UKT Tirana Water - Financial and Operational Performance Improvement Programme, Stakeholder Participation Programme

Contract No.: C41898/9091/51286

FOPIP Report

October 2019

Table of content

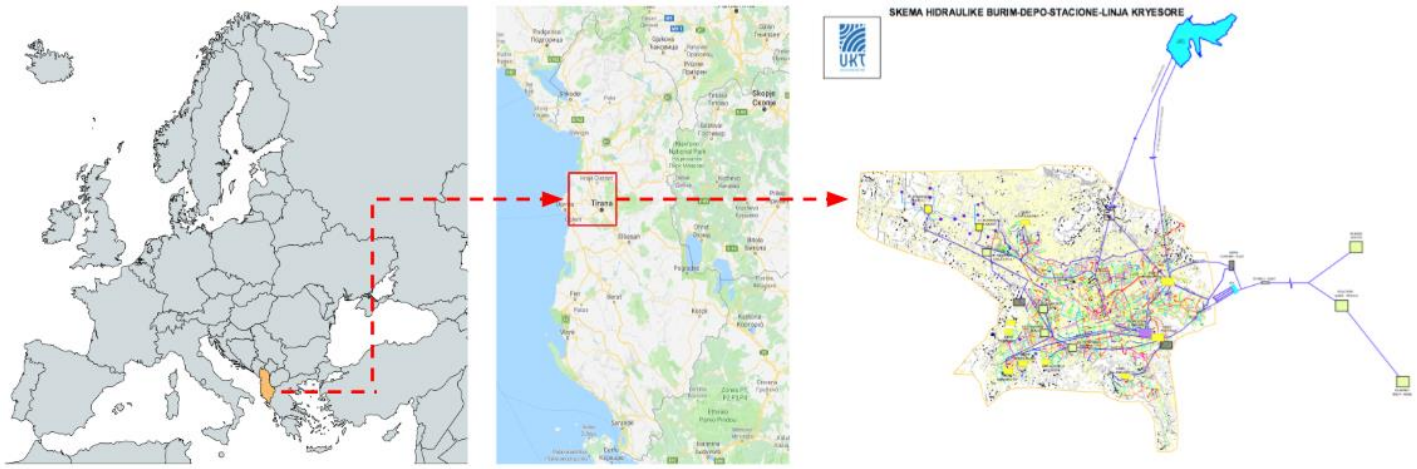
List of Acronyms

CAPEX	Capital Expenses
CIM	Computer Integrated Manufacturing
CMMS	Computerized Maintenance Management System
CPU	Control Process Unit
CRM	Customer Relation Management
DMA	District Meter Area
DMZ	District Meter Zoning
EBITDA	Earnings before interest, taxes, depreciation, and amortization
EBRD	European Bank for Reconstruction and Development
ELT	Extract, Load and Transform
ERM	Enterprise Resource management
GIS	Geographical Information System
HR	Human Resources
HRMT	Human Resources Management Talent
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
IS	Information System
IT	Information Technology
KPI	Key Performance indicator
MRS	Manufacturing Execution System
NRW	Non Revenue Water
O&M	Operation and Maintenance
OPEX	Operating expenses
PLC	Programmable Logic Controller
SaaS	(Software as a Service)
SCADA	Supervisory Control and Data Acquisition
T&D	Training and Development
WTP	Water Treatment Plant

1. Introduction

1.1. Context

Created in 1939, UKT is a municipal utility company providing water supply and wastewater services for the municipalities of Tirana, Vora and Kamza.



Project Area Location and UKT existing water infrastructure

UKT operates an area covering approximately 800,000 end-users over the three municipalities. The water network is 1,800km long for an annual production of 106 million m3 out of which only a third is billed. Drinking water is supplied from different sources including natural springs, groundwater wells, and river abstraction.

Existing studies and documents indicate that UKT is facing a number of operational challenges (subject to confirmation during the diagnosis phase of the FOPIP project) including:

- The poor condition of the water network and low maintenance leading to high levels of interruptions in water supply and poor water quality;
- A high rate of non-revenue water (about 2 thirds of the water produced) largely due to physical losses in the distribution network which greatly affect the cost of service and overall performance of the system;
- Threatened sustainability due to the Company's reliance on depleting and polluted wells;
- The high cost of pumping groundwater which weighs on the company's financial situation;
- A complicated cash flow situation which may jeopardise the implementation of the priority investments identified in the 2017-2021 Business Plan.

In order to increase its capacity, UKT has received a loan from the European Bank for Reconstruction and Development to implement an investment project to finance improvements in the water supply system, more specifically for (i) construction of a pipeline for transferring water from the Bovilla water treatment plant to the western part of the City; and (ii) extension of the Bovilla water treatment plant.

1.2. Project Scope

T**he objective of this FOPIP Project is to support the General Manager of UKT in further building the company's operational and financial performance and implementing commercial rigor** through:

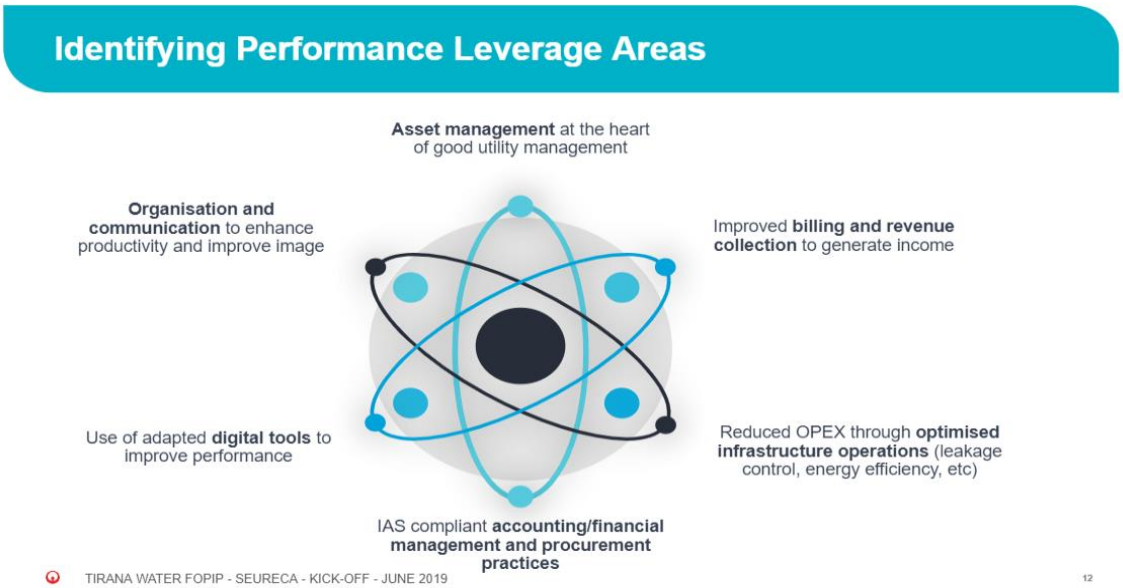
- The development of a **programme to improve the financial and operational performance** of UKT Tirana with focus on improving revenue collection, reducing operational costs, implementing the EBRD's Environmental and Social Policy 2014 Performance Requirements as well as reviewing the potential for private sector participation in the Company's non-core activities;
- The preparation of a **Public Service Contract** (PSC) to streamline interactions between UKT and the Municipality of Tirana and other stakeholders through the clarification of the respective roles and responsibilities as well as the definition of indicators for measurable improvements (within a clearly defined timetable) to improve operational efficiency and levels of service (e.g. reducing unaccounted for water and sewage leakages);
- Develop and implement a **Stakeholder Participation Programme** aimed at increasing public participation in the provision of water services. This programme shall accompany the implementation of the infrastructure investments financed under the EBRD loan to encourage public awareness and sustainability.

Continuity and quality of service are at the heart of UKT's strategic vision and this project is therefore directly aligned with UKT's long-term customer-oriented strategy and key priorities to achieve 24-hour water supply in the city of Tirana by 2021.

1.3. Objective of this deliverable

The objective of the FOPIP Report is to propose a programme to improve UKT's financial and operational performance, based on the assessment performed during the earlier stages of the project.

Areas of focus had been identified during the kick-off and were given specific attention during the assessment phase:



The FOPIP Report therefore proposes a number of actions, identified as priority, aimed at providing quick wins for the improvement of the operational and financial performance of UKT. These actions have been detailed

one by one into “action sheets” to provide UKT with guidance on implementation, timeline, costs etc, for integration into the ongoing Business Plan update performed by UKT Management.

The action sheets propose the use of KPIs to measure the impact of the implementation of the various measures. For purposes of performance monitoring, it is highly recommended that a baseline be performed prior to the implementation of structuring actions in order to assess the starting point and document progress.

Finally, a number of improvement actions had been identified as Medium or Low priority during the assessment and have been summarised into a table for integration into a longer term corporate strategy.

3. Corporate and Governance

3.1. Summary of key findings

UKT is subject to Law No 9901, dated 14.04.2008 “On traders and trade companies” and specific aspects of its governance are regulated through the company statute and its internal regulation.

UKT statute regulates specific aspects of the company, defining the objectives of the company and focusing specifically on its administration, defining the role, duties and responsibilities of the General Assembly, Administration Council and Legal representative, also defining procedural aspects of meetings, appointment and dismissal of the General Assembly and Administration Council members and also the legal representative. While the internal regulation focus more in detail internal specific aspects of UKT, defining specific objectives on: (i) development of a strong financial and operational company, (ii) the applicable of relevant legislation in force, (iii) attraction of strategic and experienced investors, (iv) development of standards for 24 hours supply of drinkable water as the one set by the World Health Organization, (v) Effective environmental discharge of wastewaters, (vi) implementation of the services in compliance with EU relevant directives. These points indicated in the internal regulation of the company seem to correspond more objectives to be achieved rather than rules that would regulate the activity of the company to achieve effectiveness, efficiency, transparency and accountability.

The internal regulation also defines the ethical code of the employee, client/sales management, conflict of interests of the employee, employee job requirements and job description and also relevant instruction for the delivery of the services.

In accordance with the initial assessment of the statute of the company and its internal regulation, it is necessary to develop mechanisms to define the level of contractual agreements internal and external procedures for guaranteeing quality assurance, performance indicators and level of fulfilment, to include code of conduct, public relations, transparency and accountability to the end clients and governing bodies.

Furthermore, UKT is an independent operating firm with long-term strategic vision, shared values, empowerment to contract local and international loans. The legal department consists of 11 in house professionals who provide support by practitioners associated with the evolution of utilities legislation permanently associated to management discussions and decisions and is proactive and fully associated with all evolutions and issues regarding corporate and commercial issues. The legal department internal/external control mechanisms for governance / transparent decision-making process need further analyses on the need to upgrade it, in relation to human resource allocation, job description and work procedures. The legal department support needs mechanism to be protected from conflicts with shareholders and main stakeholders.

3.1.1. Public Service Contract between UKT and the Municipality of Tirana

Current institutional arrangement roles and responsibilities of the parties that constitute the bodies of the company are defined through several legal tools and lack consistency.

The municipality of Tirana has agreed with WRA a performance agreement for 2018, setting up indicators that needs to be fulfilled by UKT. This agreement has been successfully accomplished by UKT. For 2019 Tirana municipality is on the verge of signing a new performance agreement with WRA setting up the needed indicators to be fulfilled for 2019. Furthermore, the general assembly and the supervisory board have signed between them two performance agreements that need further assessment in relation to the indicators that need to be accomplished by UKT.

Tirana municipality has never signed a performance agreement with UKT. The municipality, through the municipal council has not defined any local standards for the implementation of the services. This topic need further assessment of the municipal council decision, where in some cases there might be some performance indicators defined in miscellaneous decisions.

The objective of the Public Service Contract (PSC) between UKT and the Municipality of Tirana is therefore to formalise the corporate relations, empowerments, repartition of rights and duties between stakeholders namely, UKT and the Municipality of Tirana, for smooth and efficient implementation of water and wastewater services to the population and other final customers.

The initial assessment and further discussions held during the preparation of the inception report enabled the identification of the key components and principles to be included the PSC: (i) contractual parties, (ii) contract duration, (iii) service area, (iv) rights and obligations of the parties, (v) regime of assets, (vi) UKT's ownership, (vii) governance and reporting, (viii) quality and risk management, (ix) staff management, (x) performance monitoring, (xi) tariff setting, (xii) subsidy policy and (xiii) termination and dispute settlement.

3.1.2. Corporate strategy and performance management

UKT developed its 2017-2021 Business Plan with the support of external consultants provided as part of the USAID Planning and Local Governance Project and the document is currently being updated for the period 2019-2023. The Business Plan lists the following strategic goals: *(i) increase water supply service coverage, (ii) increase sewerage service coverage, (iii) reduce non-revenue water, (iv) Increase the bill collection rate, (v) become financially sustainable and (vi) achieve uninterrupted water supply service.*

UKT Business Plan is very ambitious and it is our opinion that, while the areas to be improved have been clearly identified, the improvement targets are too optimistic considering the experience of the past few years and the timeframe should be adjusted. Most of the improvement measures are dependant on substantial CAPEX investment (191 Million Euros over 5 years) , particularly on the network to improve the operational performance and generate both OPEX reductions and additional revenue generation. This extensive CAPEX needs to be financed which UKT had thought to solve through the contracting of loans.

However, analysing figures over the past 2 years shows that UKT only managed to actually implement 10% of the forecasted water network investments and 50% of the sewerage network CAPEX. This means that **UKT is not able to implement CAPEX investments at the speed originally planned in the Business Plan and therefore, the expected benefits will not be reached within the foreseen timeframe**. A more realistic timeframe shifting the 2021 targets to 2030 is much more feasible and should enable UKT to:

- Reduce the debt ratio and annual loan repayment which is quite high and weighs heavily on the company's finances;
- Have sufficient time to build capacity within the operational teams to work on the new infrastructure.

3.1.3. Corporate Performance Monitoring

In general terms, UKT Key Performance Indicators stay above national average values for most of the indicators st by the Regulatory National Commission (RNC) except for "Water supply continuance (h/day)".

UKT has a good performance with regards to total cost coverage. With a total reported revenue of about 4.3 billion ALL in 2018, the Utility seems to cover about 129% of its total costs, being therefore one out of two companies in the country reaching full cost recovery.

Among Key Non-performance Indicators as reported from WRA in 2018, UKT has not yet completed the transformation of the company following the administrative and territorial reform and in compliance with the format and time terms as of the sector reform that are defined in the Decision of the Council of Ministers Nr. 63, which means that UKT has not yet a valid license as a service provider to cover all the territory of the

municipality following the Territorial and Administrative reform of 2015. Recommendations will be provided to support UKT on this component.

Furthermore, only a slight improvement is recorded on improving NRW, amongst the most important KPIs when it comes to service provision performance. NRW levels are still high, hence their priority in the operational improvement plan to be prepared under this project.

