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ENERGY EFFICIENCY IN WSS UTILITIES

CAPACITY-BUILDING PROGRAM

August 2015

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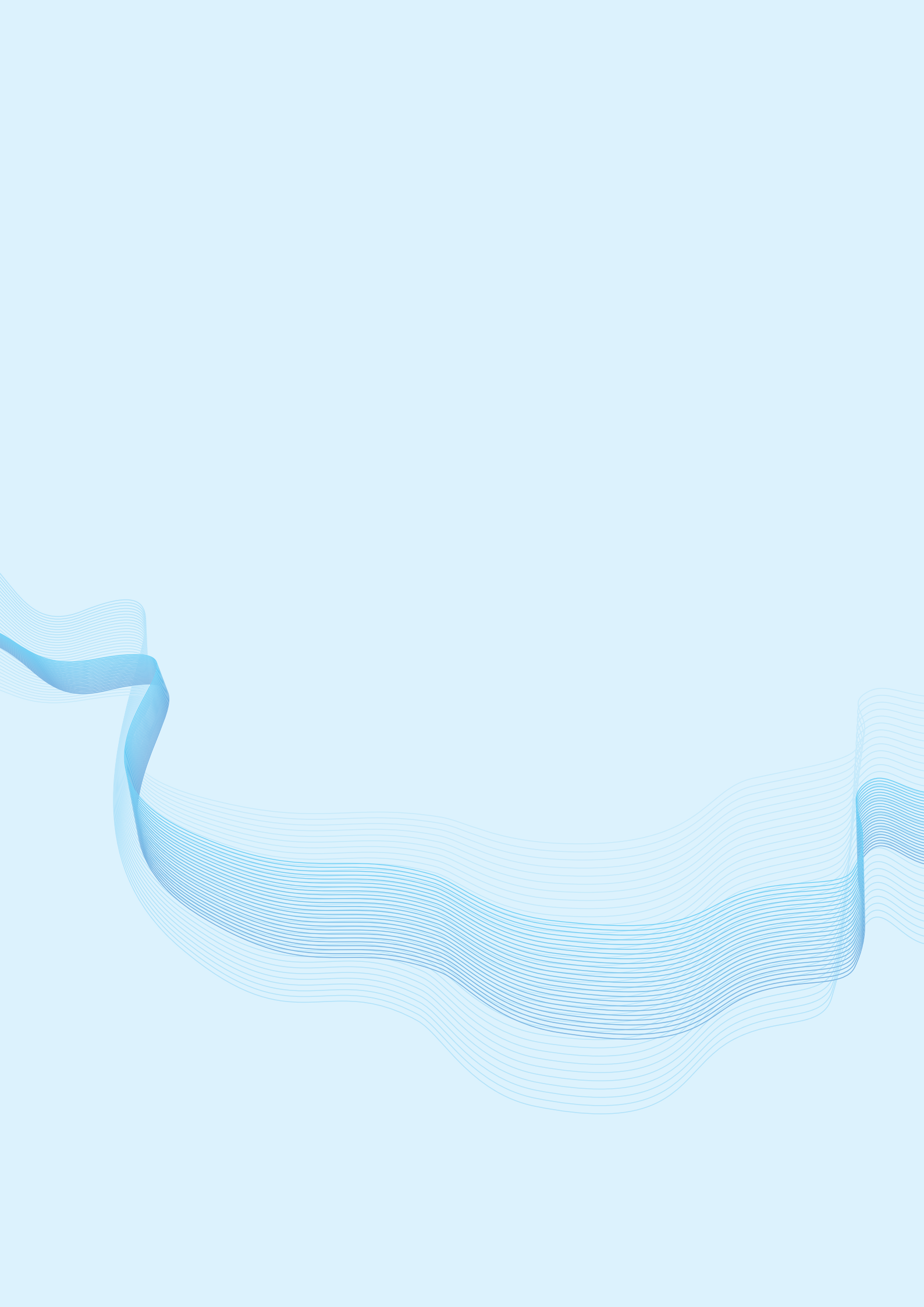


