focused on introduction of Asset Management methods in pilot municipalities in order to improve efficiency and transparency in managing water and sanitation infrastructures in SEE. In order to achieve this aim, the Project is implemented through the following three components:

1. Raising understanding of the benefits of Asset Management methods among decision makers in efficiency and transparency in managing water and sanitation infrastructures in SEE.
2. Developing data exchange standards between existing financial AM and GIS software, designing and establishing a web-based database and web-based modules for asset management.
3. Disseminating Asset Management methods in water and sanitation sectors at the local level in SEE.

Countries of SEE participating in the project are: Albania, Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro and Serbia.

This report is produced within the first of the above three components of the project. The outputs of the first component are as follows:

- a. Report on International Asset Management Practices in EU, produced in September 2014;
- b. Municipal Asset Management Toolkit for the water and sanitation sector, produced in October 2014; and
- c. Regional Report on Asset Management Practices in SEE.

2 INTRODUCTION

The Regional Report is based on the findings of National Reports of seven participating countries of SEE, which were produced by national experts of each country.

National Reports present findings of existing Asset Management practices in each country. National Report comprises of a National Assessment Report, which presents the overview of AM practices on national level, and Case Study Report, which presents in-depth information about AM practices in public utility (PU).

National Assessment Reports are based on surveys conducted in 4 municipalities/ public utilities in Albania, B&H, Croatia, Kosovo, Montenegro, and Serbia, and 8 municipalities/PUs in Macedonia.

Case study Reports are based on a survey:

- a. in one municipality/PU in Macedonia, Montenegro, Serbia, Kosovo, and Croatia, and
- b. in two municipalities/PU in Albania and B&H.

3 ROLE OF ASSET MANAGEMENT

In SEE countries, public utility assets are managed, and sometimes owned, by PUs, but the PUs are owned by local government (Municipality). Management of all aspects of providing water supply and wastewater services is deeply influenced by the municipal authorities, which are responsible for monitoring activities of PUs, approving their business plans and reports, service tariffs, etc. Local authorities sometimes provide grants for capital investments in utility infrastructure, but usually capital investments are the responsibility of PUs, as this is clearly stated in most of the respective local decisions/decrees. However, PUs usually lack financial resources even for regular maintenance, not to mention for bigger investments. The current practice in managing public utility infrastructure has, obviously, not been satisfying as it resulted in many problems that both Municipality and PU face nowadays, such as: (i) old infrastructure, which has not been rehabilitated in due time to prevent serious deterioration; (ii) frequent failures due to poor maintenance; (iii) high water losses; and finally (iv) technically, financially and organisationally inefficient system.

Local decision-makers need to care about managing public utility assets in a cost effective manner for several reasons: 1) these types of assets represent a major public investment; 2) well - run infrastructure is important in economic development; 3) proper operation and maintenance of a utility is essential for public health and safety; 4) utility assets provide an essential customer service; and 5) asset management promotes efficiency and innovation in the operation of the system.

The most important trigger for implementation of asset management practices in public utility is the concern about aging physical assets. If the required annual maintenance is not performed to the extent necessary (which is usually 2% of its investment value annually), as well as periodic upgrade of assets (capital investments) is not performed at strategic points, the assets will deteriorate significantly. Costs of operation and maintenance will also increase as the assets age, burdening PUs, even more, with excessive costs that it can no longer afford. Normally PUs do not have enough financial resources to rehabilitate or replace all deteriorated assets at once, and therefore, are in need of a strategic and integrated approach which provides answers on how to prioritize among investments/interventions and make better decisions.

A specific situation in PUs is the lack of basic data on characteristics and location of assets (buried assets), as these data are often known only by an aging/retiring workforce, and it is necessary to transfer their knowledge into asset records/inventory.

Another trigger is unreliable network/system that is subject to frequent failures, making it difficult to deliver the type of service that customers expect and demand. Consequences of asset failure may be broader than interruptions in service delivery, including environmental, economic and health consequences.

Finally, there is usually no long term planning of capital investments based on balancing risks and consequences of asset failure with costs of investments. As the result, scarce financial resources, both municipal and PU's, are spent on non-prioritized investments instead on investments that contribute more to the improvement of systems' efficiency in meeting the required level of service, and to the improvement of business effectiveness of PU. Planned maintenance and timely upgrade

of the system allows focus on those interventions/investments that provide improved service at reasonable costs.

All of these crucial issues are dealt with by various elements of Asset Management System. AM system is a set of elements/practices, used by respective decision-makers (Municipality, PUs), with the aim of providing the required level of service in the most cost-effective way, thus ensuring a long-term sustainability of public utility services. AM system encompasses different aspects of knowledge and competence required for sound decision-making, such as: business management, economics, engineering and IT management.

4 REGIONAL FINDINGS

4.1 SAMPLE MUNICIPALITIES/PUBLIC UTILITIES

The criteria for selection of municipalities/public utilities in seven project countries to participate in the survey of existing AM practices were the following:

- to represent bigger and smaller municipalities/utilities;
- to cover urban and rural municipalities;
- preferably to have a management information system (software);
- preferably to have cadastre of underground infrastructure.

Public utilities (PUs) are normally organized at the municipal level, with the exception of Croatia and Kosovo, where PUs are regional and owned by more than one Municipality. Basic information of the selected municipalities/PUs is presented in table below.

Country	Municipality/PU	No of population	No of population served by WS	No of population served by WW	IT systems, MIS	Cadastre of underground infrastructure
Albania	Peshkopi	31450	14500	14500	No	No
	Preza	6545	1900	482 connections		
	Vaqarr	4357	1600	290 connections		
	Peqin	8939	6950	1250		
Bosnia & Herzegovina	Zenica	145000	77009	66997	No	Yes
	Bijeljina	115000	105000	25000	Partial GIS database	No
	Zvornik	65000	24000	12000	No	No
	Kiseljak	22000	11039	5905	No	In the process of developing
Croatia	Liburnijske vode, Ičići	28336	26283	11531	GIS database	Digital form, but generally incorrect
	Ponikve voda, Krk	19042	15700	7053		
	KTD Žrnovnica, Novi Vinodolski	19691	19347	9683		
	KD ViK, Rijeka	183473	182795	116354		
Kosovo	Regional Water Company "Hidromorava" serving municipalities Gjiłlan, Viti and Kamenice	173250	23090 customers	NA	GIS database	Digital, in AutoCAD, ArcGIS
Macedonia	Skopje	531444	503876	404646	Commercial software for assets inventory	In GIS (ArcGis) for water and sewage
	Tetovo	86580	20716	13904		In AutoCad, only water
	Kavadarci	38741	38300	38741		Analogue form and in AutoCad