Finally, the performance grid does not provide information on “Water supply coverage” which will be further investigated under this project.

The Water Regulatory Authority aims to encourage service improvement, provided by licensed companies that operate with regulated tariffs, being always focused on the consumer. In this framework, WRA will continue to promote and support the WSS companies that make efforts to improve their operational efficiency. From the other side, the improvement of regulatory instruments will help the companies to improve their internal management in order to reduce the costs of service and increase the income.

3.1.4. Corporate tools and digital systems

The assessment performed during the initial phase of the project pointed out that the main strength of the IT department is in software management (ERP and Billing System) and particularly the support to users. A support contract was subscribed (Level 3) for software maintenance and editing by the publisher.

However, strong weaknesses have been noted relative to the lack of documentation and traceability at different levels:

- The organizational positioning of the IT department into a global support direction is not up to the stakes;
- The department is understaffed to drive the implementation of strategic tools with substantial impacts on the overall utility performance, usually to define clearly the responsibilities between senior management, IT department and operations department;
- No security policy;
- No performance monitoring through KPIs;
- Lack of multi-year IT strategy covering technologies (data storage, architecture, license management, etc) and deployment of new software.

In general, the assessment pointed out the lack of IT strategy and governance of digital projects. Indeed, explicitly defining the roles between directorates is essential to ensure the successful deployment of strategic IT tools. One of the major challenges of UKT’s Information Systems and is to set up a real decision-making information system aimed at:

- Gathering and organising information coming from various sources,
- Integrating and storing data to give users a business-oriented view,
- Finding and analysing information easily and quickly.

Controlled operation requires multi-sectoral management indicators (operations, customers, finance, etc.). This requires the implementation of a data management policy combined with the implementation of an appropriate technical architecture. This project requires the integration of this policy from the design of the IS as part of the urbanization approach as mentioned before.

3.2. FOPIP Recommendations - Actions for implementation

3.2.1. Recommendations

We are proposing selected high priority actions to be implemented in the FOPIP and which focus on the following areas:

4 recommendations with high priority to improve Corporate performance and Governance	
CORP-1	Set up governance process and improve reporting mechanisms
CORP-2	Set up corporate performance monitoring system
CORP-3	Organisation of the Digital function and strategy across UKT
CORP-4	Implementation of a global data management system

3.2.2. FOPIP High priority actions

The following section aims at describing in detail the actions that were identified as potential quick wins to improve UKT's operational performance in the area of Corporate and Governance that could be implemented by UKT as soon as possible.

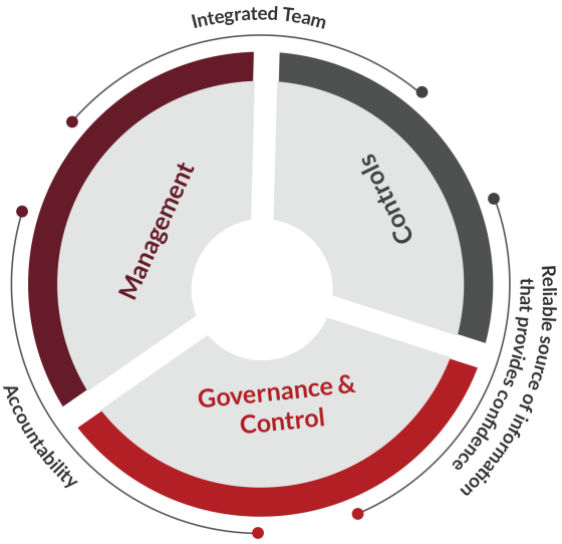
FOPIP Action - CORP-1: Set up governance process and improve reporting mechanisms

Action objectives:
Effective and transparent reporting will allow UKT to present a cohesive explanation of its performance and help to engage with internal and external stakeholders, including customers, employees, shareholders, creditors, and regulators.
Through this action is recommended to conduct a revision of UKT's current external reporting requirements. Also further analysis will be conducted in order to upgrade the legal department internal/external control mechanisms for governance/transparent decision making process, in relation to human resource allocation, job description and work procedures. Also the legal department support will be presented with a set of mechanisms to be protected from conflicts with shareholders and main stakeholders.

Description of the action:
UKT doesn't have any written policy that allows it to conduct a wide range of reporting, including financial and regulatory reporting; environmental, social, and governance reporting (or known as a sustainability reporting); and, increasingly, integrated reporting. UKT should communicate with their stakeholders about:

- mission, vision, objectives, and strategy;
- governance arrangements and risk management;
- trade-offs between the shorter- and longer-term strategies; and
- financial, social, and environmental performance (how they have fared against their objectives in practice).

Implementation of effective reporting processes is essential for UKT to be able to provide this information. All sections in its reporting process - the people and processes involved in the preparation, review, approval, audit (when relevant), analysis, and distribution of reports - need to provide accurate, timely and high quality reports to meet the external stakeholders' needs and a better alignment of externally reported information with that which is reported internally. Specifically, it should periodically conduct a review of the effectiveness of the UKT performance and report to stakeholders on that.In accordance with the initial assessment of the statute of the company and its internal regulation, it is necessary to develop mechanisms to define the level of contractual agreements internal and external procedures for guaranteeing quality assurance, performance indicators and level of fulfilment, to include code of conduct, public relations, transparency and accountability to the end clients and governing bodies.



An effective governance structure is essential if UKT wants to set and meet its strategic goals; this structure should combine controls, policies and guidelines that drive UKT toward its objectives while also satisfying stakeholders' needs. For this, objectives are to be replaced with fair rules and instruments to ensure implementation and control of rules that are enforced by a fair system/body, for the full protection of stakeholders.

The foremost sets of controls may come from its internal mechanisms. These controls will monitor the progress and activities of UKT and should be associated with corrective measures; serving as internal objectives of the company and its internal stakeholders, including employees and managers. These objectives should include smooth operations, clearly defined reporting lines and performance measurement systems. Internal mechanisms should include oversight of management, independent internal audits, segregation of control and policy development.

External mechanisms may be imposed by external stakeholders in the form of regulatory guidelines; guidelines with best practices may be proposed to UKT.

For purposes of project management and implementation, it is key that UKT appoints a UKT Governance Committee with high-level representatives of key departments (including Legal, HR, Public Relations, Procurement, etc.) to ensure implementation of the measures and adequacy of the recommendations with UKT's reporting requirements. The UKT Governance Committee must be very clear on its roles and responsibilities and leaders of change management for the successful implementation of the recommendations.

Period	***Tasks***	***Entity responsible***
Q1 2020	Task 1: Appoint a Governance Committee within UKT in charge of implementing this action (composed of high-level members of different departments) Task 2: Draft terms of reference for the external expert that will develop the new governance system, in collaboration with new UKT Governance Committee.	General management New UKT Governance Committee
Q2 2020	Task 3: Procure External Expert	Procurement Department

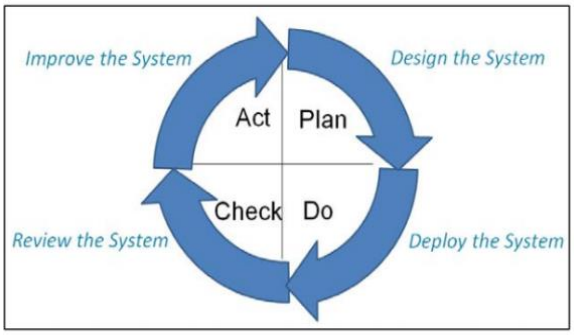
Q3 2020	Task 4: Organise working sessions to: • Identify internal and external stakeholders, including groups of differentially or disproportionately affected (customers, media, and citizens' associations); • Review existing legal department internal/external control mechanisms; • Identify best practices on external stakeholders reporting requirements; • Organize focus groups with relevant external stakeholders to engage them in evaluating to which extent every reporting aspect affects their assessments and decisions; • Identify all the aspects that could be included in the sustainability report toward the stakeholders;	New UKT Governance Committee External Expert
Q4 2020	Task 5: Develop the new UKT governance framework to: • Define the level of contractual agreements internal and external procedures for guaranteeing quality assurance, performance indicators and level of fulfilment, • Include code of conduct, public relations, transparency and accountability to the end clients and governing bodies • Review and suggest current grievance mechanism to allow communities and other stakeholders to register complaints, queries or comments that are addressed in a timely manner by the Project	External Expert
Q1 2021	Task 6: Examine the effect of internal/external control activity on financial accountability and transparency of UKT. Task 7: Identify and propose mechanisms for conflict resolution with shareholders and main stakeholders (through participatory workshops).	Legal Department New UKT Governance Committee External Expert
Q2 2021	Task 8: Implement the new governance framework and upgrade UKT internal/external control mechanisms for governance/transparent decision-making process	New UKT Governance Committee External Expert
Q3 2021	Task 9: Train UKT staff on use of the new system and facilitate change management Task 10: Transformation of the company to cover the whole territory following the administrative and territorial reform - the company to take over and integrate the assets/systems of water and sanitation inherited from previous communes in one system to cover the whole territory of the new municipality following the administrative and territorial reform of 2015. Task 11: License as a service provider to cover all the territory of the municipality following the Territorial and Administrative reform of 2015	New UKT Governance Committee External Expert New UKT Governance Committee Legal Department
Cost/benefit analysis *Cost: External Expert: 75K-100K Euros* *Benefits: Intangible -* • *High-quality reporting it will be crucial for stakeholders to assess UKT performance and make informed decisions with respect to the organization's capacity to create and preserve value.* • *Internal/external control mechanism set in place will ensure that UKT activities are carried out in compliance with its objectives; also ensuring transparent and accountable financial resources utilisation from UKT.*		**Performance monitoring** *Not applicable*

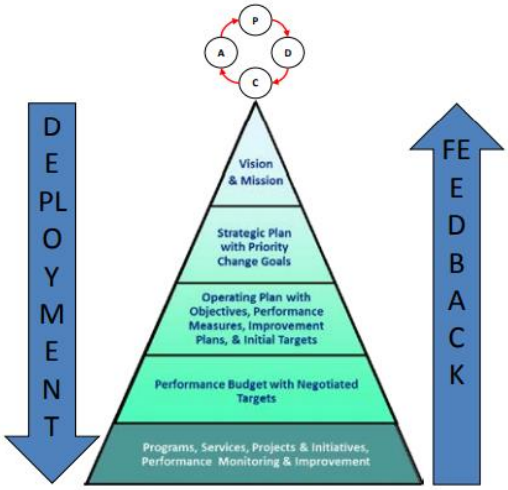
FOPIP Action - CORP-2: Set up corporate performance monitoring system

Action objectives: Performance monitoring will include setting up of appropriate online monitoring systems based on the identified KPIs of UKT Business Plan. This would include a dedicated web platform that allows UKT to host information and conduct real time data analysis and reporting; which can be later used on performance indicators' analysis and provide support to develop performance improvement plans.

Description of the action: Through its 5-year Business Plan, UKT has developed a very ambitious development strategy with high achievements on a number of performance indicators. Assessing projections versus actual achievements seems to indicate that the Business Plan implementation is not aligned with forecasts and needs to be revised into a more realistic timeframe. The identification of pain points and areas that are more difficult to implement needs to be clearly analysed by UKT top management in order to realign its strategy. However, the assessment pointed out the absence of integrated performance monitoring system across departments with high emphasis on the importance of analysing the results, justifying any variation and adapting the forecasts. Moreover, UKT receives performance targets from the Regulator does not have any signed performance agreement with Tirana municipality. The municipality, through the municipal council has not defined any local standards for the implementation of the services. The Public Service Contract to be developed under this assignment should support the improvement of UKT performance monitoring at high-level. To serve as a strategic roadmap, performance indicators should reflect both external requirements and internal corporate strategies through an integrated framework.

A performance monitoring (PM) system can be of great value to any organization by providing periodic, repeatable cycles of information that UKT can use to continually improve its operating performance. The PDCA model may be used as a useful approach for organizing and operating a PM system. The PDCA model not only can support system development and implementation but can also drive results-based culture change throughout the organization.





To make culture change a reality, measures, targets, scorecards, and dashboards must be developed with the participation of those held accountable for reaching the targets and must be available on a timely basis to all employees, demonstrating how they are linked to the organization's objectives. A culture will change when the new desired behaviors are measured, reacted to, rewarded, reported, and celebrated through a feedback system as in following Figure.

The PM system should enable the deployment of the goals and objectives of the organization as well as providing a structured framework to allow the relevant information to flow to appropriate points for enabling decision and control processes.

As indicated in the Business Plan, UKT strategic goals already propose a series of KPIs:

Indicator	Baseline 2017	Actual 2018	Difference of 2018 as of 2017	National average 2018
Non-revenue water (%)	66.97	62.00	-4.97	63.00
Coverage of O&M costs (%)	159.00	186.00	-27.00	119.00
Coverage of total costs (%)	129.00	148.00	-19.00	92.00
Rate of actual collection (%)	86.24	87.00	-0.76	79.00
Rate of general collection (%)	98.00	97.00	0.01	98.00
Rate of metering (%)	80.27	86.00	-5.73	74.00
Staff efficiency (staff/1000 connections)	3.92	3.81	-0.11	5.50
Water supply continuance (h/day)	10.20	10.10	0.10	12.70
Waste water coverage (%)	83.80	89.00	-5.20	52.20
Water supply coverage (%)	-	-	-	77.00
Non-revenue water (%)	66.97	62.00	-4.97	63.00

The follow-up of the KPIs progress must be centralised at management level but individual indicators must be measured on a continuous basis by the relevant departments with a close understanding of the reasons for potential variations. Each Head of Department must be very clear on the indicators under its remit and be trained on performance management. Moreover, reaching aggressive performance targets requires the implementation of specific systems to percolate performance management down to operations and incentivise staff to improve their efficiency.

Moving forward on the improvement of Performance monitoring would therefore require the development of:

- A consistent approach, adapted to UKT's current situation and external requirements;
- Specific tools and systems to support the implementation (performance monitoring dashboard, incentive systems, etc).

Performance monitoring also requires the establishment of a common baseline adopted as the situation at T0. Progress is then measured in reference to this baseline according to a number of agreed ratios. The establishment of a baseline is usually a sensitive exercise as it often brings to light the organisation's weaknesses. It is therefore recommended that the baseline be assessed by an external consultant who comes to the organisation with a fresh look, independent from the history of the Company. Moreover, adequate communication and change management are essential for the buy-in of all team members right from the beginning.

For purposes of project management and implementation, it is key that UKT appoints an internal UKT Performance Committee with high-level representatives of key departments to ensure implementation of the measures and consistency with UKT Corporate Strategy. This Committee could be composed of the UKT staff working on the Business Plan who already have an overview of the Corporate strategy and cross-departmental implications. The UKT Performance Committee must be very clear on its roles and responsibilities and leaders of change management for the successful implementation of the recommendations.