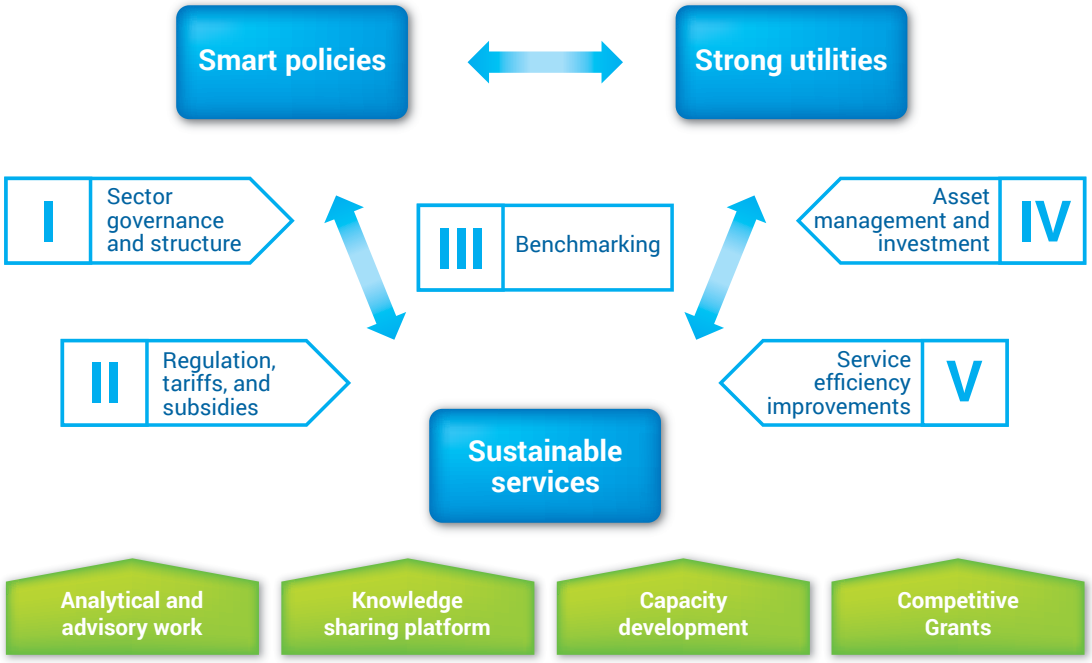
ENERGY EFFICIENCY IN WSS UTILITIES CAPACITY -BUILDING PROGRAM

EXECUTIVE SUMMARY

The Danube Water Program supports policy dialogue and capacity development in the water supply and wastewater (WSS) sector in the Danube region. The program is jointly run by the World Bank and the International Association of Water Supply Companies in the Danube River Catchment Area (IAWD) with seed financing from the Government of Austria. This Energy Efficiency program received additional funds from the Energy Sector Management Assistance Program (ESMAP). The Danube Water Program works with regional, national and local stakeholders to (1) promote and inform policy dialogue around the core challenges facing the water utility sector; and (2) strengthen the technical and managerial capacities of the sector's utilities and institutions, including preparing and supporting service efficiency improvement activities.

Implemented from October 2013 to August 2015, the **Energy Efficiency in WSS Utilities Capacity-Building Program** organized wholesale technical assistance and capacity building on energy efficiency (EE) to water and sanitation utilities in three targeted countries (Romania, the Serbian hub and Ukraine). The program includes the following four phases:

I. Development of a capacity building program;
II. Delivery of a capacity building program;
III. Support for the implementation of training outcomes; and
IV. Documentation of the approach and outcomes.



1 PROJECT IMPLEMENTATION PROCESS

The project consisted of four phases whose implementation spanned from February 2013 to August 2015 with a final objective of a maximum number of utilities completing an energy audit report and identifying suitable mechanisms to finance the identified EE measures. Each section presents the main goals, work undertaken to achieve the objectives and the barriers encountered specifically within this phase, as well as the prospected solutions.

1.1 Phase I: Background Research and Country Selection

The objective of Phase I was to develop a background document to evaluate and compare current approaches related to EE in WSS, and review potential financing mechanisms in the region and beyond. This first assessment would enable the project team to conceptually plan and design the Capacity Building Program for EE in WSS based on international best practices, existing approaches and local circumstances.

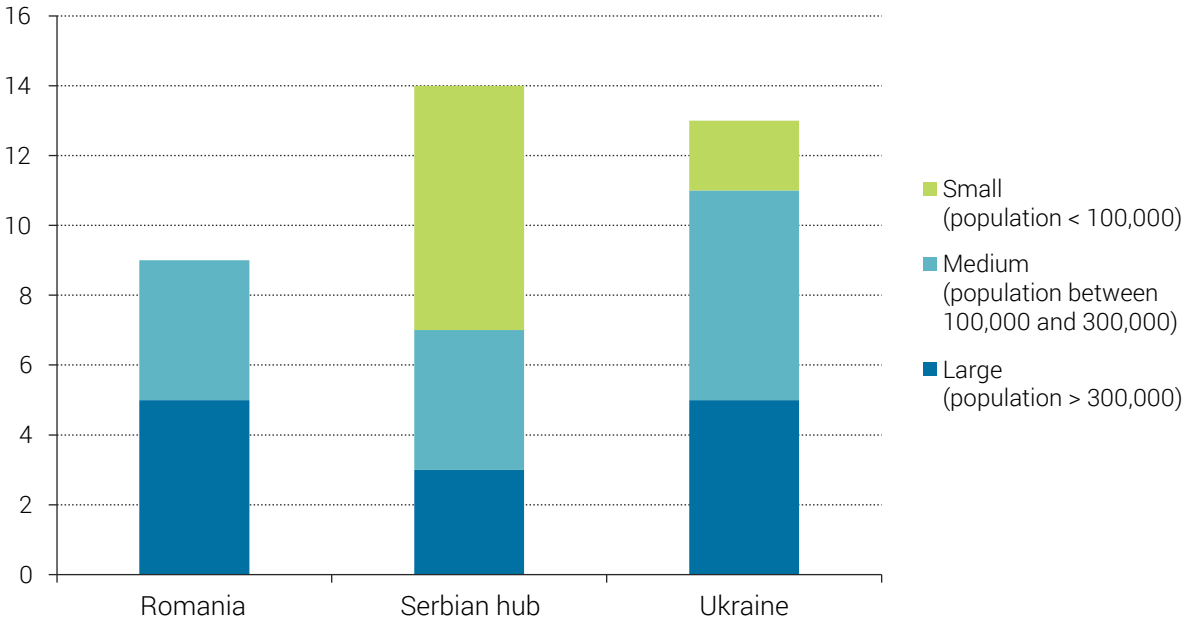
Utilities who applied for the call for proposals were evaluated based on three main criteria: (1) financial capacity, (2) technical potential, and (3) willingness to participate in the initiative. Sub-criteria were also applied as follows:

1.2 Phase II: Delivery of a Capacity Building Program

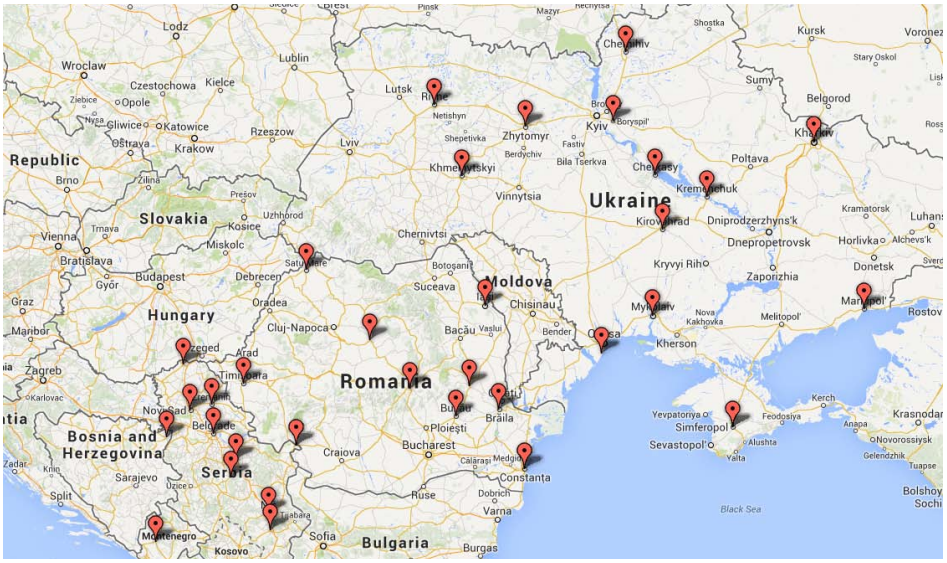
The objective of Phase II was to deliver the capacity building program designed in Phase I to achieve concrete action plans based on the results of the energy audit. It was implemented in close coordination with three national consultants and the water associations. The capacity building program was broken down into three training sessions: (1) an international initial workshop held in Sofia, Bulgaria, where all the utility representatives were gathered; (2) national event No. 1 organized in each of the participating countries which focused on technical aspects; and (3) national event No. 2 organized in each of the participating countries, which combined technical and financial aspects.

1.2.1 Participating Utilities

The WB, supported by the Econoler team, initially selected 36 utilities through a call for interest advertised on the DWP website and via national water utility associations. The utilities that officially participated in the project are broken down by country and size in the figure below.