Country	Municipality/PU	No of population	No of population served by WS	No of population served by WW	IT systems, MIS	Cadastré of underground infrastructure
	Prilep	76768	75973	70175		Network drawn in Bentley hydraulic model
	Kichevo	56734	33851	24644		Analogue form; in AutoCad 40-50%; in Epanet (all pipes above 80 DN); only water
	Probishtip	16193	15050	13285		Analogue; in Quantum GIS 25%
	Rankovce	4144	3904	1442		Digital, drawn on Google Maps, only water, higher profile pipes
	Bogdanci	8708	6585	5531		In AutoCad, water pipes above 50 DN, sewage one village
Montenegro	Podgorica	188000	155000	93000	GIS, software for finan. and commercial operations	Digital (GIS)
	Bijelo Polje	46051	31338	15060	Software for financial and commercial operations, in the phase of implementing GIS	Analogue
	Herceg Novi	30992	28452	19916	GIS, software for finan. and commercial operations	In electronic form (GIS)
	Tivat	14111	13405	4022	GIS, SCADA, software for finan. and commercial operations	Digital (GIS)
Serbia	Belgrade	1,6 mio	1,4 mio	1,1 mio	Yes	Digital
	Leskovac	162000	88712	70206	No	Analogue
	Velika Plana	41000	25761	8800	No	Digital, only for water
	Vrbas	67000	46500	15000	No	Analogue

Table 1: Overview of sample municipalities

4.2 STATE OF THE UTILITY ASSETS

The biggest problem regarding the state of assets in water utilities is old and deteriorated water and sewerage network that has usually not been properly maintained and/or upgraded leading to many

other operating problems in provision of good utility services, such as: frequent failures and interruptions in water supply service and high water losses in the water supply system. Water losses are reportedly one of the main issues which are portrayed negatively due to its impact on revenue, increased operational costs, energy waste and wastage of water resources. Maintenance and rehabilitation are insufficient in most PUs, and annual network rehabilitation rates are low. The main reason could be found in insufficient funds, even for covering the operational costs.

Country	State of assets
Albania	Peshkopi - old network, illegal connections, high water losses Preza - high water losses over 50%, sewage network is new, large percentage of inhabitants do not have sewerage network Vaçarr – water and sewage network new, major problem are non-technical losses, electrical losses are about 48% Peqin – water losses 38%
Bosnia and Herzegovina	Bijeljina, Zvornik - old water network, high water losses, frequent breakages Zenica - lack of drinking water, old infrastructure, water losses reduced to 27% by installing of equipment for zone measurements, installing of telemetry system for management purpose Kiseljak - lack of drinking water, old network, reservoirs in bad condition, insufficient capacity of sewage collectors leads to frequent spillages
Croatia	Water losses in the range 20-40%, systems is generally up to 50 years old
Kosovo	About 60% of the existing pipes in Gjilan are from asbestos-cement material, with an average age over 40 years. These pipes are in bad shape, with frequent damages and significant water loss. Water losses over 50%.
Macedonia	Old water supply and sewerage network, increased trend of failures, water losses in average 50%,
Montenegro	Podgorica - average age of assets, 49% water losses Bijelo Polje - old network, inability to adequately maintain the water supply network, 65% water losses Herceg Novi - old water supply network, 70% water losses Tivat - old water supply network, 55% water losses
Serbia	Old infrastructure, inadequate maintenance due to low tariffs which leads to frequent failures and high water losses. However, there are currently on-going projects for improvement of condition of assets.

Table 2: Main issues of the state of utility's assets

4.3 LEGAL AND REGULATORY FRAMEWORK

Utility services in SEE countries are regulated by relevant laws on utility/communal service, including services like solid waste collection and disposal, etc. More specifically, water and wastewater services are usually regulated separately by relevant decisions/ordinances which establish the basic elements of these services as well as responsibilities of Public Utilities. These decisions regulate the manner and conditions of drinking water supply, termination of the drinking water supply, discharge of urban waste water into the recipient via the sewerage system, connection to water supply and sewerage systems, the relations between the service provider and the service user, etc. This aspect in some countries is regulated by state regulations and in other countries by municipal regulations.

These regulations usually contain provisions that the PUs are obliged to provide continuous and undisturbed utility services to all customers, to maintain good condition and functionality of utility assets, to maintain health and hygiene standards, etc.

Country	Laws and regulations	Level of authority
Albania	Decision on water supply and sewerage	Municipal
Bosnia and Herzegovina	The Law on Communal Activities Decision on water supply and sewerage	Cantonal Municipal
Croatia	Ordinance on special conditions for the performance of public water supply Ordinance on special conditions for the performance of public sewerage	State
Kosovo	Law on Publicly Owned Enterprises	State
Macedonia	The Law on Communal Activities The Law on Drinking Water Supply and Discharge of Urban Waste Water	State
Montenegro	Decision on supplying the city/municipality with drinking water	Municipal
Serbia	Law on Communal services	State

Table 3: Legal regulations on utility services

4.4 INSTITUTIONAL FRAMEWORK AND RESPONSIBILITIES IN PROVISION OF UTILITY SERVICES

Municipalities are responsible for overall planning and development in water and sewage sector, such as expansion of service coverage area, improvement in quality of service, etc. Municipalities usually have some kind of strategic development plans and spatial plans which, among others, define the baseline for management of water resources, with directions and priorities. These plans normally define strategic and operational objectives for the water and sewage sector, targets, implementation period, etc.

Municipalities have respective departments in charge of communal services, as well as communal inspectors, who monitor functioning of communal services at the municipal level.

Since Public Utilities are founded and owned by the Municipality (in some cases by more than one Municipality), the Municipality also supervises the work of PUs over the Supervisory Board and the company's Assembly. Members of the PU's Supervisory Board are appointed by Municipal Mayor, whereas Assembly usually includes all member of Municipal Council. These two management bodies of PUs are instruments of municipal control over the activities of PUs. Through these bodies, Municipality reviews and approves PU's Mid-term and Annual plans and Annual reports thus directly controlling activities of PUs. The Supervisory Board controls the financial aspects of the work of PUs and examines and conducts an audit of all documents and records of the PU, reviews the annual financial report and the annual operating report of the PU, and submits its opinion on the aforementioned reports to the Management Board and Municipal Council for further approval.