Period	Tasks	Entity responsible
Q1 2020	Task 1: Appoint a Performance Committee within UKT in charge of implementing this action (composed of high-level members of different departments) Task 2: Draft terms of reference for the external expert that will develop the performance monitoring system, in collaboration with new UKT Performance Committee.	General management New UKT Performance Committee
Q2 2020	Task 3: Procure External Expert	Procurement Department
Q3 2020	Task 4: Develop new UKT Performance monitoring system and tools. Task 5: Confirm the baseline on current status of selected KPIs	External Consultant
Q4 2020	Task 6: Train UKT managers on the use of the new system and facilitate change management Task 7: Implement the new Performance monitoring system across departments	New UKT Performance Committee External Consultant
Cost/benefit analysis *Cost: External Expert: 80K Euros* *Benefits: Intangible -* • *Strategic visions and clear corporate objectives* • *Enhanced decision-making* • *Improved corporate performance*		**Performance monitoring** *Not applicable*

FOPIP Action - CORP-3 : Organisation of the Digital function and strategy across UKT

Action objectives:

- Creation of a true Information Systems (IS) Department at the same level as the Operations Department;
- Definition of a clear governance of software implementation projects;
- Establishment of a dedicated project-oriented organization for the implementation of operational software;
- Construction of a global and multi year action plan into an urbanization approach of the information system.

Description of the action:

Digital transformation within water and sanitation utilities is a major challenge which is only possible through streamlined internal processes, facilitated exchanges with customers and improved operational performance. It requires significant investments in terms of CAPEX but also taking into account the change within the services.

Its implementation requires clear governance and strategy, in particular the division of roles between IT and business departments (customer, operations and engineering) in terms of:

- Project governance;
- Transformation strategy (technological choice, prioritization...);
- Budget management.

Currently, in order to facilitate this, new organizations are emerging that integrate the creation of an independent digital transformation department and require the definition of the roles of the IT and the operations department.

This approach is based on the following observations:

- The software offered, potentially in SaaS (Software As a Service) mode, can be deployed by business departments and does not necessarily require internal development or maintenance;
- The actors in the "business" departments have the strategic vision of the need and the skills to deploy the tools;
- Digital transformation involves organizational and cultural changes that are not the responsibility of the IT department;
- Digital is present at all levels of the company. This transversality requires a clarification of the role of the IT Department.

Therefore, we propose the creation of a Digital Transformation Directorate, attached to the General Directorate, in order to:

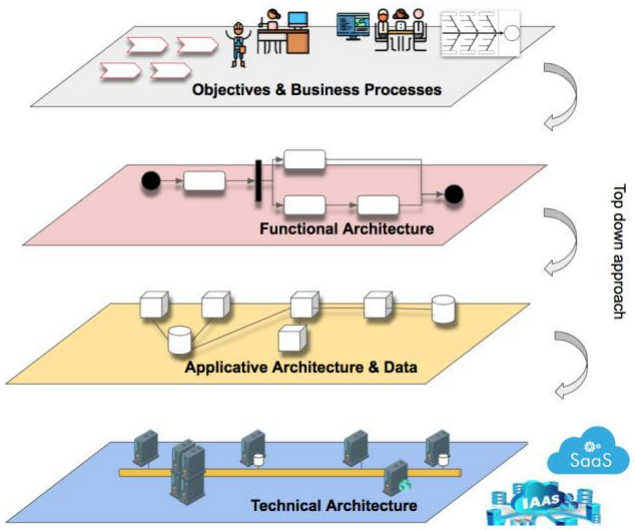
- Define UKT's digital transformation strategy (definition of needs, prioritization, budget) in coherence with UKT overall strategy;
- Manage budgets specific to digital transformation;
- Be responsible for project management and project teams setup (project manager, engineers) for all functional deployments with the teams from the information systems and operations departments;
- Manage preliminary studies;
- Take charge of the definition and implementation of change management within UKT.

It is also proposed to create an Information System (IS) Department reporting directly to the General Management and independent from the general services department. The Head of the IS Department will sit in UKT's management committee and have budgetary independence with a multi-year strategy.

As part of UKT's digital transformation, its missions for this IS Department are primarily:

- The definition of technological choices to achieve UKT's strategic digital transformation objectives;
- The implementation of application support and maintenance, including contracting with subcontractors;
- The supervision and operation of IT infrastructures;
- The supervision of IT developments;
- The definition and implementation of an IT security policy.

In order to implement UKT's digital strategy, the IS Department defines with the Digital Transformation Department an approach to the urbanisation of the information system. This refers to a method of supporting the transformation, rationalization, simplification and improvement of the information system. It is driven by the objectives and business processes defined in the digital strategy in a top-down approach as shown in the diagram.



Urbanization is based on two basic rules:

- An application must belong to one and only one block in order to limit the impacts when replacing it (weak coupling rule);
- Dependencies must respect the notions of strong coherence and weak coupling.

The implementation of the approach is carried out in several stages as described in the schematic below:

- Analysis of the existing system: functional, application and technical architectures;
- Consideration of UKT's strategic objectives;
- Identification of target architectures;
- Migration of the existing system;
- Developments if necessary;
- Implementation;
- Tests.

This iterative and evolutionary approach is applied to the integration of every new products or developments of existing software and is made possible by the modular nature of the architecture implemented at the beginning of the project.

The Transformation Department defines an interdepartmental project organization whereby the IS department, in collaboration with the relevant Technical Departments define the key functionality requirements for the digital tools to be deployed and oversee their implementation.

It requires technical and managerial skills that potentially require the support of specialized and experienced external companies. It can be carried out internally subject to targeted recruitment.

Period	***Tasks***	***Entity responsible***
Q1 2020	Task 1: Appoint a Digital Transformation Department and definition of its missions	Senior directory
Q2 2020	Task 2: Modify the positioning of the IS Department within the organizational chart. Re-define of its mandate.	Senior directory
Q2/Q3 2020	Task 3 : Define UKT's digital strategy. Support by a Consulting Firm (tender if necessary)	Digital Transformation Dept Procurement Dept
Q3/Q4 2020	Task 4 : Information system urbanization strategy	IS Department (with Consulting Firm)
Q1 2021 - on	Task 5 : Selection of selected digital tools and system and for each of them: - Preparation of Terms of reference - Selection - Implementation	Digital Transformation Dept IS Dept Operational Depts

Cost/benefit analysis

Costs to be identified by the relevant departments, depending on the solutions selected.

Benefits will be substantial:

- *More efficient organisation and project governance*
- *Gain in managerial efficiency*
- *Faster deployment of digital tools*
- *Reduced OPEX through more efficient operations*
- *International visibility with alignment with industry best practices*

Performance monitoring

- *Speed of implementation of IT projects*
- *Nb of successfully implemented IT projects*

FOPIP Action - CORP 4: Implementation of a global data management system

Action objective:

- Implementation of a big data storage for all the data
- Implementation of a data viz or BI software connected to the data warehouse
- Easy access, any time, to any data, indicator, reflecting the current situation and enabling enlightened decision-making

Description of the action:

The variety and complexity of professions within UKT complicates performance management as well as external reporting and customer relations. Moreover, the assessment highlighted the difficulty to locate/access some information as well as the disparity of information from one department to the next and, at time, the use of different information for the same element (different data sources throughout the company). This situation brings confusion to the management and smooth/fast decision-making is hindered.

Additionally, the high costs associated to decision-making in large organisations such as UKT requires tangible elements and easy access to data (ability to perform standard or on-demand queries to calculate point or recurring indicators). The objective is to obtain these indicators quickly, reliably and repeatedly. This is made possible by the advent of big data technologies (large-scale storage technologies).

As part of our approach, we refer to "datalake" technologies and not "datawarehouse". A datalake is a data warehouse without a predefined data organization within a strict schema. It is therefore a flexible technology in the case of all the data uses aren't defined.

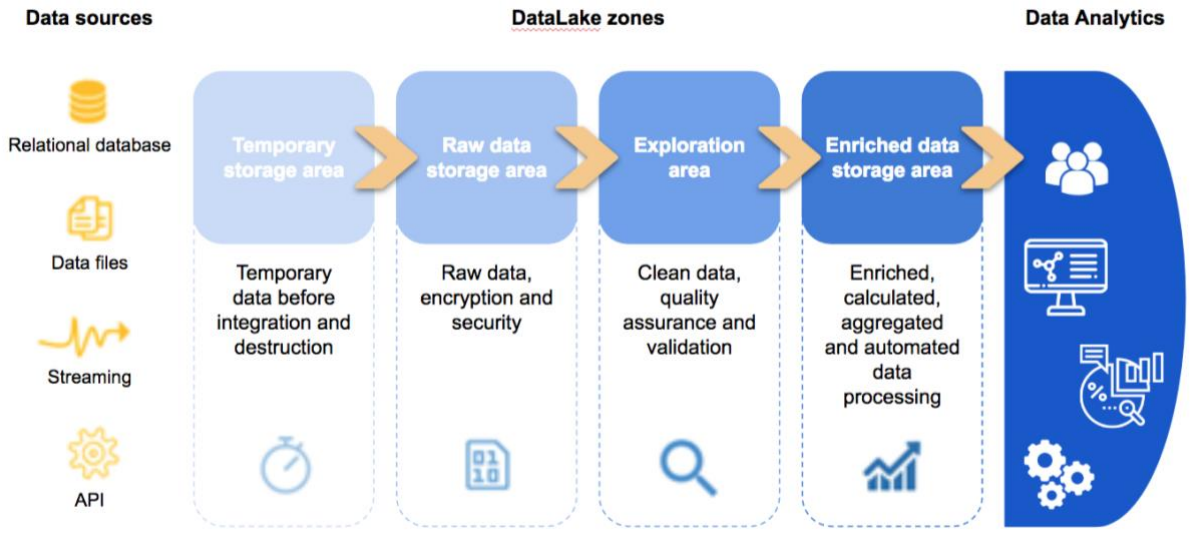
However, this new approach is different in that it allows the data to be loaded and then transformed to make them usable. Data initiatives are very often limited by the difficulties inherent in the collection and ingestion phases of the systems. On this point, being able to load the data on a platform in an almost raw state and iterate quickly to use them is an undeniable advantage (also referred to as ELT (Extract-Load-Transform) approach).

In the construction of a datalake, the cloud is certainly the best option, as it offers very large storage capacity and allows access to the data anytime, anywhere. It is the most flexible solution with a higher level of security.

The implementation of a datalake is carried out according to the following steps:

- Definition of data sources according to the objectives set in terms of indicator calculation;
- Set up secure flows for data transfer from sources to the datalake;
- Data structuring within the datalake within an object-oriented data model
- Definition of data management rules to reference, normalize and qualify the data within the datalake.

The schematic below presents the different zones and functions integrated into a datalake.



Cloud datalake vendors provide tools in their offer to:

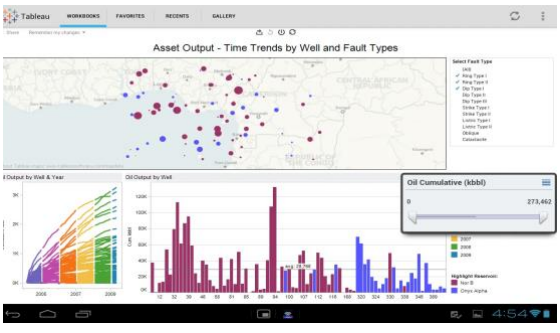
- Data viz;
- Data management (standardization, referencing, qualification, processing);
- data analysis;
- Machine Learning and/or Artificial Intelligence.

The datalake cloud offers also natively integrate components such as:

- FTP servers
- Connectors with market software (Financial, CMMS, GIS...)
- Connectors for importing data from Internet of Things objects
- Data query tools
- Cata sharing and data export tools

The final objective of setting up a unique and integrated data management platform is to facilitate decision-making and feed performance monitoring (KPIs). To that purpose, numerous Data Viz software or more advanced, Business Intelligence software, are available to create KPI made to measure (see the example below):

Example of BI Software (Microsoft Power BI)



Example of BI Software (Tableau Software)

The implementation of these steps requires significant skills in ELT data transfer tools, database management and experience in implementing a datalake. As such, UKT would benefit from the support of a specialized integration company for the implementation of data flows and data structuring. This company must first be selected via a consultation for which the support of a consulting company in support of the IT

department may be necessary : identification of needs, project volume (datas, KPI), definition of a target architecture, selection of "datalake" (or datawarehouse") technologies , evaluation of UKT's internal skills.

Finally, the consulting firm will define UKT's human resources needs in terms of operations, administration, deployment and support. It will define the short- and medium-term strategy for the internalisation or outsourcing of these tasks. The mission of this company can be extended to the monitoring of the implementation.

The IT department and other departments will ultimately be trained by the IT integration company, in the use of Business Intelligence tools for data management (Table, Power BI, etc.).

Period	***Tasks***	***Entity responsible***
Q1 2020	Task 1: Definition of the global strategy and the main objectives	Digital Department
Q2 2020	Task 2: Consulting and selection of an IT consulting firm	Digital Department
Q2/Q3 2020	Task 3: Finalization of the strategy and definition of the functional, technical and organizational needs. Preparation of the reference terms.	Digital Department IT consulting firm
Q4 2020	Task 4: selection of an IT integration company	Digital Departments IT consulting firm
Q1/Q3 2021	Task 5: Implementation and test	IT integration company
Q3/Q4 2021	Task 6: Training / skills transfer	IT integration company Digital Department
Q3/Q4 2021	Task 7: implementation of the targeted organization	HR department

Cost/benefit analysis

Costs:

- *CAPEX: 250 to 400 kE*
- *OPEX: 50 to 100 kE*

Benefits will be substantial:

- *More efficient reporting internal and external*
- *Gain in managerial efficiency*
- *Decision making based on KPIs*
- *Facilitated activity management*
- *Risk reduction in operational and global management*

Performance monitoring

Number of KPIs implemented

Increasing of the performance monitored by KPI

Quality of the reporting

3.2.3. Medium/Lower priority actions

The following table provides indications on a number of medium-long term recommendations to further develop the Corporate Management and Governance function according to the approach of continuous improvement.