PARTICIPATING UTILITIES BY COUNTRY AND SIZE



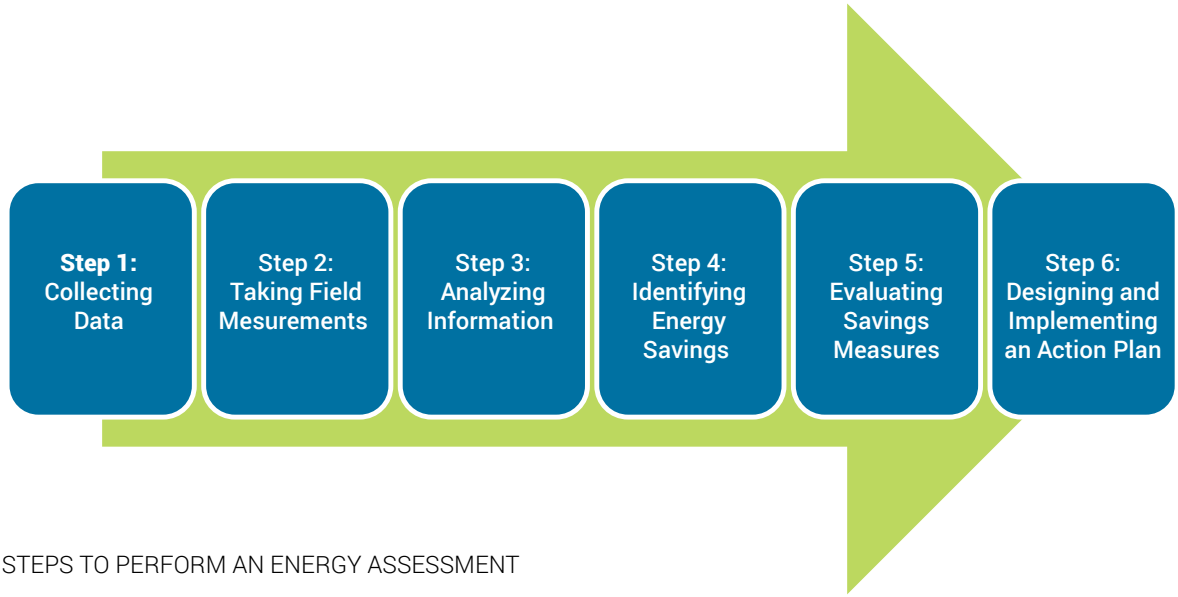
MAP OF PARTICIPATING UTILITIES

In addition to the utilities counted above, three utilities from other countries attended the initial workshop for their own interest, but did not participate in the project: Prishtina (Kosovo), Prizren (Kosovo), Aquasan mreža (Bosnia and Herzegovina).

1.2.2 Initial Workshop

The initial workshop was crucial for the successful implementation of the program. The three-day workshop was held from April 8 to April 10, 2014 in Sofia, Bulgaria. It brought together a total of 39 utilities, which were advised to send two representatives to attend the initial workshop—one technical expert and one from the management staff. The workshop aimed at transferring essential knowledge on energy savings in the water sector as well as building capacities of technical managers for conducting an energy audit. Gathering representatives from all participating utilities and meeting peers facing the same energy challenges also create a stimulating and motivating atmosphere.

Individual workshops were an opportunity for: (1) water associations to actively participate and present local EE characteristics to their respective groups; (2) utilities to work as a team and complete various activities, such as building an initial EE analysis using RETScreen® and drafting an initial EE action plan for their utility; and (3) utilities to obtain specific and customized guidance from an international technical expert.



STEPS TO PERFORM AN ENERGY ASSESSMENT

EE Training Material
The EE training material was developed based on three main learning tools: (1) RETScreen software; (2) EE Manual; and (3) data collection forms. It was provided in four languages: Bulgarian, Romanian, Serbian and Russian.

Throughout the modules, all the required steps for the implementation of the energy assessment methodology were presented. Indeed, performing an energy assessment on a water and wastewater system involves the development of a sequence of phased steps to determine where and how much energy is used in the system, the level of efficiency, measures and specific projects to implement to reduce consumption and cost, the cost benefit or cost-effectiveness of such actions, an implementation plan, and methods to evaluate and monitor results.

Overview of Workshop Appreciation and Results
According to the participants and speakers, the initial workshop provided valuable information, plus valuable guidance and essential capacity building on technical, financial and managerial aspects of implementing EE projects in WSS utilities.

The Capacity Building Program for EE in WSS is intended to address issues and challenges facing water utilities and propose concrete solutions. According to the participants and speakers, the initial workshop provided valuable information, plus valuable guidance and essential capacity building on technical, financial and managerial aspects of implementing EE projects in WSS utilities. This clearly indicates that such a discussion and knowledge-sharing platform were highly relevant and strengthened the utilities' motivation to implement EE measures. Participants hoped that more such opportunities would be offered for them to meet with colleagues facing similar issues and realities and thus encourage peer learning.

1.2.3 National Event No. 1

National Event No. 1 was conducted in mid-July 2014 and organized in close coordination with the respective national water associations. All trainings were conducted in the country's national language and the participants had to pay for their own travelling expenses (only catering and the venue were covered by the IAWD).

Objectives
The main objectives of National Event No. 1 were to (1) present the country's main EE developments in the water sector; (2) allow the utilities to present their progress on steps 1 to 4 of the energy assessment and engage in peer-review; (3) develop potential EE measures under the guidance of the national consultants; and (4) overview the main EE financing opportunities.

1.2.4 National Event No. 2

National Event No. 2 was conducted in October 2014 (Romania and the Serbian Hub) and November 2014 (Ukraine), and was organized in close coordination with the respective national water associations. All training sessions were conducted in the country's national language and participants had to pay for their own expenses (only catering and the venue were covered by the IAWD.

Objectives
The main objectives of National Event No. 2 were to (1) allow the utilities to present their progress on steps 5 and 6 of the energy assessment and engage in peer reviewing; (2) provide additional instructions for the implementation of detailed energy audits and the drafting of audit reports; (3) run a training session on financing measures in the WSS sector (by Econoler's financial expert); and (4) visit a WSS utility and become familiar with the EE measures implemented.

1.3 Phase III: Support for the Implementation of Training Outcomes

The objective of Phase III was to provide further support to selected utilities in delivering an energy audit report and seeking suitable financing for the implementation their EE project. Throughout Phase III, the Econoler project team provided technical and financial assistance tailored to each participating utility. Econoler documented the supporting activities and the progress of utilities with five monthly reports. The section also includes an overview and assessment of each country's result.