Furthermore, Municipalities are in charge of making decision on water and sewage tariffs upon the proposal made by PUs. The tariffs are supposed to cover all the O&M and investment costs of the PUs, but this is usually not the case, as the tariffs are too low to cover all the costs.

In the case of regional PUs, such as in Croatia, all Municipalities are involved in decision-making, depending on their respective share in PU. In Kosovo a regional PU is controlled by the Government of Kosovo, more precisely the Ministry of Economic Development. The Supervisory Board is replaced by Board of Directors consisting of representatives of Ministry and one member which represents all three municipalities. The mandate of the municipal member is one year and with rotation is replaced by next municipality.

Responsibility of PUs, on the other hand, is to organise its work and activities in providing water supply and sewage services to all customers. This specifically includes the following responsibilities: (i) providing continuous and uninterrupted utility services to all users, (ii) ensuring good quality drinking water, (iii) maintaining the water and sewage network in good condition, (iv) reduction of water losses; etc. PUs are responsible for setting the level of services in accordance with the requirements of the minimum standards of services determined by the respective rules and regulations on communal services.

The legal responsibility of the PUs implies covering all costs through the service tariffs, in order for the public function to be completely fulfilled. However, due to insufficient funds collected through the tariffs, PUs usually address the municipal budget, grant or loans for the coverage of investment costs. There are cases of PUs which are not able to cover even their O&M costs. The situation in project countries is very diverse regarding funding of the costs related to utility services.

The table below presents the summary of findings on this very important issue in the project countries.

Country	Coverage of costs of utility services
Albania	Acquisition, rehabilitation, replacement of utility assets is performed by PUs. O&M costs must be covered by tariffs, whereas capital costs are planned according to available funds.
Bosnia and Herzegovina	PUs are responsible for O&M costs. Capital costs can be funded by municipal budget, Government of the Entities, or by bank loans. In case of loans, the Municipality provides guaranties, but PUs repay the loan. In the case of smaller PUs, such as in Kiseljak, Municipality provides funding for all capital investment in communal infrastructure, and sometimes, depending on the capabilities of the municipal budget, subsidized the maintenance costs.
Croatia	Planning, design and construction of assets, as well as all associated costs, is under the responsibility of the PU. Municipalities determine capital investments but they are not participants in the construction. PUs can fund the investment from loans and repay the loans themselves. For smaller PUS, the investor can be the Water Agency "Hrvatske vode".
Kosovo	The Municipalities are not legally bound to financially support or invest in the PU, but sometimes they do commit capital investments in cooperation with the Utility. They do not subsidize the O&M costs of the PU. Ministry of Economic Development (MED), as the owner of PUs and the assets, each year commits funds in certain amount for capital investments as per Utility's priorities. The Utility, in the harmony with their business plans, prepare the project proposal and apply to the MED for investments. However, the donors are still participating with the largest part in the capital investments.
Macedonia	O&M costs are covered by PUs, but in some cases, especially with smaller and rural utilities, the Municipalities often subsidize O&M costs. PUs have to carry out investment maintenance, such as repairing the equipment, which is not

Country	Coverage of costs of utility services
	included within the regular maintenance (repairing or replacement of spare part which has higher value) and in cases when such repair does not modernize the equipment, but keeps the same level of usefulness. In general, PUs do not cover the capital costs.
Montenegro	PUs are responsible for covering O&M costs. Regarding capital costs, smaller PUs are directly dependent on the Municipality or possibly donors. Larger PUs, such as Podgorica, carried out over 50% of capital investments over the past five years from its own funds, or donations, while the rest is provided from the City Budget.
Serbia	PUs are responsible for O&M costs. For capital investments, PUs rely on Municipalities, whereas bigger PUs, such as Belgrade, carry out their capital investments as well.

Table 4: Coverage of costs of utility services

The ownership and depreciation of utility assets is another issue in Municipalities/PUs and the situation is diverse in different countries. The Municipalities are founders and owners of PUs, but the utility assets are in some cases owned by Municipality and in other by PUs.

Country	Ownership of assets
Albania	PUs are owners of all assets and responsible for regular accounting and depreciation of assets.
Bosnia and Herzegovina	Municipality is the owner of assets and keeps records of infrastructure and performs depreciation. Management of municipal utility infrastructure is entrusted to PUs. The exception is PU Zenica which owns utility assets except the storm water infrastructure.
Croatia	All utility assets are owned and kept in books by the PUs.
Kosovo	Utility assets are owned by Ministry of Economic Development. The bookkeeping, accounting and depreciation, are conducted in the central unit of the PU, in Gjilan.
Macedonia	Utility assets are in most cases municipality-owned but used and managed by PUs. However, some of the sample PUs claimed that they owned the water and sewerage network. In general, all assets are kept in the PUs accounting books and asset inventory, with data about the purchase price and the depreciation. However, this doesn't mean the PUs owned these assets. In some rare cases, these assets could be finding in both accounting and asset inventory books.
Montenegro	In some municipalities, owner is PU in other (Bijelo Polje) owner is Municipality. All PUs perform bookkeeping of all assets through the general ledger, and they are responsible for calculating the depreciation of assets.
Serbia	Municipality is the owner of assets. PUs are responsible for operation and maintenance of assets, keeping all assets in accounting books and carrying out depreciation.

Table 5: Ownership of utility assets

4.5 PLANNING OF UTILITY SERVICES

Utility services are normally provided on the basis of respective plans and programs. Municipalities usually have their own strategic/development plans for the water and sanitation sector, which include strategic objectives for the longer period, for example 5-10 or even more years. These objectives usually cover issues such as: expansion of service area, improvement of quality of service,

reduction of water losses, protection of water resources, construction of wastewater treatment plants, etc.

However, there is also an obligation of PUs to make their mid-term and short-term plans regarding more specific operating activities as well as, usually, smaller investments. PUs in project countries do not make long-term strategic plans, e.g. for 10 or more years, which would define a wider vision, mission and objectives of company, as it is done in EU countries, and which is usually based on detailed analysis of stakeholders' and customers' requirements and demands.

PUs in project countries usually make 1-year or 3-year plans, or both. Plans mostly contain measures and activities to be done in the following years, including the financial plan, with clear identification of the budget necessary to perform those activities. In case of some PUs, there are only indications about the desired activities, without statement how they can be financed or, even, without indicated budget. Plans mostly incorporate priority activities, operational and maintenance plan and investments that could increase the efficiency and operational performance of the utility. In most cases, these plans could be understood as a "wish list", since the necessary budget for their realization is not well and clearly presented. Furthermore, plans of future investments are not the result of evaluation by adopted methodology and clear criteria for the evaluation. The investment planning is performed by experience and personal estimation of the PUs' management and by reports made by PUs' departments, which are done on the basis of collected market prices, earlier tenders, experiences, etc.