#	AREA	ACTION	BRIEF OBJECTIVE OF THE MEASURE	UKT TEAM IN CHARGE OF IMPLEMENTATION	FINAL OUTPUT EXPECTED AND KEY INTERMEDIARY MILESTONES	EXPECTED TIMELINE FOR IMPLEMENTATION	ROUGH COST ESTIMATE
1	Corporate / Governance	Develop/implement a risk assessment procedure and Health & Safety plan	To develop and implement a HSE Management System regarding UKT context and to determine safe procedures for all conducted operations, reducing the risks to the lowest possible level.	HR department	HSE Management System developed/implemented	Q2 2021	800 euro/month
2	Corporate / Governance	Development of an infrastructure outsourcing service with a focus on cybersecurity	To avoid the risk of a cyber attack. To optimize the functionning of the infrastucture. To control the availibility of the infrastructure.	IT departement	Monitoring of the infrastructure with KPI dedicated. Infrastructure outsourcing service selected.	Q2 2020	50000 to 100000 euros per year.
3	Corporate / Governance	Implementation of indicators for monitoring the IT activity for the support part with deployment of a simple ticketing software.	To have a global overviw of the IT activity. To improve the relationship with the internal client. To monitore the performance of the different softwares To organize the different level of software support	IT departement	System established and in place Internal IT Support organized	Q2 2020	SaaS offer : 25 to 50 euros per users per month. Implemented by UKT.
4	Corporate / Governance	Promotion of SaaS-type software (eg Navision migration) for any new acquisition	To reduce the infrastructures cost. To guarantee the upgrading of the software's version. To facilitate the software's implementation by UKT. The quality of Internet connections must be assessed ((prerequisites)	IT and Digital department	SaaS = criteria of software's choice	Q1 2020	

5. HR and Organisation

5.1. Summary of key findings

5.1.1. Organization

UK Tirana has a very complex organization managing a workforce of 1,300 full time employees. The Utility's current organization reflects the characteristics of a hybrid structure. Over the last few years, UKT has undergone a few re-organizations to address staff attrition, retirements, and the operating philosophies of new "Interim" Deputy-Directors. As illustrated in the organizational chart, two Deputy Directors are appointed to generally focus on the operations and administration. The Deputy Director of Administration is responsible for the Financial and Sales Functions while the Deputy Director of Operations is responsible for Engineering and Production/Distribution Functions.

UK Tirana, given its large service area, is divided into five large units (covering the urban area), each of those functioning as a utility branch with one Head of Department managing three main functions: Customer Service/Sales, Operations and Maintenance - Water and Wastewater. All five units report directly to the Director of the Utility, however UK Tirana uses an Intranet Service where all customer data (contracts/billing and collections) are transferred to the main servers at the Customer/Sales Department of the Utility. In addition, UK Tirana has created a Regional Directorate which covers services being provided to all 13 former communes – current Administrative Units. The Regional Directorate functions under the same structure as the other five urban units based on the three main functions: Customer Service/Sales, Operations and Maintenance - Water and Wastewater. Down to the operational level, the organizational structure is relatively horizontal with numerous departments/sections, including about 8 directly reporting to the General Director.

The sheer number of sections presents a challenge to both staff and management to make sure that:

- projects/activities are coordinated;
- decisions are made fast enough at managerial level;
- lines of communication exist;
- "silos" do not develop.

Moving forward, a more compact structure may be recommended. One of the recent organization developments for UK Tirana was the creation of a dedicated Customer Care Unit which functions as a Call Center, responsible to register and handle all Customer Complaints from all Customers in the service area of Tirana Utility. For the time being, this directorate reports directly to the Director of the Utility. UK Tirana has a well-structured Task Force Unit, consisting of 10 teams, responsible to identify illegal connections and formalize them under a regular legal customer contract.

5.1.2. HR Management

Human resource recruitment planning helps to determine the human resources required to achieve a company strategic goals. UKT recruitment needs are presently planned based on the expressed needs associated with the recruitment process as per the Albanian Labour Code; where information is published in the official page of UKT. At the same time, UKT largely uses the job fairs for entry-level job recruitment; specialists from UKT meet with job seekers or students and attempt to stand out and give an overview of what it is like to work in UKT. Lately UKT has undergone in a new practice of partnerships with schools/universities, in creating opportunities for students to conduct an internship in the company, part of them end being employed by the company. There is a need for better recruitment policies as yet recruitment needs are not anticipated based

on annual appraisals.

As defined in the Labor Code, employment contracts are in place and set respective rights and obligations, including job descriptions and personnel specifications. The employment contracts are in written form and may be amended only with both parties' agreement. UKT Internal Regulation also provides job description for each of the positions in its structure. The Internal Regulation document is updated every time a new position is added, but best practices also recommend that an HR Manual should be developed and regularly revised to ensure full alignment of the practices and staff with the corporate strategy.

The Financial Directory is responsible for the processing of payroll. Directory specialists are responsible for timely completion of paperwork and recording of time worked for employees. There is no computerised HR management system for payroll processing and this function is currently performed through Excel. "Personnel Salaries" reflects base salaries for all staff, overtime, 13th-month pay check, personnel treatment, and compensation for the Supervisory Council. Base salary reflects labor costs, which include the effects of annual inflation indexing of 4% starting from 2017. Meanwhile, the slight reduction in staff number in 2018 due to the separation of two former communes, did not significantly reduce labor costs as UKT Senior Management decided to increase the number of staff in 2019 to prepare for the receipt of the new wastewater treatment plant. The Senior Management decided not re-assess salaries based on the job position.

Internal communication is mainly centralized and department notifications are issued limited to organization changes and rules changes, on HR arrivals and departures, disciplinary actions, permission and vacancies. Usually communication is handled through formal written motions and via email.

In the case of UKT, provisions related to disciplinary measures are set in the individual/collective contracts, which represent an escalation process. In relation to the application of disciplinary measures, the applicable procedure guarantees the right of the employee to participate in hearings, protect its position and present the facts and proofs, within a reasonable term.

UKT employees' performance is evaluated annually, based on a performance objective contract co-signed by employees and their manager. Getting compensation right is important for effective HRM. Performance-based compensation is not applied and seems to be necessary as tying compensation to performance is an important incentive that raises staff productivity and efficiency. UKT should formalize performance evaluations by creating a results-based management system, which evaluates individual staff performance against the company's strategic plan. Employee compensation formulas should be adjusted to include performance-based remuneration, which increase productivity across all departments. UKT doesn't apply any standardized annual surveys to measure employee satisfaction.

Developing and managing human resources effectively is an essential element for the development of UKT, on this the implementation of a staffing plan should be consistent with the utility's strategy. A staffing plan identifies the necessary composition, size, and structure of a water utility's staff. A good staffing plan considers outsourcing initiatives, the introduction of new technologies and the expected gains in labour productivity through training and development. UKT staffing plan needs to identify which staff should be trained and which jobs should be outsourced to carry out its strategic plan.

In this regard, UKT has put some training actions in place but without assessing training needs nor specific strategy and budget. Furthermore, there is no team dedicated to the training/development sector within the Human Resources Directory and trainings are implemented only through the Projects Office. Representatives of the HR directory report that there are mismatches between the capabilities required for the execution of a task and the abilities of the employee responsible for the task. Also, performance plans for each employee that are directly linked to the utility's overarching strategy and goals are lacking.

Safe work methods are yet to be developed for the water and sewerage functions of UKT. Water and sewerage operations staff need to be trained on some aspects of managing risk. Also, there is no system in place to advise when training is required. UKT is not yet accredited with ISO 9001 on Health and Safety.

5.1.3. Gender equality

Concerning gender equality in the company, there is no active policy to engage women in suitable positions and multiple levels. However, even though only 25% of the staff are women, the ratio is gradually increasing. That may serve as a promise that in the near future, more women will be part of the company, bringing new views to the table together with fresh perspectives on opportunities for company' growth. Women in decision making positions (directors/head of director) constitute only 24% of the total number for 2019; while they constitute a higher ratio in advisor/heads of units positions.

In general, government efforts toward gender equality is progressing on the approximation of national legislation with international standards and requirements as one of the commitments that the GoA has undertaken through ratification of several international conventions on human rights and especially conventions specifically addressing the rights of women. This process is also based on the signing of the StabilisationAssociation Agreement (SAA). Equality is one of the objectives and duties and an integral part of the Council of Europe Treaty and the EU Charter of Fundamental Rights. Albania's obligations for the integration of gender issues also derive from the five priority areas in the "Strategy for equality between women and men 2010- 2015" of the European Commission. Actions taken in this regard allow for a better treatment of gender needs; in this context, a series of laws, policies, strategies and sectoral programmes have been reviewed and improved from a gender perspective, as detailed in the "National report on implementation of the Platform for Action Beijing +20". However, further steps need to be taken for a successful implementation of improved legislation and policies.

5.2. FOPIP Recommendations - Actions for implementation

5.2.1. Recommendations

We are proposing selected high priority actions to be implemented in the FOPIP and which focus on the following areas:

3 recommendations with high priority to improve UKT organisation and HR function	
HR-1	Revise UKT organisational structure
HR-2	Improve HR Management in line with industry best practices
HR-3	Implement a Talent Management strategy within UKT

5.2.2. Actions

The following section aims at describing in detail the actions that were identified as potential quick wins to improve UKT's operational performance in the area of HR and Organisation that could be implemented by UKT as soon as possible.

FOPIP Action - HR-1: Revise UKT organisational structure
Action objective: In order to increase the UKT performance level and be aligned with its strategic intent it is recommended to revise the company's organisational structure and make sure it enables the organisation to efficiently perform its activities.

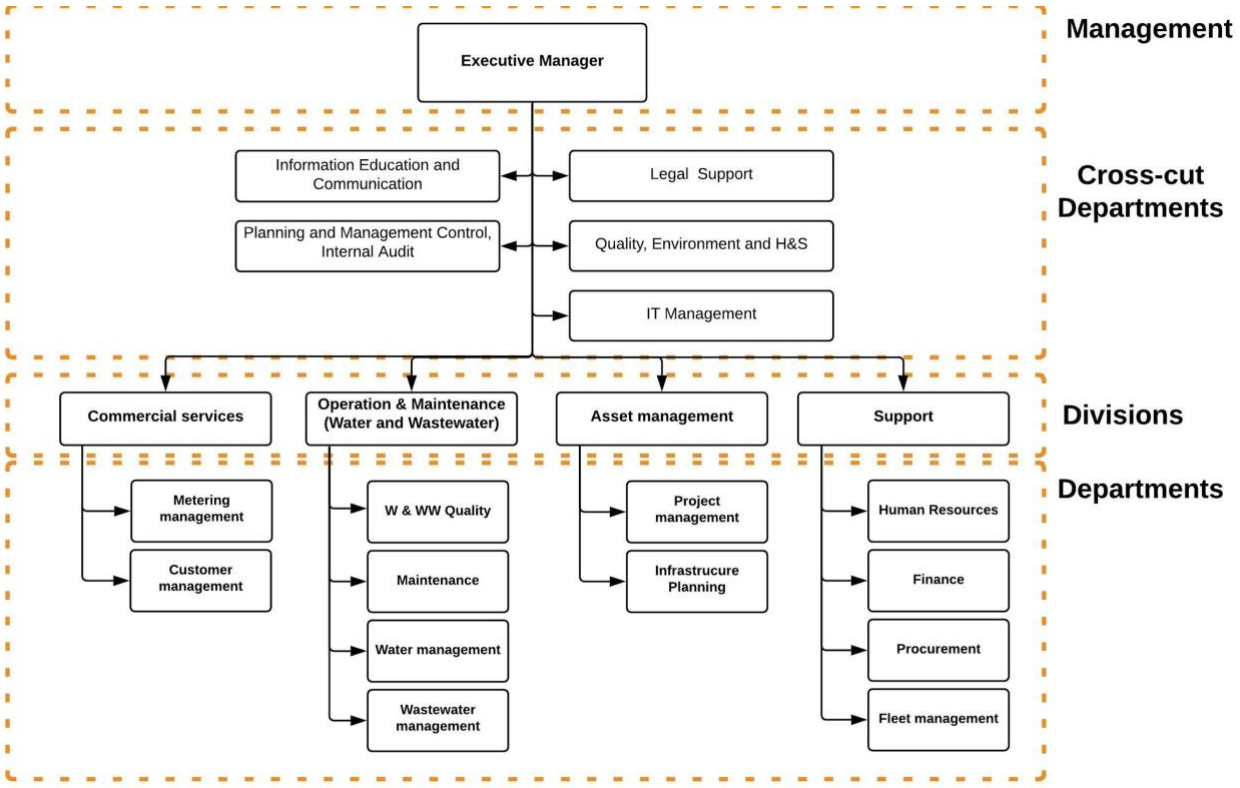
Description of the action:

As mentioned in the Inception Report, three or four levels of reporting typically are sufficient for most organizations. The Senior Management of UK Tirana will consider potentially re-classifying any staffing positions that have very large or few direct reports to make sure that these positions serve better to the Organizational Structure and encourage trust in delegation of duties and responsibilities.

Moreover, it is recommended to amend the organisational structure to reflect the following recommendations:

- Establish a sector within the Directory of HR that would be responsible for development/training of human resources;
- Create a GIS section - GIS applications allows the water utility company keep record of pipes, valves, fittings, hydrants and meters together with their characteristics and status); determining and prioritizing repair and replacement works; and closing valves to redirect water flow. GIS allows you to view, question, interpret, understand and visualize data in many ways that reveal relationships, patterns and trends in the form of maps, reports and charts. GIS application allows decision makers to view the spread of the system in the territory and to store information about the surrounding areas like property owners, property papers category of use of the land etc.
- Assess the possibility to merge the two laboratories;
- Review UKT organisation to have all customer-related functions reporting to the Deputy Director in order to increase synergies and improve the consistency of the departments strategies;
- Appoint an Asset Manager and integrate Asset Management in the Technical Department without overlapping tasks and responsibilities;
- Separate HR from Administration and strengthen HR strategic functions (Talent management) Recruiting additional HR managers to support the department transformation could be considered as UKT currently stands below industry benchmarks (one HR staff for every 100 employees);
- Consolidate Supporting Resources (staff): The number of administrative staff (secretaries and clerical) in the Utility needs to be reviewed and the possibility of implementing a centralized secretarial/administration pool could be considered to streamline functions and avoid duplications (especially at the Administrative Units and Regional Directorate). As described in the initial report, it is going to enable better expertise, and knowledge management;
- Create an Information Systems (IS) Department at the same level as the Operations Department, reporting directly to the General Management and independent from the general services department;
- Create a Digital Transformation Directorate, attached to the General Directorate, in order to: define UKT's digital transformation strategy in coherence with UKT overall strategy; manage budgets specific to digital transformation; be responsible for project management and project teams setup for all functional deployments with the teams from the information systems and operations departments; manage preliminary studies; take charge of the definition and implementation of change management within UKT.

Generally, a leaner and simpler organisational structure would be recommended. For purposes of reference, below is a typical water utility organisational structure:



More adapted to UKT, a proposed review of the organisational structure has been inserted in Annex A to this report.