1.3.1 Participating Utilities

One the one hand, 20 utilities (around 55% of the initial selection) showed strong commitment to submitting an energy audit report and identifying suitable financing mechanisms (the complete list is shown in Table 5). On the other hand, 16 utilities withdrew from the program during the implementation of Phase II and therefore did not make it to Phase III. Further analysis of the attrition rate is presented in Section 3 on the utilities' evaluation of the program. Among the 20 utilities below, 18 could submit an energy audit report and seven were able to secure the financing of their EE projects.

1.3.2 Country Assessment

Romania

Since joining the European Union, Romania has been more stringent on energy efficiency so as to meet the requirements calling for the full transposition the EU Energy Efficiency Directive. This has resulted in the adoption of Romanian Law No. 121/2014 on EE and the establishment of the Energy Efficiency Department. Romanian Law No. 121/2014 on EE introduces certain obligations imposed on economic operators that must carry out an energy audit conducted by competent professionals every four years, and prepare programs to improve energy efficiency, including short-, medium- and long-term measures. The government also plans on establishing a specialized fund for energy efficiency investments that will be accessible to a wide range of energy efficiency suppliers, from energy service companies to final consumers. The legal and policy framework aims at:

- training energy auditors and conducting independent energy audits;
- creating standards, rules and regulations that lead to the adoption of energy-efficient technologies;
- supporting the development of ESCOs (energy services companies which provide services and implement measures to improve the energy efficiency of the consumer's facilities, while the consumer takes some financial risks, for payment for such services is based on improving energy efficiency and meeting other performance criteria agreed upon by the parties).

TYPICAL CURRENT PUMPING AND ELECTROMECHANICAL EQUIPMENT IN ROMANIA. / CREDIT AQUASERV TARGU MURES.

OVERVIEW OF THE RESULTS IN ROMANIAN UTILITIES

Utility	Energy Saving Opportunities	Energy Savings (%)	Total Investment (EUR)	Confirmed Financing
Aquaserv Targu Mures	Replacing pumps No. 1 and 2	34.65	30,994	X
	Installing VSD			
Apaserv Satu Mare	Water pumps replacement at Carei	21.81	30,634	X
	Water pumps replacement at Sanatatii	40.23	7,474	
	Water pumps replacement at Str. Independentei	23.84	5,068	
	Water pumps replacement at Str. Closca	31.07	1,921	
Focsani	Replacement of five GM50L-type blowers	20.10	126,483	X
Raja Constanta	Construction of two on-site, fully-equipped electricity transformation substations in existing buildings	-	1,198,745	X
Buzau	Replacing motors and pumps	40.56	62,504	X
Brasov	Replacing water pumps and electric motors	18.00	25,400	X
		TOTAL	1,489,223	

- establishing a specialized investment fund for energy efficiency and financing instruments or tax incentives to implement energy efficient techniques.

This is likely to boost EE initiatives, and it could trigger the emergence of new specialized energy services suppliers. It will also generate increased interest among banks in terms of offering financial incentives to players in this field.

In the Romanian WSS utilities sector, large infrastructure projects have already been financed by European grants, which greatly helped in complying with European environmental standards and had a considerable impact on the development of communities. This approach aimed to increase both efficiency investment costs and operating costs of new investment objectives.

Nearly EUR 7 billion were invested in the Romanian water sector. The technological flows at sewage and treatment plants were upgraded, and the cost of electricity decreased from over 20% to 10% thanks to lower operating costs, but water and wastewater utilities still have significant potential for energy saving opportunities. The Romanian WSS utilities have enough experience in managing EE projects, but the Danube Water Program offered them the possibility of analyzing various EE solutions without the costs involved by specialized companies.

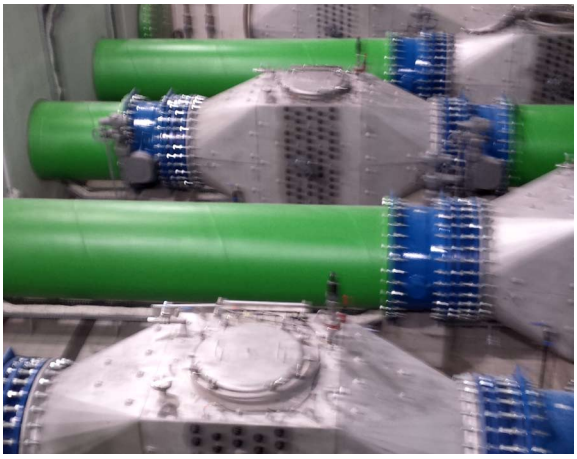
Out of the nine initial Romanian participating utilities, six submitted an energy audit and five secured financing.

The table above shows results as they were stated by the energy audit report. However, along the implementation of Phase III, the Aquaserv Targu Mures and Apaserv Satu Mare changed their EE project and investment plans.