Reporting of PUs' activities is also very important in terms of presenting the accomplished activities and objectives from the plans. These reports should analyse implemented vs. planned objectives, including technical, organisational and financial indicators. It also should provide explanation for deviations from the plan, and provide corrective measures in order to achieve those plans.

Country	Planning and reporting
Albania	<p>The municipalities/communes have strategies for water supply and sanitation sector for the period of 5-10 years, which identifies priority investment projects. It also identifies strategic objectives for PUs, in terms of technical objectives as well as financial objectives, with target levels for each forthcoming year.</p> <p>There is no information available whether PUs make any plans or reports on their activities.</p>
Bosnia and Herzegovina	<p>Municipalities have development plans which include general plans for water supply and sanitation sector, usually for the period 5-10 years.</p> <p>PUs have 3-year or 1-year plans, and sometimes both. The Plans are made by PU staff with cooperation and suggestions from Municipality, based on priorities defined in the Strategic plan of the Municipality and the current financial possibilities. They include technical, organisational and financial activities, current and planned revenues and costs, plans for maintenance and investments.</p> <p>For example, PU in Zenica has Feasibility Study for water and sewage with defined measures until 2035, but this was done via grant project, it was not something PU planned to do. These measures will ensure the proper functioning of utility services in Zenica in the next 50-100 years.</p> <p>PUs make Annual reports presenting activities carried out in the previous year. A parallel analysis is given of planned and implemented works regarding rehabilitation and development. Report usually provides comments and explanations, and descriptions of the planed elements and reasons due to</p>

Country	Planning and reporting
	which certain activities have not been finished.
Croatia	<p>Croatia is in the process of reforms in water and sanitation sector until 2016 with reorganizing utility services into regional companies, and therefore there are currently no strategic decisions.</p> <p>PU's prepare Annual plans including: total volume of delivered services; number of employees, expected income, planned expenditures, the cost of subsidies for water services (water supply and wastewater), maintenance plan, investment plan, integrated management system and improvement of the quality system..</p> <p>PU's make Annual reports which usually only present the overview of spent financial resources.</p>
Kosovo	<p>PU makes 3-years Business Plan. The Plan includes operation and maintenance plan, capital investments, minimum standard of services to be reached towards the customers, etc. Objectives regarding the level of service are defined in the Business Plan, such as: reduction of losses, increase in billed water and collection of bills. However, it is not thoroughly described how to meet these objectives. PU has made a list of necessary project proposals, with no indication how they will be implemented as the costs are high, making these project only a wish list.</p> <p>There is no annual plan.</p> <p>PU is reporting on monthly, quarterly and annually basis to different institutions. These include reports about the key performance indicators, mainly technical, commercial and data. Regular reports are provided to National Institute of Public Health of Kosovo regarding the water quality.</p>
Macedonia	<p>According to the law, PUs should have strategic plans for communal services, but, in general, strategic plans do not exist or they are not updated, without precise info about the actions necessary to achieve the defined objectives and required level of service, with the exception of biggest PUs. There are Annual plans which mostly contain measures and activities for the following year, including the financial plan that contains all revenues and costs of the PU, the investments together with the dynamics of their implementation. However, there are still PUs that do not prepare the investment plans with clearly indicated available funds. Investment plans in some cases present a wish list of projects.</p> <p>In general, Annual reports of PUs do not review the fulfilment of the previously adopted Annual plans, do not identify and address any areas of under-performance, do not provide any proposed corrective action with explanation of the reasons why some activities have not been finished and implemented. In such cases, the same activities could be found in the next, and next Annual plans of the PUs.</p>
Montenegro	<p>Most PUs have their strategic/business plans, for the period of 3-5 years. Some PUs don't have such documents but they are in the phase of developing them.</p> <p>All PUs have Annual plans which contain annual goals and activities, including activities on the level of management, engineering and financial activities. All annual plans are directly harmonised with the Business Plan, so strategic goals of the Utility are also operationally executed through them. Annual plans have clearly identified costs for capital investments.</p> <p>Annual reports ensure monitoring of execution of planned activities on annual level. They include analytical processing of data with statistical indicators: number of faults on water supply and sewage network, number of newly registered consumers, consumption of material, analyses of readings of consumers, analysis of NRW, etc.</p>
Serbia	<p>PU's have both mid-term 3-years plans and annual plans.</p> <p>Annual plans, especially in terms of its reflecting the Utility's strategic objectives from the Strategic Mid Term Plan, is focused on NRW plan, financial</p>

Country	Planning and reporting
	<p>performance of services, MIS and customers relation. Tariff model is developed and regularly updated for drinking water and wastewater collection service.</p> <p>PU's prepare Annual reports which cover all aspects of activities (water production, commercial issues, investments, etc.) and they contain analysis of the current values compared to the previous year's values.</p>

Table 6: Planning and reporting in PUs

Except in cases of the biggest PUs and Municipalities, there is no existing Asset Management Plans, which are intended to be a "living" documents for guiding the Municipalities and PUs into the future related to management of water and sewage assets, and which identifies the technical and financial needs of assets and provides information well in advance of major asset renewal, rehabilitation or replacement so that Municipality/PU can plan for these major projects and budget accordingly. Mostly, planning of interventions on the assets is done on an ad-hoc basis.

4.6 ISSUES OF HUMAN RESOURCES

Human factors constitute a part of asset management system that enables implementation of all other asset management practices. Human factors include: clear assignment of roles and responsibilities for the implementation of respective tasks, definition of required knowledge and competence of staff, and understanding a need for training.

The premise of successful of asset management is that all parties involved in the process have sufficient amount of information and knowledge about asset management and its requirements.

In general, top management of the PU has the final decision of the content of the annual plans and defining the priorities, usually based on requests for acquiring, replacement or repair of assets from the respective technical department. Monitoring the implementation of plans and investments is responsibility of top management. PUs in project countries are currently not so much familiar with the concept of asset management, so there are no positions in the PU that are specifically asset managers.

Generally, maintenance and operational activities are mainly done without writing procedures, which can be the cause of inefficiency of staff. The evaluation of skills and performance of the staff is rare. The communication between departments is, in general, through personal contacts, but there is a trend to practice written communication and email communication. There are cases when staff is not even familiar with objectives and plans of PU. In practise, there are insufficient trainings to the employees in the PUs, especially related to technical staff.