Period	*Tasks*	*Entity responsible*
Q1 2020	Task 1: Finalise revision of organisational structure	HR department Management
Q2 2020	Task 2: Prepare staffing strategy in line with reorganisation: • Detail additional staff • Prepare job descriptions for recruitment • Assess current training needs requirements	HR department
Q3 2020	Task 3: Define budgetary requirements (staff, training, equipment, etc) for organisational reorganisation and include in the next budget	HR department Management
2021	Task 4: Implement organisational reorganisation including: • Creation of departments/sections • Reallocation of staff (consolidation of administrative support functions) • Recruitment of necessary additional profiles • Training of staff as required	HR department Relevant Departments
Cost/benefit analysis *Cost to be quantified upon selection of the final organizational structure and may include costs related to recruitment, training, equipment etc.* *Benefits: This action would increase the UKT performance level and aligned it with its strategic intent.*		**Performance monitoring** • *Nb of staff/1000 connections*

FOPIP Action - HR-2: Improve HR Management in line with industry best practices

Action objective:

- Improve performance of the HR department to ensure efficient performance of service for ultimate customer satisfaction
- Alignment with international best practices

Description of the action:

The diagnosis of the HR management highlighted a few areas of improvement which could quickly improve the organisation's performance, in line with international best practices for water utilities.

Key areas of improvement of HR management performance include the following:

- Develop clear job description or role profiles based on: Tasks and responsibilities, required qualifications and core competencies per each position.
- Establish a Grading & remuneration system. A grade shall be attributed to each job position based on the following factors:
  - Job requirements and necessary competencies
  - Complexity of the processes to be carried out
  - Level of managerial responsibility

  A Job Mapping Matrix specifies the grade of each UKT's job position. The HR department shall make sure all the job descriptions clearly specify the grade of the position.

It is also recommended to transform the HR function into a strategic utility department rather than a support function by putting emphasis on the performance of the employees to improve UKT's overall service delivery.

First of all, the appointment of a HR Committee is highly recommended with the role to develop and implement measures to improve HR Management Performance. The HR Committee will also formally communicate to the concerned staff or Line Manager and change of situation. The HR Committee, on behalf of the Administrative Council, will; 1) oversee and administer the UKT's human resource policies, plans, and procedures, 2) review, approve, or recommend for approval, decisions relating to the fair and competitive compensation of executives, directors, and other key managers.

To support the HR Committee, the recruitment of a specialised HR Consultant is highly recommended in order to develop the required tools and mechanisms to be put in place.

Period	*Tasks*	*Entity responsible*
Q1 2020	Task 1: Appoint the HR Committee and introduce a better span of control Task 2: Develop terms of reference for the HR Consultant	HR department UKT Management
Q2 2020	Task 3: Procure HR Consultant Task 4: Establish a Talent Management sector within the HR Directory	Procurement Department
Q3 2020	Task 5: Develop new HR strategy, system and tools: • Clear job descriptions • Grading & remuneration system • Establish a Talent Management Guideline	HR Consultant HR Committee

Q3/Q4 2020	Task 6: Consolidate the HR Department Role	HR Committee
2021	Task 7: Implement HR improvements Task 8: Train HR staff in performing their new functions	HR Committee HR Department

Cost/benefit analysis

Cost: External Expert: 75K Euros + any necessary recruitment and training (to be identified by the HR Committee upon starting this action)

Benefits: Intangible - Improved staff motivation directly leads to improved performance, hence increase customer satisfaction

Performance monitoring

- *Nb of staff/1000 connections*
- *Staff satisfaction*
- *Staff turnover*

FOPIP Action - HR-3: Implement a Talent Management strategy within UKT

Action objective: Improve UKT's ability to retain and develop/train the talent needed at all levels of its organisation

Description of the action:

Developing and managing human resources effectively is an essential element for the development of UKT, on this the implementation of a staffing plan should be consistent with the utility's strategy. A good staffing plan considers outsourcing initiatives, the introduction of new technologies and the expected gains in labour productivity through training and development. UKT staffing plan needs to identify which staff should be trained and which jobs should be outsourced to carry out its strategic plan.

It would be advisable that, based on international best practices, the HR Department takes a more strategic role through the establishment of following sectors as described in the following Organisation.

The proposed chart for the HR Department taking into consideration international best practices would be composed of the following:

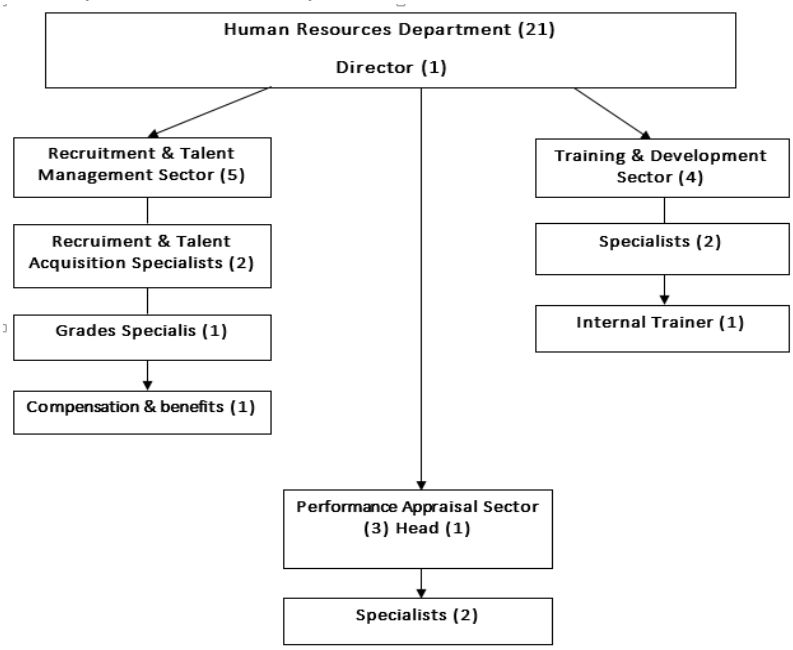
- Recruitment & Talent Management Sector
- Training & Development Sector
- Performance Appraisal Sector
- Compensation 7 benefits Sector

The Talent management strategy shall be built in order to serve the UKT's business strategy and to allow UKT to reach its objectives.

Talent Management Guidelines should be developed to define the Talent Management processes, methodologies and tools that may be implemented in UKT by the HR department in close collaboration with

the Heads of Units, Divisions and Sectors in order to hire, develop and retain talents.
In order to be efficient and ensure the proper allocation and development of the talents available at all levels, the HR department shall integrate the different tools at its disposal within the institution regarding the management of talents and consequently create a coherent strategy for encouraging the talents' professional growth. Concretely, all the available instruments such as training and development activities, performance evaluation, selection and integration processes and compensation and benefits shall be elaborated and implemented in order to contribute to a common objective: the proper management of talents.

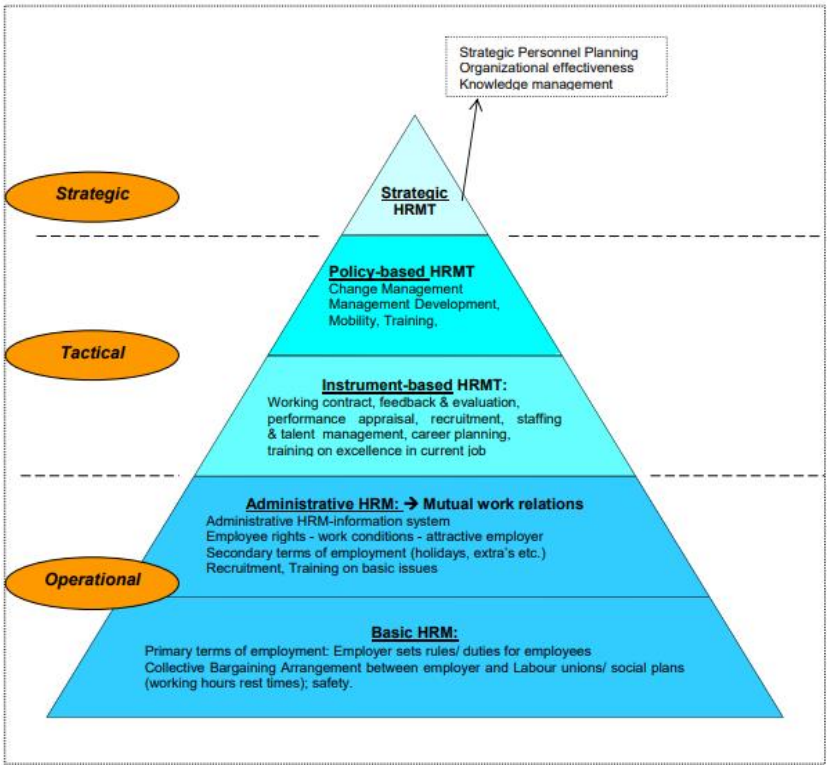
To support this new approach, it is necessary that a dedicated Training and Development (T&D) Sector be created within UKT HR Department, and composed of 4 staff, one of which will serve as Head of Sector.



The main actions to be taken would involve:

- Prepare detailed Job profiles for the T&D staff
- Establish a Training Policy & procedures Guideline, including:
  - Roles & Responsibilities (from HR Committee to T&D Specialists)
  - Training Needs Analysis Catalogue
  - Training Budget
  - In the Job training procedures
  - E-Learning programs
  - Employee Cross Training Plans
  - General Training/Induction Trainings for all

Human Resources Management Talent (HRMT) activities can be divided into five types of activities: Basic HRMT; administrative HRMT; instrument-based HRMT; policy-based HRMT; and strategic HRMT, which are illustrated in the following figure.



Period	Tasks	Entity responsible
Q1 2020	Task 1: Revise the organisational structure to allow the creation of the Training and Development Sector within the HR Directorate Task 2: Recruit T&D Sector Head	HR department Management
Q2 2020	Task 3: Prepare detailed Job profiles for the T&D staff and recruit T&D staff Task 4: Establish a Training Policy & procedures Guideline, including: • Roles & Responsibilities (from HR Committee to T&D Specialists); • Training Needs; • Analysis Catalogue; • Training Budget; • On the Job training procedures; • E-Learning programs; • Employee Cross Training Plans;	HR Department T&D Sector Head
Q3/Q4 2020	Task 4: Communicate to all managers on T&D and start changing the company culture Task 5: Develop rule to allocate budget for training of staff for the coming year	T&D Sector Head
2021	Task 6: Implement Talent Management practices, led by the T&D sector with the support of all managers	T&D Sector Head All departments

Cost/benefit analysis	Performance monitoring
Costs to be identified during the first phase for the setup of the T&D department and annual costs to be consolidated in the yearly budgets *Benefits: Intangible - Improved staff motivation directly leads to improved performance, hence increase customer satisfaction*	• *Nb of staff/1000 connections* • *Staff satisfaction* • *Number of staff having received training* • *Staff turnover*

Additional recommendations have been detailed in Annex B to this report and can provide support to the HR department in the standardization and improvement of HR practices.

5.2.3. Medium/Lower priority actions

The following table provides indications on a number of medium-long term recommendations to further develop the Organization and HR function according to the approach of continuous improvement.

#	AREA	ACTION	BRIEF OBJECTIVE OF THE MEASURE	UKT TEAM IN CHARGE OF IMPLEMENTATION	FINAL OUTPUT EXPECTED AND KEY INTERMEDIARY MILESTONES	EXPECTED TIMELINE FOR IMPLEMENTATION	ROUGH COST ESTIMATE
1	HR / Orga	Develop formal training program that can be used for all employees	To develop a training programme for all employees on Code of Conduct and HSE and prepare a TNA for any other issue.	HR department	A training program prepared along with the training curricula	Q2 2022	20,000 euro
2	HR / Orga	Develop and budget comprehensive training plan tied with organizational goals	To develop and budget a comprehensive training plan, taking into considerations: needs assessment and learning objectives; consideration of learning styles; delivery mode; budget, delivery style, audience, content, timelines, communication, and measuring effectiveness of training.	HR department	Training plan designed	Q2 2022	20,000 euro
3	HR / Orga	Propose an HR system with strategic employee data, including links to the organization's strategic intent	To provide a Human Resource Information System (HRIS) that meets the UKT needs of the users by delivering comprehensive functionality, valuable reporting, increased efficiency, improved risk management, remaining relevant with a robust self-service function.	HR department	Developed system, providing accurate HR data for data analytics, improving the quality of UKT decisions	Q1 2022	20,000 euro
4	HR / Orga	Propose a system to regularly communicate with all utility staff	To provide a system that enhances communication and workflow in an easy way to obtain information between employees, and reduces duplication of tasks with legacy systems.	HR department	System established and in place	Q1 2023	10,000 euro
5	HR / Orga	Define job description and terms of reference for missing positions in the utility's staffing plan	To identify the missing staff per department and prepare per each of them a job description and TORs as a written document presenting the purpose and scope of the service to be provided, the methods to be used, the standard against which performance is to be assessed or analyses are to be conducted, the resources and time allocated, and the reporting requirements.	HR department	Missing staff identified Job desctiption and TORs in palce per the missing staff	Q1 2020	15,000 euro
6	HR / Orga	Develop and implement annual staff satisfaction surveys	To launch an employee satisfaction survey in an internal UKT system, and design a plan and a general timeline for the entire process from start to finish; to conduct the survey annualy.	HR department	A system of employee surveys in place and action plan is defined, communicated, and implemented	Q4 2021	10,000 euro
7	HR / Orga	Develop policy for directly linking compensation/promotions to annual performance evaluations	To design and implement a reliable performance appraisal system and then reward the most productive workers and teams accordingly (including bonus, high salary rates, extra benefits, allowances, and pre-requisites).	HR department	A reliable performance appraisal system	Q4 2022	15,000 euro

6. Financial Management and Accounting

6.1. Summary of key findings

As a large utility serving the entire capital city of Tirana, it is essential that UKT aligns its current financial and accounting practices with international standards (IFRS). This would greatly benefit the Company in terms of:

- Access to reliable financial information for improved decision-making;
- Proper financial planning and analysis of the current status;
- Accurate reporting to external stakeholders (EBRD, regulator, etc) for improved governance;
- Reduction of operational costs through a more efficient financial management.

6.1.1. Finance and Accounting tools, methods and staffing

At the moment, UKT prepares its financial reports in compliance with IFRS but a number of practices are not aligned with IFRS in the regular operations of the Economic Department.

Streamlining and standardizing financial and accounting procedures requires first of all the development of adequate tools and methods through the preparation of its Financial and Accounting Manual. This has to be prepared in compliance with IFRS and will provide specific instructions on how financial management and accounting processes should be performed.

Moreover, the assessment pointed out the existence of gaps between the staff's qualifications and duty requirements indicating the need for capacity development. An IFRS specialist should perform a training needs assessment within the Economic Department and identify the gaps and areas where the team should reinforce its knowledge and build capacity. In particular, trainings should be regularly undertaken on the principles of financial reporting in line with IFRS standards, especially considering that IFRS are continuously being updated.

6.1.2. Non-compliant accounting of trade receivables

It was also highlighted during the assessment that trade receivables were not addressed in compliance with IFRS 9 and that there was no specific methodology within UKT to address this matter.