TYPICAL CURRENT PUMPING AND ELECTROMECHANICAL EQUIPMENT IN ROMANIA. / CREDIT AQUASERV TARGU MURES.

Serbian Hub

Serbian utilities mostly had well-trained staff who successfully completed all the analyses. Since the systems in the utilities are inefficient and largely outdated, representatives recognized the need to improve EE in the generation and processing of water. Utilities were also facing numerous challenges in the implementation of Phase III. Serbia is indebted at 70% of its GDP and no government—neither local nor central—will grant additional credit lines. Utilities are run by local governments, which often have political agendas, and the decisions that they make are often linked to political strategies. There was frequent divergence between higher management



BELGRADE UTILITY, DRINKING WATER PLANT

OVERVIEW OF THE RESULTS IN UTILITIES FROM THE SERBIAN HUB

Utility	Energy Saving Opportunities	Energy Savings (%)	Total Investment (EUR)	Confirmed Financing
Zvezdara (Belgrade)	Changing No. 1 pump at CS17a pumping station	60.1	437,724	
	Changing No. 2 pump at CS17a pumping station	56.5		
	Changing No. 3 pump at CS17a pumping station	56.1		
Vracar (Belgrade)	Changing No. 1 pump at CS16 pumping station	53.3	325,071	
	Changing No. 2 pump at CS16 pumping station	51.5		
	Changing No. 3 pump at CS16 pumping station	54.8		
Subotica	Increasing biogas production by 10%-15%	-	540,000	
Izvoriste (Leskovac)	Energy savings in maintenance and operations	39.3	14,238	
Gorina (Leskovac)	Building a small hydroelectric plant	-	379,080	
Biljeljina (BiH)	Replacing existing 64 kW pump with 45kW pump at B2 pumping station	-	32,562	
	Replacing 75kW existing pump with a 45kW pump at B11 well	-		
	Replacing existing 75kW pump with 45kW pump at B12 well	-		
Niksic (Montenegro)	Pump replacement at Vitalac	39.7	69,000	
	Pump replacement at Široka street	43.1		
	Pump replacement at Donja Luka škola	40.1		
	Pump replacement at G. Rubeža	46.2		
	Pump replacement at Donja Luka Relejska	42.9		
	Pump replacement at Donja Rubeža	19.1		
Naissus Nis	Changing No. 1-2 pumps at Mediana 2	51.2	82,054	
	Changing No. 3-4 pumps at Mediana 2	64.2		
		TOTAL	1,797,675	

and technical experts regarding the importance of a future development strategy for utilities, whose absence hinders the implementation of identified EE projects. Any financial decision requires the consent of management, often politically appointed out of touch with the real and long-term needs. The management of utilities moreover avoids long-term financial commitment in the form of taking out loans from banks.

The water sector in Serbia definitely needs financial help to boost the EE in plants for the generation and processing of water. What could help are non-refundable and low-interest loans. It is essential to overcome the problems that arise with loans that are impossible to repay on time. The water sector in Serbia should turn to funds offered by the developed countries and the EU, which are intended for that very purpose. Commercial loans offered by banks are not sufficiently favorable, so utilities avoid them.

Out of the fourteen initial participating utilities from the Serbian hub, eight submitted an energy audit and none secured financing.

Ukraine

The implementation of Phase III in Ukraine was laborious due to several factors:

- The majority of the participants from Ukraine were participants of the World Bank Urban Infrastructure Project (WB-UIP). This project provided long-term loans with the lowest interest rates available in Ukraine. The range of loan amounts was about USD 10-50 million depending on the utility, which fully covered the implementation of the main energy efficiency measures at utilities. Several utilities claimed that their technical staff would be busy with the heavy workload involved in UIP2, which forced them to stop their collaboration with the Energy Efficiency in WSS program.
- Ukraine's economy has been in recession since the beginning of 2014, and the inflation rate has skyrocketed since the project kick-off (25% in January 2015 compared to 6.9% in April 2014). These dire economic and financial conditions greatly hindered EE investments. The budgets of water utilities have shrunk because of public deficits, and upper management is reluctant to take out loans due to high interest rates (which could reach up to 30% in commercial banks according to our national consultant). Also, the devaluation of the national currency prevents utilities from importing new material (such as pumps).
- When participating at the initial workshop, practically all utilities from Ukraine expected to receive additional financing with grants. Thus, some of the utilities had no real technical specialist (energy engineer) present at the kick-off meeting who could provide an energy audit. Also, the representatives from the utilities did not understand why they needed to produce an energy audit report. They expected that the WB would provide a consultant or give financing to hire a consultant (as it was under UIP).

Out of the thirteen initial participating utilities from Ukraine, four could submit an energy audit and two could secure financing.