Country	Human resources issues
Albania	<p>Staff is familiar objectives, strategies, plans, service standards, procedures for responding to consumer complaints as well as incidents, but they have minimum information on AM.</p> <p>Evaluation of employees is conducted annually in terms of the realization of the plans and objectives.</p> <p>Training of staff is minimal once per year to increase their performance in sectors where they are positioned. There is urgent requirements for training of</p>

Country	Human resources issues
	staff to use the last-software, as well as acquaintance with contemporary technology
Bosnia and Herzegovina	<p>Top management (TM) is responsible for decision-making on plans for investments, financial sustainability of the company, and representation of the company in all aspects. Communication channels, both vertical and horizontal, are well set in PUs. The employees are well acquainted with strategic aims and standards of services, procedures for responding to customer replies and incidents. For the most part, there is a clear procedure for the exchange of data and information across different sectors / departments, but there is room for improvement, as usually there is not MIS installed.</p> <p>Evaluation and training of employees is performed periodically. There have been some trainings of technical staff in GIS.</p>
Croatia	<p>TM creates annual plans and reports based on annual needs. Generally all PUs have formally good practice of vertically and horizontally communication. There are well described written procedures for operation and maintenance. Information is always shared between top and middle management. Workers often don't have information about the reasons why they are doing some task. During the period between 2006 and 2012 a group of employees developed a training scheme for all PUC's workers. They had established an inhouse training centre and designed the internal procedures for safety in sewer department. After the departure of key staff in 2014 this activity has almost disappeared with some training sessions still being organized.</p>
Kosovo	<p>TM is responsible for making decisions on asset management, while the request for acquiring, replacement or repair of assets comes from the respective department.</p> <p>Recently installed "Billing and Accounting Software" (beginning of 2014), which includes several financial modules and operates through the server, gives opportunity for promptly communication between departments with availability of having access to the available data including the important ones for asset management. All the asset information is available in the Utility's server, and each department has access to this section.</p> <p>There are no written procedures about sharing of data and information across different sector/departments in the PU.</p> <p>Heads of departments regularly implement evaluation of employees' performance against the plans and objectives.</p> <p>There is no schedule for staff training, except for the new software "Billing and Accounting Software".</p>
Macedonia	<p>TM of PUs has final decision of the content of the Annual plans and defining the priorities. TM is responsible and accountable for the delivery of results, for financial issues of the company, etc.</p> <p>There are no written procedures for operation and maintenance.</p> <p>The communication between employees from various departments are through personal contacts, telephone contact and work orders in case of bigger and well organized utilities.</p> <p>There is absence of regular evaluation of the employees in PUs.</p> <p>Trainings of employees are insufficient, especially related to technical staff. However, staff in the financial sector, public procurement and even IT is regular trained, mostly from the specific events.</p>
Montenegro	<p>TM is responsible for achieving strategic and annual plans. Monitoring activities on the implementation of strategic documents and annual plans is done with weekly reports, i.e. monthly or quarterly.</p> <p>There is a written procedure for operation and maintenance.</p> <p>Introducing strategic goals and plans to the staff in all utilities is developed to a particular middle-level management. Further forwarding of information depends on the level of development of the PU.</p>

Country	Human resources issues
	<p>Communication between employees is mostly in written form through a type of intern computer network, through which the exchange of data is possible among different departments.</p> <p>Evaluation of employees regarding objectives defined in plans is rare.</p> <p>One of the biggest failures of water utilities is surely the lack of needed skills and knowledge by the staff. The process of education is permanent in all utilities and is more or less successful.</p>
Serbia	<p>The role and responsibility of TM in development of Strategic/Annual plans and reports are not described precisely in the PU's founding acts.</p> <p>Specific tools with the decision-making process organization for asset acquiring/maintenance/rehabilitation/replacement are in the phase of preparation and they are still on the asset registry level. The only exception is Belgrade.</p> <p>MIS have been established within PUC Belgrade only.</p>

Table 7: Human resources PUs

4.7 MANAGEMENT OF ASSETS

Asset inventory

In order to start with any planning of future actions, it is necessary to have a certain degree of information about own assets including their location. In the countries covered by this report, such inventories of assets are very basic with limited data of questionable reliability. Categorising assets according to the type and characteristics of assets and developing assets hierarchy is usually unknown method in most PUs. None of the PUs has written regulation/protocol on asset data collection.

Performance and condition monitoring, risk assessment

It is crucial that PUs have a clear knowledge of the condition of their assets and how they are performing in order to assess the need for minor and major repairs, rehabilitation or replacement. There are many ways to assess the condition of assets. The condition of some assets can be inspected visually, tested in different ways, analysed based on history, mode and frequency of failures. There should also be defined grading criteria for grading of asset's condition. None of these requirements exist in majority of PUs.

After determining the asset condition and the required level of maintenance/investment, the next step would be to identify the risk of asset failure. The reason is to help prioritize the most critical assets. None of the countries have reported to be implementing any kind of criticality/risk assessment methodology.

Maintenance

Public utilities do not spend enough money on preventive and regular maintenance in order to maintain the functionality and good condition of assets. This causes economic inefficiency in the company's work. The fact is that 50% to 75% of the total revenues of PU are spent on salaries and other forms of financial support to employees (nutrition, transport, taxes and contributions to salaries, etc.). Maintenance in many of PUs is performed when failure already occurs.

Records of failures

There is insufficient records regarding the number, type and location of the failures, breaks and blockages, including size and material of the pipe, soil type, installed repair materials. This poor practise does not help the utilities to display a clear picture of reasons behind such a big number of pipe breaks and sewerage blockages and does not provide an opportunity to assess and predict the service life of pipes and the need for their reconstruction or replacement.

Regional findings

Summary of findings in project countries is presented in table below.