As of 31.12.2018, UKT trade receivables amounted to 3.9 billion ALL with an increase of 43% in 2018 as compared to 2017. This is a major issue to be tackled by the Risk Department but the assessment highlighted that the current methodology in place for client risk categorization is not compliant with IFRS 9 requirements.

IFRS 9, a new standard into force since 2018, requires each company to analyse the risk factors combined with forward looking information in order to create a statistical model for impairment which should incorporate the risk parameters for each category of clients. Impairment calculated based on IFRS 9 methodology would then reduce the trade receivables for the impairment amount in the financial statements of UKT for period ended 31.12.2018 and a restatement of Equity for the potential effect as of 1.1.2018 would be required to be performed as well. The new IFRS has brought a change in the accounting treatment of impairment mainly due to the change in the model from "Incurred Losses Model" (old model based on IAS 39) to the "Expected Credit Losses Model" (new model based on IFRS 9). The initial application of the requirements of the new standard is expected to increase significantly the impairment of trade receivables upon initial recognition, which means it is expected to reduce the net amount of receivables in the financial statements of UKT as of 31.12.2018.

To comply with IFRS and adequately address trade receivables, UKT should develop a new model and methodology in accordance with IFRS 9 for impairment of trade receivables. The training of the team on the application of this new methodology will also be essential.

6.1.3. Accounting of fixed assets

The assessment highlighted the necessity to perform some adjustments in equity for revaluation reserve and fixed assets.

Additionally, it was noted that there was a need for an asset management procedure to be developed detailing the data entry process, controls in place, access rights for the accounting staff, review and authorization procedures as well as mapping of the accounts to the UKT activities in accordance with IFRS. The possibility of a software database for fixed assets should be seen as a priority given the large number of items included in fixed assets as well as their specific quantity in the total assets of UKT. The software would increase efficiency in depreciation recalculations, as well as producing automatic status/monthly reports for fixed assets.

6.1.4. Revenue accounting

The assessment indicated that a number of connections are still unmetered and that water consumption, for those customers, is estimated based on a norm of usage (estimated m3 per inhabitant). The corresponding revenues are therefore estimated and in accordance with IFRS 15 in force since 2018 (before 2018 ISA 18), UKT should move towards a revenue base entirely relying on measurement, invoicing water as it consumed.

Furthermore, the customer's database is not up to date with the current information on actual consumers, new addresses etc. For instance, since 2016 is was identified that a pool of customers is still being held in the customer database which relate to former buildings which were constructed with no permission and that were subsequently destroyed. However, the process is still ongoing to perform a full database of customers update. The financial impact of this was a credit/increase in revenues and a related debit/increase in trade receivables, which should be adjusted and reversed accordingly. Revenue being recognized for former customers, which are not updated in the customer database and whose buildings no longer exist.

6.1.5. Improving financial reporting and calculation of covenants

UKT is required to comply with the covenants as specified in its Financing Agreement with EBRD on a six months basis. Three covenants have been defined in the contract with EBRD:

- Debt service coverage ratio, calculated as i) Cash available for debt service for the 12-month proceeding to ii) Sum of the principal repayments and interest repayments, with a limit of not less than 1.15x;
- Debt to EBITDA ratio, calculated as i) Relevant Financial Debt to ii) EBITDA for the 12-month proceeding, with a limit of not more than 3.5x; and
- Collection to customer to total revenue ratio, calculated as i) Collection from customer to ii) Total revenue, with a limit of no less than 85%.

The assessment, as described in the Inception/Assessment Report highlighted that the calculation of covenants is currently not performed in line with the definitions of EBRD's Financing Agreement. More specifically the following mistakes were identified in the calculations as of 31.12.2018:

- Debt service coverage ratio was calculated based on draft and not final data. As a result, the ratio of 1.63x was reported to EBRD based on draft data instead of 4.03x based on final data.
- Debt to EBITDA ratio calculated excluded Long Term Debt. Based on the definition in the EBRD contract the full debt should be considered when performing this calculation.

- Collection to customer to total revenue ratio was calculated by UKT as 102% while based on our assessment it should have been reported as 77% as required in the EBRD Finance Agreement.

Hence, it is highly recommended that UKT:

- Develops a template to calculate the ratios specified in the covenant's definition in EBRD contract;
- Commits a specialist in charge of calculations should ensure that final financial statements amount as report by Economic Department;
- Ensures total amount of Debt and Goodwill impairment amount is included in Debt to EBITDA ratio calculations;
- Ensures there is quality control and that the calculations are reviewed by a senior staff. In case of covenant ratio breaches such instances should be reported together with a reasoning why, and a waiver of breaches should than be obtained by EBRD;
- Attaches the Final Financial Statements used in the covenant calculation report as an annex to ensure consistency and transparency.

As part of this assignment, Baker Tilly already gave the detailed review on ratios calculated as of 31.12.2018. This review will continue to be performed also for period ended 31.12.2019.

6.1.6. Increase financial reporting frequency

The assessment indicated that UKT currently reports its financial statements annually to the Administrative Board and the Shareholders Assembly. A comparison of actual versus budgeted financial results is only carried out annually.

Best practices show that increasing the frequency of reporting to internal management committees would facilitate the budgeting process by making it more accurate and increase the overall control. Increasing frequency of reporting would also facilitate the calculation of covenants and reporting to EBRD and help senior managers in their decision-making process.

6.1.7. Improvement of procurement practices

The assessment highlighted that while UKT while the Department dedicated to Procurement followed national guidelines, there was no internal Procurement strategy proposing a strategic approach to procurement as well as guiding cost optimisation. It was therefore proposed to reorganise the Procurement Department to allow strategic functions to be clearly identified.

Moreover, the procurement process involving cross-departmental and even cross-organizational (if we consider the National Procurement Authority) requests and validation processes are performed manually with paper records. Harnessing technology with the implementation of dedicated procurement software and automation initiatives could prove to be a key performance improvement leverage at UKT. Navision, the new ERP system being deployed within UKT, has a module for procurement which could provide the advantage of easily integrating with the accounting system and also, potentially, the stock management system.

6.2. FOPIP Recommendations - Actions for implementation

6.2.1. Recommendations

We are proposing selected high priority actions to be implemented in the FOPIP and which focus on the following areas:

1 integrated recommendation with high priority to improve UKT accounting performance	
FIN-1	Streamline and standardize Financial Management / Accounting Practices

6.2.2. Actions

The following section aims at describing in detail the actions that were identified as potential quick wins to improve UKT's operational performance in the area of FInancial Management and Accounting that could be implemented by UKT as soon as possible.

FOPIP Action -FIN-1: Streamline and standardize Financial Mgmt/Accounting Practices

Action objective: As a large utility serving the entire capital city of Tirana, it is essential that UKT aligns its current financial and accounting practices with international standards (IFRS). This would greatly benefit the Company in terms of:

- Access to reliable financial information for improved decision-making;
- Proper financial planning and analysis of the current status;
- Accurate reporting to external stakeholders (EBRD, regulator, etc) for improved governance;
- Reduction of operational costs through a more efficient financial management.

Description of the action:
In order to streamline and systematize financial management and accounting practices, we recommend that UKT:

a) Develop an Accounting and Finance Manual in compliance with IFRS;
b) Develop and implement a model and methodology in accordance with IFRS 9 requirements for trade receivables;
c) Develop a model for covenant calculations, including a review process and ensure financial information is included in the calculations; and
d) Increase financial reporting frequency

A. <u>Develop an Accounting and Finance Manual in compliance with IFRS</u>

The accounting manual should as a minimum describe the following:

- data entry process in the accounting software;
- controls in place to ensure such data are correctly processed and entered;
- access rights for the accounting employees;
- review and authorization procedures;
- mapping of the accounts to the UKT different activities including, sales, other revenues, accounts receivables, collection and fixed assets in accordance with IFRS and IAS.

In addition, the following documents should be developed:

- Procedure of Accounting describing the process flow, and
- IFRS Accounting Manual which is up to date and in compliance with reporting standards.

Training should be provided to UKT employees involved in the process to improve the know how in line with the manuals. Specific training on IFRS requirements should be done annually to the key employees involved in the financial reporting process. As the IFRS are being continuously updated and complementing existing standards it is crucial for UKT to be aware of the latest IFRS and IAS changes for each reporting period.
An IFRS team/specialist should be employed in the economic department with the responsibility of identifying the needs to IFRS trainings, need to update the IFRS Accounting Manual and any changes needed to be performed in financial reports of UKT. In collaboration with key management this role should further decide to go on a procurement process for external consultants' involvement when needed

B. <u>Develop and implement a model and methodology in accordance with IFRS 9 requirements for trade receivables</u>

UKT should develop, with support from an external consultant expert in IFRS, a methodology for impairment of trade receivables and a specific impairment model applicable to UKT which would than calculate the impairment amount in accordance with IFRS 9.
A project working team from UKT should be committed to provide the necessary adequate and historic information to external consultants with regards to days past due of trade receivables, customers and collections and other specific information needed to develop the model and methodology.
The external consultant should develop the following:

- Methodology for impairment of trade receivables in accordance with IFRS 9 requirements;
- Specific impairment model which would then calculate the impairment amount in accordance with IFRS 9.

Trainings on IFRS 9 model should be provided to UKT employees involved in the process of impairment evaluation. In order to ensure consistency, annual updates to the model should be performed as needed in order to fully comply with IFRS 9 requirements.

C. <u>Develop a model for covenant calculations, including a review process and ensure financial information is included in the calculations</u>

- Develop a template for the calculation of the ratios as specified in the covenant's definition in EBRD contract;
- Commit a specialist in charge of calculations should ensure that final financial statements amount as report by Economic Department;
- Ensure total amount of Debt and Goodwill impairment amount is included in Debt to EBITDA ratio calculations;
- The calculations should then be reviewed by a more senior staff to ensure accuracy of the ratios. In case of covenant ratio breaches such instances should be reported together with a reasoning why, and a waiver of breaches should than be obtained by EBRD.
- Final Financial Statements used in the covenant calculation report should be attached as an annex to ensure consistency and transparency.

D. <u>Increase financial reporting frequency</u>

UKT should establish a management committee composed of senior staff of each relevant department. The management committee could analyze which financial and non- financial information should be reported and prepare a standardized draft report to be used for monthly, quarterly and analytical reports. The report could include analytical techniques to be performed in comparing actual vs budgeting results.

Period	***Tasks***	***Entity responsible***

Q1 2020	Task 1: Procure an external consultant with expert knowledge in IFRS to: ○ Develop a finance and accounting manual in compliance with IFRS. ○ Develop a methodology for impairment of trade receivables in accordance with IFRS 9 requirements and ○ Develop a specific impairment model applicable to UKT which would then calculate the impairment amount in accordance with IFRS 9; ○ Train UKT on IFRS application. Task 2: Develop a working paper for covenant calculations to ensure consistency of data reported and compliance with EBRD requirements on Financing Agreement. Task 3: Establish a management committee composed of senior staff from relevant departments to analyze financial and non- financial information from monthly, quarterly reports used in decision making process. Task 4: Calculate covenants and review by senior UKT staff to ensure accuracy of the ratios before submission to EBRD - Support from Baker Tilly on this new review under the FOPIP assignment.	Economic Department / Procurement Department Economic Department Economic Department
Q2 2020	Task 5: Appoint a working team from UKT to facilitate the information needed from external consultants regarding the development of the IFRS manual as well as IFRS 9 methodology and model. Task 6: IFRS Consultant assesses the current IFRS knowledge and capacity level and designs a tailored training plan for UKT	Economic department Economic department
Q2 2020	Task 7: Training of teams: ○ Training implementation by external IFRS expert consultant to UKT Economic Department teams, ○ Training on IFRS framework and manual of accounting, ○ Training on IFRS 9 model for impairment evaluation.	Economic Department Expert
Each Q3 20XX	Task 8: Perform annual updates to the model of IFRS 9 as needed in order to fully comply with IFRS 9 requirements on an ongoing basis. Task 9: In case of covenant ratio breaches such instances should be reported together with a reasoning why, and a waiver of breaches should than be obtained by EBRD. Task 10: Annual training on IFRS	Economic Department Economic Department
Cost/benefit analysis *Costs: The following estimate costs have been estimated for outsourcing of these activities:* ● *Development of IFRS Manual and Accounting Manual - 17 KEUR.* ● *Training on IFRS general and 6 model (5 persons, 1 week) - 7 KEUR.* ● *Annual updates on IFRS - 6 KEUR/year.* ● *IFRS 9 Methodology Development- 35 K EUR.* ● *Development of IFRS 9 Model 10 KEUR.* ● *Trainings on IFRS 9 model (5 persons, 1 week - 5 KEUR.* ● *Annual updates as needed in order to fully comply with IFRS 9, - 3 KEUR/year.* *Benefits:*		**Performance monitoring** ● *Reduced nb of qualifications for non-compliance with IFRS in the annual auditors' report.* ● *Reduced nb of errors/mistakes identified by the external auditors.*

• *Increased consistency of accounting and finance processes and increase consistency of evaluation and measurement of trade receivable impairment.* • *Preparation of financial statements in compliance with IFRS and IFRS 9 requirements for trade receivables.* • *Reduced timing for preparation of financial reports, trade receivable reports and covenant calculation reports.* • *Increased reliability of the financial report to potential investors and borrowers to the Company.*	• *Reduced nb of errors in covenant calculation reports.* • *Reduced timing of financial reporting.*

6.2.3. Medium/Lower priority actions

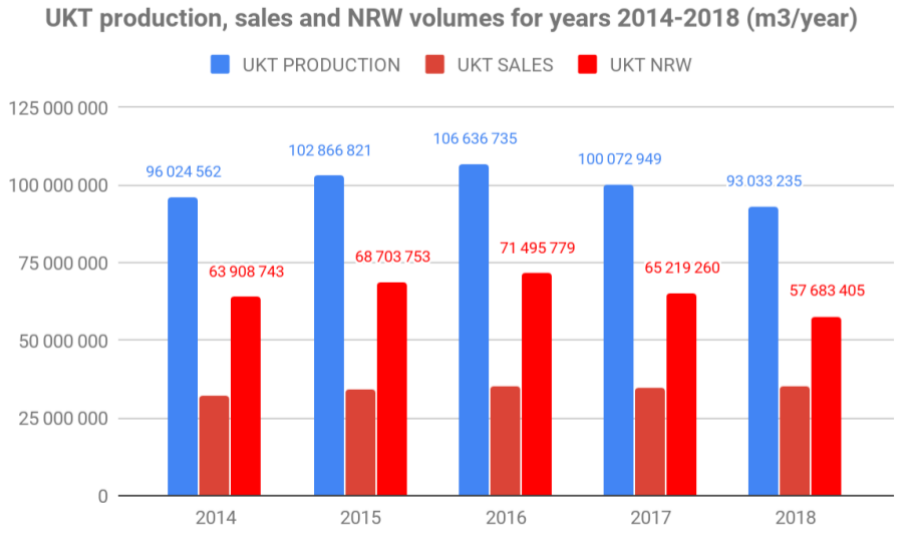
The following table provides indications on a number of medium-long term recommendations to further develop the Financial Management and Accounting function according to the approach of continuous improvement.