OVERVIEW OF THE RESULTS IN UKRAINIAN UTILITIES

Utility	Energy Saving Opportunities	Energy Savings (%)	Total Investment (EUR)	Confirmed Financing
Chernihiv	Replacement of waste water pumping station Replacement of compressors at waste water treatment plant	32.0	344,250	
Kremenchuk	Installation of a combined heat and power generator	-	2,187,000	
Kharkiv no 26	Replacement of pumps installation of VFD motors	75.0	174,590	X
Pyatihatki (Kharkiv)	Replacement of pumps installation of VFD motors	47.4	510,228	X
		TOTAL	3,216,068	

1.4 Phase IV: Documentation of the Approach and Outcomes

In addition to submitting a final report documenting the project outcomes, the objective of the fourth phase was to prepare a final revised version of all relevant training material and tools for use in future such activities. To facilitate the replication and scaling-up of the initiative by national water utility associations, detailed lessons learned were also developed for each of the phases.

The initial training document and tools were validated by our international and local experts to readjust or clarify some information, based on the participant's comments during the initial workshop. The three national consultants also thoroughly reviewed the translations of written documents to identify and correct the errors and weaknesses with technical terms.

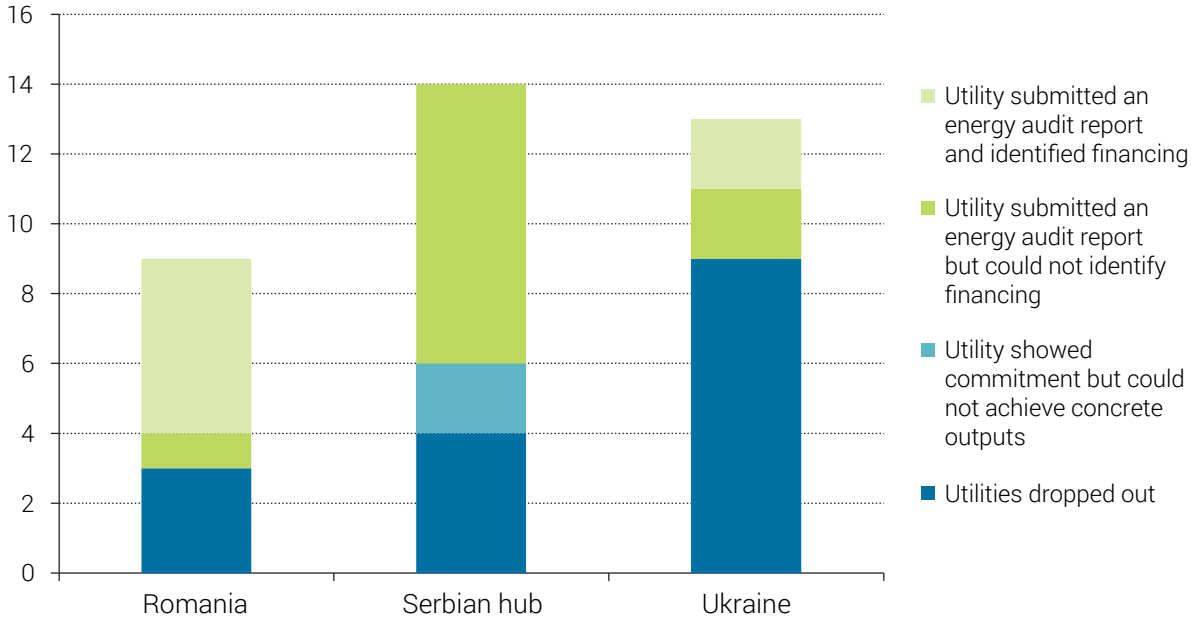
Econoler conducted two rounds of evaluation of the training program: (1) after the initial workshop, and (2) at the end of the program. The main comments from utilities and national consultants were compiled and addressed in the final version of the training material.

2 PROJECT OUTCOMES

Overall, project outcomes were positive with utilities showing great interest and commitment in the program. This part will present and appraise the main project outcomes, including the number of utilities that successfully delivered an energy audit report, identified financing sources, and provided details on the confirmed investment.

2.1 Overview of Utility Outputs

Out of 36 utilities selected, 20 reached Phase III and required support to finalize their energy audits or identify suitable financing mechanisms. Out of these 20, 18 were able to submit an energy audit report, while seven confirmed financing.



PROJECT AGGREGATED RESULTS

2.2 Investments Identified and Committed

The table below shows the project aggregated results.

PROJECT AGGREGATED RESULTS

Project Outputs		
Investments Identified	Investments Committed	
1,489,223	1,678,102	Romania
1,797,675	0	Serbian hub
3,216,068	684,818	Ukraine
6,502,966	**2 362 920**	**TOTAL**

The second table presents the seven investments that were confirmed by the utilities, representing a total of EUR 2,362,920.

FINAL TOTAL INVESTMENT AND FINANCING SOURCES OF THE COMMITTED EE PROJECT

Utility	Country	Financing Source	Total Investment (EUR)
Aquaserv (Targu Mures)	Romania	ESCO	320,000
Focsani	Romania	Self-financed	126,483
Apaserv (Satu Mare)	Romania	Self-financed	7,474
Raja (Constanta)	Romania	Private investor	1,198,745
Brasov	Romania	Self-financed	25,400
Kharkiv no 26	Ukraine	Municipality funds	174,590
Pyatihaki (Kharkiv)	Ukraine	Municipality funds	510,228
		TOTAL	**2 362 920**

2.3 Evaluation of Project Outcomes

2.3.1 Strong Correlation Between Attending the Capacity Building Program and Submitting an Energy Audit Report

When the participation of utilities in the training sessions is analyzed, a strong correlation between attending the whole training program and submitting an energy audit report is revealed.