Country	Management of assets
Albania	<p>There is Microsoft Word or Excel – based partial inventory of assets, with very approximate data (asset group, average age per group, and average condition per group of assets).</p> <p>Conditions of assets are determined based on the year of construction / repairs / replacements. There is no application of grading criteria. No risk assessment.</p> <p>Assets are maintained only when failure occurs. There are no analysis of failures and repairs.</p>
Bosnia and Herzegovina	<p>Inventory of assets exists normally within the Accounting departments of PUs. There is no specialized software-based database; exception is Bijeljina which has partially unique database in GIS. The number, location, age, type of material, diameters, lengths of assets is available in most cases, but rarely the condition. The value of assets is not available in most cases.</p> <p>Monitoring and measuring the performance and condition of assets is not systematically organised according to a known methodology and clearly established procedures. In some PUs, condition is primarily assessed by the level of water losses, the number of failures and repairs. But there is no exact and orderly records and analysis of failures and repairs.</p> <p>Conducting the risk evaluation or comparing the possibility of failure in relation to consequences is not systematically organised by a known methodology and clearly set standards.</p> <p>Planning and performing regular (periodic) maintenance of assets is performed in PUs.</p>
Croatia	<p>There are GIS databases of assets, which in most cases are correct. The quality of data for waterworks is much better than for sewers.</p> <p>Monitoring performance and condition of assets is not organised according to a known methodology. The working unit for water supply collects all information on pumps, control boxes and other infrastructure objects. The working unit for wastewater collects and follows all information about the condition of pipes, scheduled cleaning and maintenance of the objects in the sewage network.</p> <p>Some assessment of condition is done, by hand, in Excel table. Risk assessment is not performed.</p> <p>PUs plan preventive maintenance at the beginning of the year, but the money spent on maintenance is not nearly enough.</p>
Kosovo	<p>A unique database with a record of more than 1600 articles of the Utility is collected, divided into three groups, reflecting each municipality (Gjilan, Kamenica, Viti) belonging to the region. Available type of asset data are: description, material type, size/diameter, value, depreciation, location. However, assets are not classified.</p> <p>There are no written procedures about the monitoring of performance assets. The Utility is not utilizing the available information that they have, such as number of leaks, number of failures/repairs, number of supply interruptions, etc. to measure the condition and performance of assets.</p>

Country	Management of assets
	<p>The records on frequency of failures are kept by the Utility. The causes of failures are identified, tracked and analysed especially if it happens in the water supply network.</p> <p>There is no risk assessment yet implemented, but sample PU plans to start using "Asset Assessment Software", which also includes tables for risk assessment.</p> <p>The ratio of reactive compared to preventive maintenance is estimated 7:3. In most of the cases, preventive maintenance plan generally is not completed on schedule. Most of the assets are replaced only when they collapse.</p>
Macedonia	<p>All assets are kept in the PUs' accounting books and asset inventory, with information about the purchase price, depreciation value, current value, for the newest assets the year of construction, location, but without info about the material, diameter and other pipes' attributes for the old ones. Each asset has an inventory number. This info is kept in commercial software that is only a part of integrated accounting software package.</p> <p>Assessment of asset condition is not so much practiced. The only indicators of the asset condition are reported number of water main breaks/km of main, sewer main breaks and blockages/km of main, and number of defect, failures of the pumps. Risk management is also not practised among the PUs.</p> <p>Reactive maintenance is more widely present comparing with preventive maintenance. However, in the last years there is a progress and increased awareness about the importance of preventive/scheduled maintenance.</p>
Montenegro	<p>Every PU has a unique data base on assets. Depending on technical capability of the Utility, data are kept in digital or analogue form. Basic attributes for assets are quantity, material, age, functionality and value.</p> <p>Condition assessment of assets is done based only on asset age; there is no methodology for grading of assets. Risk assessment is not performed.</p> <p>Planning preventive maintenance is carried out partly at annual level, based on the following activities: periodic examinations of the asset, daily and continual work in the field, SCADA monitoring, measuring losses in pressures, analysing damages.</p>
Serbia	<p>Asset registries were kept at the level of accounting information, not separately by services. There is no systematic approach to data as unique accounting and technical databases. So the data are not systematized.</p> <p>PUs do not spend enough funds on preventive and regular maintenance in order to maintain the functionality and good condition of assets. This is due to the low tariffs.</p>

Table 8: Management of assets

4.8 DATA SYSTEMS AND INFORMATION TECHNOLOGIES

Sources of information

By means of a field survey, an insight to approach to information technology and, partially, to information itself related to asset management was established on a regional level, covering several countries of the South Eastern Europe (SEE). A number of survey reports for individual utilities have been prepared based on interviews and questionnaires that have resulted in total of 7 national reports for: Albania, Bosnia, Croatia, Kosovo, Macedonia, Montenegro and Serbia.

The overall results bear limitations, stemming mostly from the size of the surveyed sample and the quality of respondents' responses.

Project's earlier outputs were used in conjunction with the fieldwork results. These include Municipal Asset Management Toolkit and Report on International Asset Management Practices. Also, the concepts related to asset management are covered in more depth there, while their referencing within this document is only in the scope relevant to understanding of the state of affairs on the regional level.

Challenges of water utility sector

It is apparent that systematic, streamlined approach to asset management (such as defined by ISO 55000) is relatively recent, and as such did not take deep roots in the wider international environment. That is equally true for information technologies in support of such approach, and it is only in the recent years that the emergence of information systems is seen to productively contribute to an asset management-focused business setting.

Several challenges are constraining the capacity of utilities to make use of information technologies and tools that have a potential to support asset management. The most important of these are very common to water business at large, such as:

- Budgeting limitations, further intensified by austerity measures due to economic crisis;
- Maintaining the levels of service with aging infrastructure;
- Availability of expertise, knowledge and awareness of asset management;
- Perception of information technologies in the context of their business; and
- Politically imposed constraints.

Although these challenges are more prominent in the region (when compared to the EU for instance), there are notable cases where utilities addressed one or several of these challenges and accomplished improved state of data availability by use of diverse information technologies. The specific approaches delivering compelling results are shaped by several key contributing factors:

- External forces driving change, such as reformation processes, the EU accession process (WBC and in particular Croatia as a new member state), or other external influences shaping local governance (UNMIK and other organization in the case of Kosovo);
- Improved budgeting by:
 - o Conveying more sustainable monetization model (example being Podgorica with improvements to fees collection rate),

- Accomplishing external funding (e.g. Serbia, Kosovo);
- Strengthening internal capacity and expertise in terms of human resources, know-how and technology:
 - When internal capacity was sought to be improved by supplementing it by external aid sources (e.g. in Belgrade), or
 - Addressing the diffusion of capacities by consolidating several smaller utilities to larger regional organizations with improved capacity, capabilities and more adequate budget (“corporatization” in Kosovo; a comparable process is also scheduled to take place in Croatia).

Information and Information Systems

However, it should be noted that on the one hand, an improved state in the area of information technology does not necessarily deliver on effective asset management practices. The asset management-centric business requires fundamentally different approach that focuses on asset information and their timely availability, while the information technologies themselves are only secondary in significance in that regard. It is only when the importance of the meaning of information and its context within an organization is properly interpreted and incorporated into the internal asset management processes that the information systems can accomplish their potential to the anticipated extent - when the efficiency and performance of an organization starts to be meaningfully impacted, turning from a reactive to a proactive approach.