#	AREA	ACTION	BRIEF OBJECTIVE OF THE MEASURE	UKT TEAM IN CHARGE OF IMPLEMENTATION	FINAL OUTPUT EXPECTED AND KEY INTERMEDIARY MILESTONES	EXPECTED TIMELINE FOR IMPLEMENTATION	ROUGH COST ESTIMATE
1	Finance / Accounting	Train staff on IFRS compliance	In order to increase productivity of Economic Department, align goals and implement a learning culture within the organization we recommend that UKT develop training manuals on IFRS conducted by the external consultant in charge of IFRS manual development, organize continuous trainings workshops and establish training evaluation process.	Economic Department	Increase know how of the employees involved in the process in relation to IFRS manul and IFRS requirements.	Q2 2020 and each Q3 20XX	Providing continuous trainings and participatory workshops to employees of UKT by the external consultant engaged could reach an approximate cost of 6 thousand EUR.
2	Finance / Accounting	Adjust equity for revaluation reserve and fixed assets	In order to comply with IAS 16 requirements for equity revaluation reserve and increase accuracy of financial information presented in the financial statements of UKT we recommend UKT to take necessary steps to adjust the revaluation reserve in accordance with IAS 16.	Economic Department	Compliance with IFRS 16 Property, Plant and Equipment	Q1 2020	If a commitment from external consultant is evaluated necessary in the process an estimate of 5 thousand EUR
3	Finance / Accounting	Identify and procure a dedicated fixed asset register tool/software, with interface with the maintenance teams	In order to increase efficiency in depreciation recalculation and produce automatic monthly reports for fixed assets we recommend UKT to develop asset management procedure and procure a software database for fixed assets.	Economic Department	Fixed asset register/ software will incerase efficiency of reports produced in relation to PPE and adequacy of	Q1 2020	Cost of purchasing a fixed asset software estimated to 14 thousand EUR.
4	Finance / Accounting	Procure and install a dedicated procurement monitoring IT software (could be a module under Navision)	To allow a more systematic approach to Procurement with dynamic follow up, generation of key ratios and proactive budgeting. IT procurement plateform should be integrated with the budgeting/accounting system.	Procurement Department	Deployment of an IT tool for integrated procurement monitoring	Q1 2022	Technical specifications of procurement IT software to be determined but cost estimate is around 75K EUR to purchase the license and about 12K Euros of annual maintenance costs
5	Finance / Accounting	Develop a Procurement Strategy for UKT, in compliance with National regulations and fostering cost optimisation	Realizing the potential value of the UKT procurement function to align procurement with the organization's broad agenda and a focus on reducing and controlling costs	Procurement Department	UKT Procurement strategy including guidelines for cost optimisation	Q1 2021	Can be done internally

7. Network Performance

7.1. Summary of key findings

The analysis of corporate production and sales data, for the last 5-year period (2014-2018), show that after an increase in 2015 and 2016, NRW levels have reached their minimum in 2018 with water losses at 57.7 Mm^3/year, or 62% of production input.



7.1.1. Water Production

Average daily production is approximately 255 000 m^3/day in 2018, out of which 51% is from Bovilla WTP, 35% from various springs (Shen-Meri, Selite, etc.) located in the mountains surrounding Tirana and the remaining 14% from various boreholes (Berxull, Laknas, etc.) located all across the UKT service perimeter.

In 2018, approximately 57% of production was measured (53.2 Mm^3) and 43% was estimated (39.8 Mm^3) while approximately 83% of sales were measured (29.4 Mm^3) and 17% were estimated (6.0 Mm^3).

7.1.2. Non-Revenue Water and continuity of supply

Water losses per kilometre of network in 2018 stand at **78 m^3/km/day**, more than 5 times the upper limit for this key performance indicator (widely used by water utilities in addition to the network efficiency). The value above which the overall performance of the system is considered to be critical for the sustainability of water supply operations is **15 m^3/km/day**.

Another KPI that can be used for NRW performance monitoring is losses per connection in litres/connection/day, which in 2018 for UKT reaches **625 litres/connection/day** (for approximately 252 000 connections). **Note:** this KPI has been calculated in this report using the total number of customers instead of the total number of connections, data not yet made available by UKT at the time of this report draft edition.

Due to the urban structure of Tirana, with many customers living in multi-storey buildings, i.e. one water supply connection for many UKT customers, the final value of this KPI would be higher than 625 litres/connection/day.

Corporate NRW levels and performance indicators for UKT service perimeter in 2018

Production (Mm^3/year)	Sales (Mm^3/year)	NRW (Mm^3/year)	NRW (%)	Network length (km)	Customers (-)	Losses per kilometre (m^3/km/day)	Losses per customer (litres/customer/day)
93.0	35.4	57.7	62%	2 027	252 260	78	625

Current UKT NRW corporate levels are linked to the operational conditions prevailing in the service perimeter, i.e. with most distribution areas experiencing intermittent supply. UKT network operations are managed with two seasonal supply schedules, one for winter and one for summer, applied to 16 main distribution areas with a maximum of three daily supply shifts depending on the reservoir storage capacity (current UKT reservoirs have approximately a total capacity of 100 000 m^3).

UKT customers get currently an average of approximately 10 hours per day of supply in summer and 14 hours per day of supply in winter.

The intermittent supply and the low operating pressures prevailing in some of the main distribution areas are the two reasons why UKT customers are equipped with individual storage roof tanks. Recent buildings have common underground storage tanks with booster pumps to supply the apartments.

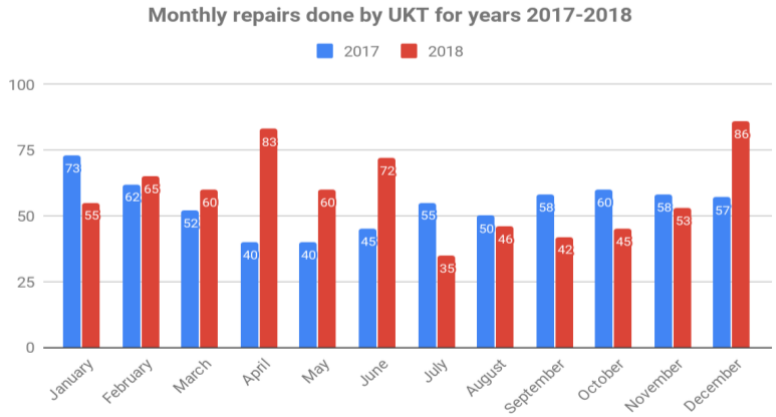
Some old buildings have booster pumps connected directly to the water supply network in areas where operating pressures are not high enough for water to reach the individual storage roof tanks.

Customer storage tanks in Tirana and booster pump connected directly to UKT network

7.1.3. Leak detection, network conditions and performance monitoring

UKT does not perform any active leakage control activities as the current organization has no dedicated staff and equipment for this. Repair interventions are therefore focused into fixing visible leaks only.

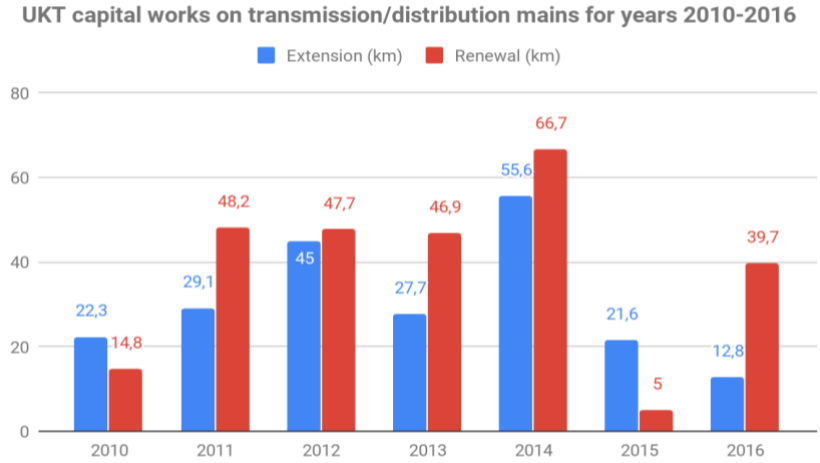
The yearly amount of repairs registered in the UKT activity reports is **650 in 2017** and **700 in 2018**.



There is no distinction made in the activity reports between repairs done on service connections and repairs done on transmission/distribution mains. There is no classification of repairs by DN and material. UKT operational reporting on interventions is therefore not detailed enough in order to help refining the yearly pipe replacement programme by identifying mains with high repair ratios.

The water supply network operated by UKT has a total length of 2 207 km, out of which 157 km are considered transmission mains and 1 870 km are classified as distribution mains. 68% of the total network length is made of metallic pipes (steel, cast iron and galvanized steel). Recent capital projects for extension and renewal of the transmission/distribution mains are usually based on polyethylene pipes (HDPE).

Awaiting consolidated data for years 2017-2018 at the time of this report draft edition, previous data for years 2010-2016 show that UKT has almost followed a 50%-50% ratio in capital works for extension (total of 214 km) and reconstruction (total of 269 km) of transmission/distribution networks.



The period 2010-2016 shows that UKT network renewal capital works have included the reconstruction of an average of 38 km per year, i.e. 1.9% of current total network length, which is very close to the industry standard practice of 2.0% per year for mature water supply infrastructure.

For the upcoming years, the average length per year for renewal works will probably have to be increased in order to clear the current backlog on transmission and distribution mains in poor conditions (such as steel, cast iron and galvanized steel pipes prone to corrosion and leakage), to avoid an important increase of NRW levels when new production resources such as Bovilla WTP extension (addition of 600 l/s) are put in service, which will increase the continuity of supply and operating pressures in the system.

Permanent flow and pressure monitoring points are nonexistent in the current service perimeter, besides the flowmeters installed at Bovilla WTP for raw and treated flow monitoring. UKT has engaged capital resources into a citywide SCADA project with the aim of installing flowmeters, pressure sensors, water level sensors, etc. in critical locations of the system, to be connected to a SCADA platform required to improve current operational knowledge and management of the water production and distribution infrastructure in Tirana. The scope of works and technical specifications of the UKT SCADA project have not yet been provided for evaluation/analysis by the Consultant.

Besides the 16 main distributions areas currently operated by UKT, there is currently no additional network zoning into DMZ/DMA which could allow UKT to refine its water balance from a bottom-up approach as well as to monitor minimum night flows in areas with 24h/24h supply. UKT is currently undertaking a pilot project to implement the first DMA in the service perimeter with the technical support from Budapest Waterworks. No pressure management through PMAs is implemented despite the potential observed across the service area.

UKT has reached a critical cross-roads point where it will either require heavily increasing production capacity to sustain overall organic demand increase in the next few years and reach 24h/24h supply continuity, or improving the overall efficiency of the system by aggressively decreasing water losses while optimizing current production capacity (including the ongoing 600 l/s extension of Bovilla WTP).

Both will require heavy CAPEX but the reduction of NRW, not only constitutes an environmental priority for water resources protection, but presents also a potential of decrease of OPEX, giving a positive leverage effect to the Company for improving their service on the long-term, especially in a predictable context of rising energy costs which could impact UKT operations if the planned progressive decommissioning of existing pumping stations (ex: Qaf Moll) is not achieved in time.

Some initial NRW and IT projects are currently developed within UKT, however they lack a cohesive and integrated structure in order for them to help the Company creating a solid base for planning and managing a network efficiency oriented corporate programme including: hydraulic macro-zoning for the whole service area, implementation of DMAs/PMAs to monitor the distribution areas, pressure management, pipe renewal programme, refined water balance and KPIs calculations, etc.

7.2. FOPIP recommendations - Actions for implementation

7.2.1. Recommendations

Based on the initial assessment phase, a first set of recommendations were submitted to UKT in order to improve day-to-day management of its water supply network infrastructure and increase its performance.

Each one had a priority level (HIGH/MEDIUM/LOW). Based on the first list, SEURECA is proposing under this FOPIP report the following 4 high priority actions to be implemented by UKT, which could be considered by the Company as the 4 strategic pillars to progressively improve network performance in Tirana and surrounding villages under UKT management.

4 high priority actions to improve UKT network performance	
NET-1	Set-up operational leak detection and location teams
NET-2	Develop and implement UKT calibrated water infrastructure hydraulic model
NET-3	Carry-out the energy efficiency assessment of electromechanical assets
NET-4	Implement macro-zoning (DMZs) in UKT service perimeter and then split them progressively into DMAs, in parallel of a pressure management programme

7.2.2. Actions

The following section aims at describing in detail the actions that were identified as potential quick wins to improve UKT's operational performance in the area of network performance that could be implemented by UKT as soon as possible.

FOPIP Action - NET-1: Set-up operational leak detection and location teams
Action objective: in order to undertake corrective and preventive leak detection works in a service area with high water losses such as Tirana and surrounding communities, SEURECA recommends implementing a minimum of 2 leakage teams (i.e. 4 permanent staff) in UKT Operations Directorate.
Description of the action: as mentioned in the initial report, **UKT doesn't perform any active leakage control activities**. The current internal organization has no dedicated staff and equipment for this. **Repair interventions are therefore focused into fixing visible leaks only** (700 repairs reported in 2018). Even though the conditions in UKT service area are not yet fully adequate to undertake intensive electroacoustic leak detection across the whole network (the two main current operational constraints are

the intermittent supply and the low pressures prevailing in some of the main distribution areas), SEURECA considers that **it is crucial for UKT to start as soon as possible building up its internal task force for NRW reduction**, furthermore for the technical human resources that will deploy the corporate NRW strategy on the field and therefore need to be identified among current staff, trained and equipped properly.

New production resources such as Bovilla WTP extension (addition of 600 l/s in the current plant capacity extension project) will increase the continuity of supply and operating pressures in the system, and therefore naturally increase the NRW levels if no counteracting plans are put in place. **Leakage teams equipped with electroacoustic leak detection equipment are one of the pillars to maintain and decrease water losses in UKT networks**, which have an important length ratio of metallic pipes.

Specific attention will be required in keeping an important grid of access points to the network such as valve chambers and fire hydrants, on existing pipes and moreover on reconstructed pipes, as recent capital projects for extension and renewal of the transmission/distribution mains are usually based on polyethylene pipes (HDPE), less suitable for electroacoustic leak detection.

Workload allocation for UKT leakage teams will focus on:

- Corrective actions such as pinpointing the source of visible leaks, detecting invisible leaks creating pressure losses in specific areas of the network and undertaking leak detection surveys within the DMZs/DMAs when the minimum night flow has increased above specific trigger levels;

- Preventive actions such as undertaking leak detection surveys to inspect X% of the network each year, focusing first on DMZs/DMAs with the worst performance indicators in terms of water losses.