2.3.2 Large Discrepancies Between Country Results

The results also show great discrepancies between the achievements of countries, which can be explained by numerous factors:

- The size of participating utilities
- Public debt and economic situation
- Legal and policy framework
- Political stability
- Viability of the ESCO market

2.3.3 Many Projects led to Modest Investments, Mostly Self-financed by the Utility, due to the Absence of a Planned EE Financing Strategy

From the initial workshop, utilities were informed that no financial mechanism was included in the program and that one of the objectives was for them to identify financing sources of their own. This has contributed to more self-financed projects or projects financed via the municipality funds. No loans from financial institutions were taken out.

3 EVALUATION OF THE PROGRAM BY UTILITIES

Utilities were generally very satisfied with the training sessions and training material that was provided. It was highlighted that the material was comprehensive and user-friendly and included a streamlined energy audit approach and evaluation methodology. Those aspects made the material very suitable for utilities to use autonomously between each training event. In fact, a strong correlation between attending the whole training program and submitting an energy audit report is revealed when analyzing the participation of utilities in the training sessions,. Indeed, out of 18 utilities who submitted an energy audit, 15 participated in all three training sessions.

> "Providing a streamlined energy audit approach and evaluation methodology for water pumping systems really helped the utilities."
>
> – **Dragoslav Šumarac,** National EE Consultant for the Serbian Hub

Most of the utilities considered the introduction to the RETScreen software to be a strong added value to the training program. This Excel-based clean energy project analysis software tool helped technical experts and management staff to quickly and inexpensively determine the technical and financial viability of potential EE projects. This tool proved very easy to use and helped support the work of local experts in every country without a need to make adjustments. Participants appreciated the opportunity for hands-on practice during the individual workshop sessions and national events.

> "The capacity building program provided technical experts with capacities to conduct energy audit and to inform the managers on the best energy savings measures to implement."
>
> – **Yuri Yarochenko Vadimovitch**, Head of the Energy Department, Kharkiv No. 26 (Ukraine)

Most of all, interaction between participants who all experience the same energy challenge in their WSS utilities was the most beneficial part of the project. At the national events, utilities were offered the opportunity to present their progress and the barriers they encountered. Then they could all participate and take the advantage of the peer-reviewing process, supervised by the National Consultant who could intervene if necessary.

> "The interactions between the participants, opportunity for knowledge and experience sharing between colleagues in charge of EE in the water sector were by far the main benefit of the project."
>
> – **Darius Bör**, Financial Expert at Satu Mare (Romania)

4 LESSONS LEARNED

Increasing the Number of Training Sessions and Opportunities for Practical Applications

The two national events were considered as the best way for utility representative to share their experience, exchange knowledge and revise each other's work with peer-reviewing. As the Serbian consultant pointed out, "It is absolutely necessary to actively and continuously involve the representatives of utilities throughout the course of the program in order to have more frequent and more comprehensive response from their side."

Providing more Comprehensive Training on RETScreen

When evaluating the initial workshop, utilities were adamant that RETScreen was a strong added-value for simulating energy saving measures and identify required investment.

Including RE in the Training Curriculum

Some utilities showed great interest in reducing their energy consumption by implementing renewable energy initiatives.

Changing the structure of the initial workshop

Due to its comprehensive coverage of the EE technical and financial aspects, many considered the three-day initial workshop overwhelming. A posteriori there are only limited advantages in having an initial international workshop—apart from gathering all participants in one place and providing a motivating atmosphere. Organizing three national initial workshops seems like a more suitable option.

Involving more Stakeholders in the Training Sessions

As initially planned in the program, water utility associations were involved throughout the capacity building program and their involvement proved very useful in organizing and facilitating the national events.

In addition to this precious involvement, it is recommended to also have utilities' higher management, municipality representatives and financial institutions participate for further project replication.

Providing additional resource for measuring equipment

Small and medium utilities usually have less internal technical expertise and are ill-equipped to conduct energy audits by themselves. Additional resources should be mobilized to support these utilities, such as a specific budget for measuring equipment (renting or buying).

Ensuring the program addresses financing challenges

Many times utilities expressed the need for the project to include adapted financing mechanisms. Procuring financing on the lending market of their respective countries was in the majority of cases either too expensive (Ukraine, Serbian Hub) or too difficult to process internally and to get approval from the main municipality.

Enhancing communication between participating utilities

Utilities indicated they had little opportunity (outside of the two national events) to exchange with their peers on barriers encountered, technical issues, potential financing schemes, etc. They would certainly benefit from enhanced communication channels.

ENERGY EFFICIENCY IN WSS UTILITIES

CAPACITY-BUILDING PROGRAM

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