On the other hand, in general, acquiring and adoption of information technologies alone may establish a solid base for further improvements. The benefits to an organization are primarily in terms of improvements to business agility, facilitated by a lower latency in obtaining relevant data. Utilities are then better equipped to respond to business challenges, analyse the shortcomings and commit to strategic planning in the future, provided that the internal managerial strategic vision and awareness is present. Furthermore, even if an organization procures off-the-shelf software solutions not specifically adapted to its business, it is being pressured to develop its internal skills and competences in the area of information technology, which is a potential for improving systems in the future. Besides managerial guidance, that skillset is one of the key pillars of knowledge needed to close a gap between isolated systems and required asset management information systems. Information systems are, after all, the enablers of an overall asset management practice, and, as such, are an opportunity that can be further exploited.

At present, only a few utilities approached information systems from the asset management perspective. Most have, or are planning to introduce some of the core information systems, such as ERPs that span only the financial aspect of assets, while others have already deployed Geospatial Information Systems (GIS), Customer Information Systems (CMS) or Computerized Maintenance Management Systems (CMMS).

However, one of the most noticeable problems constraining the effective deployment of information systems is a lack of information. In many utilities, even the rudimentary data about assets is not universally ascertained, for instance: location, amortization, financial value or performance of underground assets. Much of the information about the older, decades old pipes is unknown or can be only partially determined, in some cases based only on educated guessing. While the newly installed assets are mostly tracked, that information is not consolidated into suitable data stores.

Building Practical Asset Registers

This leads to a conclusion that the necessary and important prerequisite for introduction of information technologies is data discovery. For instance, the information about more recently completed work can be derived from the secondary sources, such as relevant project implementation documentation, contracts, invoices, bills of materials and other sources of information that are available elsewhere. Collection of information about older asset is more difficult and may include field investigation, measurements, examination of archives, cadastral data, construction plans and other, more complex means of data retrieval.

In a contemporary asset management approach, the asset information also has to be properly classified within an Asset Register. The data discovery process must be governed by information needs, which implies that the asset data scope, structure and hierarchy within the Asset Register should be identified prior to starting the information collection process. That will ensure that the information needs are met to adequate extent and that the intended outcomes will be accomplished.

Correspondingly, the surveyed regional practices have shown that consolidated and accurate information about assets stem from a trustworthy Asset Register, which is a foundation to building usable information systems on top of it. Data discovery and collection therefore has to be complemented by verification of the data accuracy, since the incorrect information in an Asset Register will propagate the errors across other, interrelated systems that depend on it, reducing their value and generating inconsistencies.

Hence, it is as an important consideration to achieving sensible practical and viable data integration between the asset register and supplementary systems that rely upon it.

The State of Affairs

Above all, the case studies have demonstrated that the successful outcomes in attempts to employ effective asset management must be driven by good governance – a managerial decision and commitment to address the challenges and develop a strategic, systematic and streamlined approach to asset management. That approach also implicates that a change in perception of information systems is needed, so they can serve their purpose in enabling, not driving asset management processes by aligning the system functionalities with business requirements and facilitating decision-making.

Country	Information systems
Albania	In Albanian case studies, utilities struggle to gather asset data and overcome deficiencies of the approach in the past. Financial data is available to some degree, but its extent is not identified at this time. Procurement restrictions make utilities manage simple data stores with office applications (MS Excel, Word).
Bosnia and Herzegovina	Two very different environments were presented Bosnia and Herzegovina. Two companies are representative of smaller utilities across the country while Bijeljina utilizes more comprehensive information systems (some in implementation phase) including Asset Register, ERP, GIS, partial SCADA and telemetry management, spare parts and materials, work orders and maintenance, but constrained by the lack of systems integration and unavailability of historical data. Also, there are plans for a system for lifecycle

Country	Information systems
	management. In that regard, the state of affairs in not very different from other countries.
Croatia	<p>In Croatia, the state of affairs in terms of available tech is better than the region average (including the only occurrence of CCTV for sewage inspection and upload to GIS), which is a good potential for asset management practices development. However, the importance of asset management is not fully realized. In mid-term, the country will carry out consolidation of utilities to a total of 20 companies (from present 144), which may strengthen the sector, and reinitiate currently low level of strategic planning.</p> <p>PU Rijeka uses Intergraph GeoMedia as the main GIS system. Working units for water supply and wastewater use the Steering control system (NUS but they are not inter-connected to each other. Besides that, the NUS are not yet connected with GeoMedia GIS application so there is no easy solution to examine spatial data. The working unit for water supply installed an Infor EAM's software for asset management in 2012 and from that year it regularly collects maintenance data. The work unit for wastewater uses the IKIS software tool that combines the storage of the original data on the state of the pipelines (3d images and videos) with the analysis in accordance with DWA M 149-3 approach (assessment and state of the system)</p>
Kosovo	<p>Considering the size of its economy and tumultuous past, Kosovo have accomplished remarkable improvements in the more recent years. The smaller utilities have been incorporated to larger regional units and information systems seem to have been systematically introduced. In the process of reorganization, smaller utilities had to commit to data collection - inventory and valuation of assets, which was a good base for further development. Asset registers and ERP systems are operational (ERP in the beginning of 2014), while GIS has been scheduled for the operation in the upcoming year. Other systems are present as well, such as SCADA or Spares and Materials and systems integration seems to be properly addressed. More advanced modules are being introduced in the future, such as MS Access-based "Asset Management Software" to facilitate planning and decision making. Overall, the provided feedback is one of the soundest among available regional data, a potentially important indicator for future development.</p>
Macedonia	<p>In Macedonia, the situation is better in larger utilities, but limited to data visualization in GIS. There have been limited attempts to gather data on asset condition and performance, as well as SCADA and network modelling. More recent legislation will likely boost data collection in the longer term, as it requires utilities to record water supply and sewage network and submit data in GIS format to Real Estates Authority.</p>
Montenegro	<p>PU in Podgorica have managed to overcome a previous initiatives to build from the information system upwards and realized that the process need to take top-down approach in terms of imposing data requirements, integration and overall process management. Currently, an integration of GIS and central asset database in the works to better facilitate asset management purposes. The utility also implemented a software solution for monitoring of assets, feeding GIS with data which is made available for maintenance purposes. Smaller utilities somewhat comparable resources, but in varying implementation stages and lower levels of data accuracy verification.</p>
Serbia	<p>One of the most remarkable examples of applying AM approach is Belgrade, where the utility has deployed a proper Asset Management System. While the other surveyed utilities in the country have limited information systems at their disposal, this utility has undertook to address operational and commercial efficiencies by building upon its internal expertise, aided by an external funding source to tackle the budgeting issues preventing them to accomplish it previously. The first step was establishing a validated asset</p>

Country	Information systems
	register - Network Asset Management System, and then the information system was upgraded with other integrated sub-systems spanning asset life-cycle management, hydraulic analysis, reporting and planning, etc.

Table 9: Information systems

Generally, it seems that there is better availability of water supply network data than sewage/storm water network data. Also, in terms of communication, most use e-mail, but there are occurrences of paper-based or oral communication for the internal purposes.

Conclusions and Future Work

It is a general impression that the asset management is generating growing attention. Bigger utilities increasingly introduce more information technologies to cope with change and there are examples where that approach is both suitable in functionalities and integration, as well as fruitful in facilitating the business.

However, a global action is needed to extend the reach of benefits to the water utility business as utilities, especially smaller, expectedly face problems to adopt technology in a more comprehensive manner. The uncertainties in the sector cloud decisions, while utilities are pressured to maintain the service levels. In terms of information technologies, utilities should be assisted in becoming aware of the appropriate approach to information technology that can be adequately leveraged to:

- Respond to challenges to their extended organization (including customers, suppliers, stakeholders, administration and public);
- Reduce latency and increase availability of adequate, accurate data in order to improve business agility and facilitate decision making;
- Improve community satisfaction and position themselves better in the future period.

In terms of the specific future activities, several basic asset management related concerns will need to be addressed. At present, outside relatively rare exceptions, universal level of understanding of contemporary asset management practices leaves a lot of room for improvements.

First, raising awareness is needed, focusing on higher-level abstraction that could swiftly lead to appreciation of the potential of asset management to profoundly address existing business issues, including recognizing the needed change in the perception of information technology.

Secondly, activities should focus on gaining momentum - preparing both generic asset management framework and more concrete information that would be truly usable and beneficial to the utilities. Once the business aspect is well accepted, the information technology area can be tackled. Baring in mind the Project's objectives and determination to deliver a software product, the systematic analysis should be conducted, governed by several principles:

- Focus on delivering usable IT services, not products;
- Deliver tangible results that wide range of water utilities can recognize as problem solvers as well as its decision support potential;

- Ensure preparedness and sufficient maturity of participating utilities and in particular their management, so that the system with a potential to enable is not perceived as the additional work;
- Address usability issues by deploying use-cases where accurate data exists, so that the system outputs are consistent and practical;
- Make possible system integration with existing internal systems of the utilities, with import/export facilities as a minimum;
- Preference is with a web solution, due to maintenance, lack of local infrastructure and system availability. However, depending on the data scope, constraints must be considered, such as national compliance requirements that may hinder sensitive data storage abroad. Initially, these issues might go unnoticed, but may jeopardize sustainability.

Finally, local support and advisory system should be established through the local counterparts such as relevant associations, administrative or political units or leading utilities to ensure sustainability and that the water supply sector maturity continues to evolve. Aside from a system that will be provided by the Project, the utilities should be encouraged and supported to proactively pursue to adopt, deploy and leverage the increasingly accessible information technologies for asset management.

5 GAP ANALYSIS AND CONCLUSION

The current situation regarding management of utility assets in Municipalities/Public utilities cannot be considered satisfactory. It is a fact that in this moment the commitment to assets management is insufficient, which has a consequence that mostly investments are carried out only when the functionality of the system is jeopardised, that is when the system cannot provide for the requested or minimum level of service.

Since the survey has shown very little understanding among the Municipality and Utility staff of what actually the asset management is and what kind of benefits it could bring to the Municipality/Utility, the first step would be introducing and training the Municipality/Utility staff on importance of asset management and best practices. Introducing the asset management concepts at all levels of the Utility is required, from the top manager to every employee. Staff must be convinced that asset management is important for improving efficiency and effectiveness of the Utility. When asset management is adopted as the way of doing business, each employee's knowledge and expertise is important to the process and to the successful implementation. Assigning clear lines of responsibilities for asset management tasks is very important. Utilities can adapt asset management principles and tools to their organizational context. Municipalities and Public utilities should promote effective learning and training programs for all involved, especially engineers and operators. Evaluation of available work force needs should be undertaken to identify action required to ensure adequate work force will be available. The evaluation should match overall needs to availability of resources in the following areas: numbers, skills, qualifications, experience and performance. This evaluation will indicate the variations necessary to the current resources available.

Survey has shown that planning processes in M/PU are not very well organized, they are mostly short-term and they do not provide a clear vision of the future needs and targeted achievements. Municipalities and Public utilities should consider developing together a long-term Strategic plans for utility services, based on detailed analysis of the condition of the existing systems, the level of service it provides and future demand and requirements of all customers. Only based on the long-term strategy and long-term objectives, an effective Asset management plan can be developed, which should be of mid-term character. Assets should be managed, operated and maintain taking into consideration their whole life cycle to achieve the required levels of service at the least cost. This should be done by combination of managerial, organisational, engineering and operating expertise in M/PU. AM techniques such as condition assessment, risk assessment, valuation of assets and cost-benefit analysis should be gradually introduced into everyday activities of Utilities.

The basis for aforementioned activities is to have as much as possible complete asset inventory which is organized and which provides possibilities to analyse data, assess performance and consequently support decision-making. Survey has shown that sample PUs have at least some type of database containing basic asset characteristics, some PUs even have asset data in GIS, but the reliability of the data is questionable. The existing databases usually present only inventories, even

without asset hierarchy; they do not provide data analysis and it is very unlikely that they are used in any kind of decision-making process for the future investments.

Successful asset management enables Public utilities to maintain a desired level of service in the most cost-effective manner. Generally, AM practice allows utility managers to proactively rehabilitate or replace system components on a continual basis rather than waiting to repair failing or damaged assets when it is considerably more expensive and disruptive to system operations. Proper management of assets requires enormous financial resources which are not always available, as the needs will always exceed the available resources to satisfy those needs. In the face of funding constraints it is important to prioritize spending on the most critical interventions. The choice of the type of intervention should be determined based on the condition and performance of assets, whereas the priority and timing of intervention is determined based on criticality assessment.

These are all the good reasons to start immediately with implementation or intensified the AM practices in the Municipalities/Public utilities in the region.