The proposed number of leakage teams will allow having flexibility and complementarity between preventive and corrective leak detection and location efforts. However, it will naturally lead to more visible and invisible leaks being reported to UKT operations staff for repair, which will require additional efforts from current intervention teams. The whole process and related workflows for leak repairs, as well as staff training and adequate equipment, will therefore need to be streamlined to increase performance to tackle the increasing amount of repairs that UKT will face in the next few years.

The leakage teams should work during night shifts to improve the quality of surveys. Considering a minimum coverage of 2.5 km per night per team and 4 nights per week, **the 2 teams could cover at least around 20 km of network each week for preventive network surveys**.

Each team should be equipped with the following equipment:

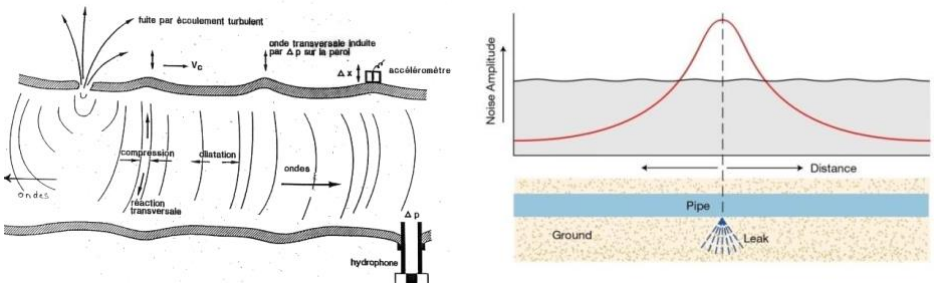
- 1 full set for electroacoustic detection such as the SEWERIN AQUAPHON A100 or equivalent from other suppliers (PRIMAYER, SEBAKMT, etc.);
- 1 full set for electroacoustic correlation such as the SEWERIN SECORR 08 or equivalent from other suppliers (PRIMAYER, SEBAKMT, etc.);
- 1 full set for buried pipes detection such as the SEWERIN UTILITRACK or equivalent from other suppliers (PRIMAYER, SEBAKMT, etc.);
- 1 full set for buried valves detection such as the SEWERIN FERROTEC FT10 or equivalent from other suppliers (PRIMAYER, SEBAKMT, etc.);
- 1 full set for electroacoustic pre-locators (noise loggers) such as the SEWERIN SEPEM or equivalent from other suppliers (PRIMAYER, SEBAKMT, etc.);
- 1 PC and smartphone/tablet enabled with UKT GIS;
- Protective personal equipment (PPE), road safety equipment, etc.;
- Intervention vehicle dedicated exclusively for the leakage teams.

Example of equipment to be procured for the leakage teams

Example of intervention vehicle to be procured for the leakage teams

Example of leakage teams working on site using electroacoustic detection and correlation

Why electro-acoustic leak detection: a water leak generates a characteristic noise, in a given frequency range, causing the pipe material to vibrate. This noise depends, among other things, on the type of leak, the service pressure, the material of the pipe, etc. This noise is transmitted to both sides of the leak point along the pipe, with a maximum amplitude directly at the breaking point and a gradual attenuation as it moves away from it. This attenuation is faster in non-metallic or slightly rigid pipes (PVC, PE) than in metallic or rigid pipes (cast iron, steel, asbestos-cement).



Schematics showing the principles of propagation of noise caused by a leak in the pipe

It is important to note that not all leaks produce a noise detectable by the leakage teams. The technician ability to accurately detect and locate leaks is closely linked to the experience and time spent in the field to gradually refine its ability to listen to leak noises in water networks. This confirms the need for UKT to start implementing the proposed leakage teams with the proper training and capacity building programme.

Electroacoustic leak detection can be adversely affected by the following operational and environmental factors, some of which have been observed in UKT service perimeter:

- Predominance of non-metallic materials (PVC, PE) in networks, as these materials very quickly reduce leak noise along the pipeline;
- Low operating pressures below 1.0 bar to 1.5 bar (the leak flow and therefore the leak noise increases with pressure);
- Lack of network access points (valves, hydrants) for direct listening or installation of accelerometers for acoustic correlation;
- Lack of knowledge of pipe routing and network structure (incomplete, erroneous or non-existent network drawings) as well as distribution mains built on private land (no access);
- Presence of a high water table around the inspected pipes or clay soils soaked with water;
- Inspection of networks in a noisy environment such as near large vehicular traffic axes;

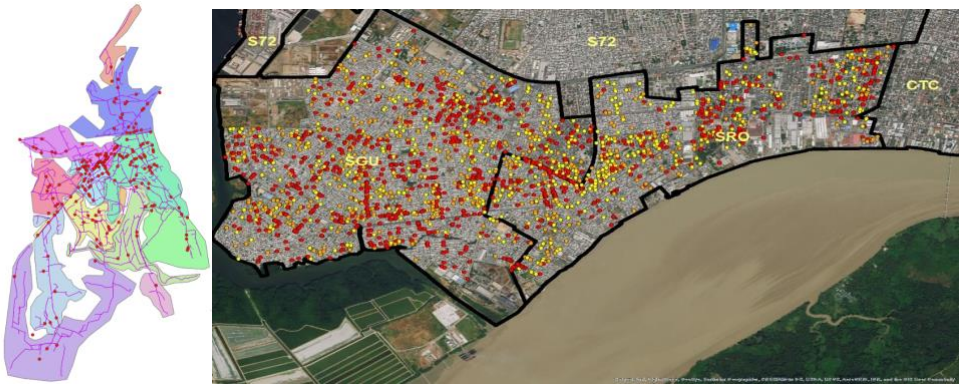
Due to their continuous presence on the field working on the water networks, leak detection and repair crews are a valuable asset for managing GIS infrastructure updates following the detection of anomalies in drawings and O&M problems in network assets.

If the UKT leakage and repair teams observe in the field an undocumented asset (pipe, valve, hydrant, etc.) or an error in the network drawings, a reporting process should be established to transmit the data to the UKT GIS team for updating the GIS database content. Specific digital forms should be created and their use would be facilitated in situ thanks to tablets or smartphones, as proposed in the equipment list.

The use of tablets or smartphones and specific digital forms will facilitate and make more reliable the process of collecting, reporting and archiving operational data linked to leak detection and repair activities.

Digital forms should be created for the following events: detection of visible leaks, detection of invisible leaks, scheduled supply interruption, temporary flow/pressure measurements, customer meters that must be replaced after a leak detection campaign, step-testing of DMAs (sub-sectorization to identify the areas of the sector that concentrate most of the minimum night flow and therefore leaks), drop-testing of DMAs (verification of the hydraulic tightness of the sector to validate boundaries and identify unmapped network interconnections), leak repair intervention, etc.

The digitization of the forms will also allow providing data for the GIS team to map interventions on pipelines and connections (and consequently improve the data available for the asset management of the networks and the definition of pipeline replacement plans). Combining NRW and repair KPIs per DMZs/DMAs will enable ranking areas to optimize the CAPEX used for the pipe renewal programme by selecting those with high levels of losses per km as well as high frequency in breakdowns and repairs.



Example of leak repairs archived on GIS for multiple years in DMZs/DMAs

Period	*Tasks*	*Entity responsible*
Q1 2020	**Preparation of technical specifications and tender documents** for the leak detection and location equipment required for 2 teams	UKT

	Identification of suitable internal candidates to be trained as staff for the leakage teams	
Q2 2020	**Procurement process** for the leak detection and location equipment required for 2 teams, including provision for initial training by the selected supplier	UKT
Q3 2020	**Completion of internal recruitment**, reception of procured equipment and launch of training sessions	UKT
Q4 2020	**Launch of preventive leak detection surveys** to inspect X% of the network each year Option: a one-year technical and operational assistance from an NRW reduction specialized firm could be considered to provide intensive on-the-job training to the UKT leakage teams in addition to the supplier training	UKT

Cost and Benefit Analysis

Costs:

- *Estimated CAPEX: ~60k€ per team (x2) / ~120k€ in total*
- *Estimated OPEX: 4 FTEs (Full-Time Equivalent), to be recruited among current operations staff. Staff grading to be determined to evaluate recurrent HR OPEX in k€/year. ~5k€ for equipment maintenance and spare parts per year*

Benefits:

Estimated benefits: UKT efforts to decrease water losses are constant all year long and able to cover the entire service perimeter, while having staff available permanently for both corrective and preventive leak detection and location surveys

Performance monitoring

- nb of leaks detected per month/year (total/visible/invisible),
- time between detection & repair,
- nb of pipe repairs / 100km of network/year,
- nb of connection repairs / 1000 connections /year

FOPIP Action - NET-2: Develop and implement UKT calibrated water infrastructure hydraulic model

Action objective: in order to address short to mid term critical challenges for UKT network performance, and improve the decision-making process for planning and validating key investments to be done on the water supply infrastructure, SEURECA recommends developing the calibrated hydraulic model for the service area water networks and implementing under the Engineering Directorate the hydraulic modelling team (i.e. 2 permanent staff) in charge of its day-to-day use and regular update.

Description of the action: as mentioned in the initial report, **UKT has not yet developed the calibrated hydraulic model for its current water supply infrastructure**. The company is embarked on an intensive multi-year capital works programme, with the aim of extending and rehabilitating the networks while improving its service levels: target of 24h/24h supply continuity, increase of pressures in certain areas, overall reduction of NRW, improve water quality, etc.

The overall strategy is also considering the decommissioning of current boreholes and related pumping stations by strengthening the network backbone of gravity trunk mains and increasing the storage assets in number and capacity, in order to convey, store and distribute the increased production at Bovilla WTP and the current production from Shen Mari and other springs.

Another pillar of UKT future network performance monitoring and improvement is the implementation of DMZs/DMAs and PMAs: hydraulic zoning and pressure management will be important tools to strengthen future operations and to reach the NRW targets required for UKT financial sustainability.

SEURECA is convinced that the success of all the above actions is strongly related to the UKT ability to improve its current portfolio of operational tools and systems, among which the calibrated hydraulic model is one of the most important ones.

The first version of the model should be the strategic model with the following objectives:

- Carry out a first technical hydraulic audit of the current water supply infrastructure to identify critical problems on the backbone network and define solutions to eliminate or alleviate them;
- Accelerate strategic decision-making processes such as short and medium term investments to improve the distribution service levels (continuity, pressure, quality) and optimize operating costs (pumping energy);
- Assist in the definition of network sectorization and pressure management programmes;
- Planning long-term works such as network extensions for new urbanizations or commercial/industrial areas, and resize areas of existing networks selected for rehabilitation;

The first version of the model should be built based on current network drawings (AUTOCAD), field visits of main above ground assets (treatment plants, well fields, pumping stations and storage tanks) and the customer database geolocation and consumption data for water demand spatial allocation.

Contribution of Operations Directorate will be crucial to validate the hydraulic structure of the first version of the model to ensure that the modelled backbone infrastructure is correct in terms of geometry and asset technical attributes.

Example of network structure digitized from paper to GIS and then to hydraulic model

The main challenge for the accuracy and representativity of the strategic hydraulic model will be the availability of operational data for the calibration process, i.e. measurements over several days and at defined time steps of flows, pressures, reservoir water levels, ON/OFF status of pumps, etc.

Temporary measurements should therefore be undertaken at selected critical and representative locations of the backbone infrastructure included in the hydraulic model. Contribution of Operations Directorate will again be crucial to validate the results of the calibration process to ensure that model results are similar to the observations made in the field by operational staff. Once the calibrated strategic model is validated, it can be used to design and model new capital works such as new trunk mains, new storage tanks, etc.

The strategic model should then be progressively refined by the hydraulic modelling team **to include the detailed network structure within the main distribution areas**, as well as new capital works completed during the construction and calibration of the first version.

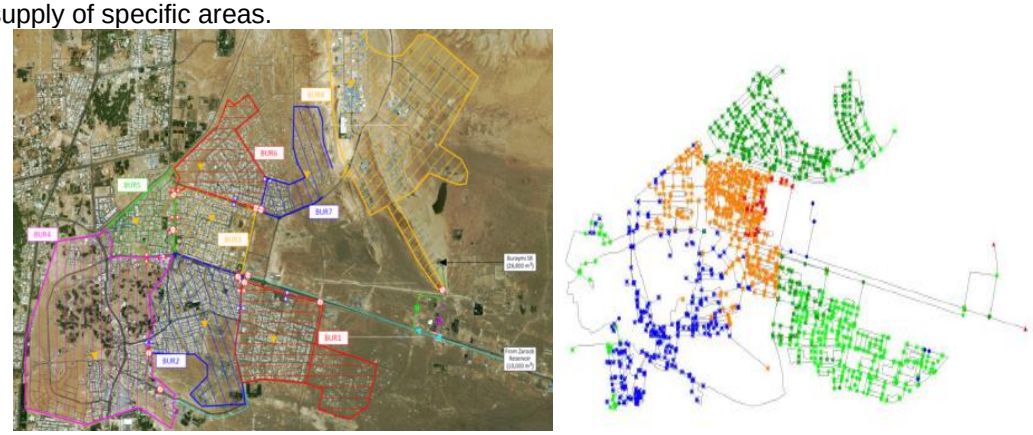
Example of hydraulic model refining over time to include smaller distribution mains

By moving down one level from the strategic model, the next step in the calibration process will be to address the secondary distribution networks.

The calibration of these areas should be done gradually by prioritizing first the hydraulic sectors integrated into a 24-hour water supply. Specific temporary flow and pressure measurements will be required area by area for the calibration process.

The refined hydraulic model can then be used to:

- Design hydraulic sectors (DMZs and DMAs) based on the current location of production and distribution areas, following the IWA design guidelines;
- Optimize the number of inlet/outlet flow and pressure monitoring points and closed boundary valves to limit the number of flowmeters to 4 per hydraulic sector (if feasible);
- Define pressure zones taking into account the influence areas of storage tanks and the direct pumping against the network, as well as the objective of avoiding mixing surface and underground water sources among them;
- Identify points where network interconnections need to be built to strengthen and/or alleviate the supply of specific areas.



Example of hydraulic model used to design sustainable DMZs/DMAs in a water supply network

In hydraulic sectors where high operating pressures are identified (in the hydraulic model and with field measurements), **UKT should use the model to study the possibility of creating new pressure zones with pressure reducing valves (PRVs)** for sectors where the cost-benefit analysis is appropriate. The selection of the type of PRV and the value of the downstream control pressure will be based on a minimum pressure objective to be always maintained at the critical point of the sector. The PRVs will allow reducing the flow of leaks and the frequency of breakdowns in pipes and connections in the pressure regulated sector.

Example of PRVs installed at the inlet of DMAs to regulate the inlet pressure to the area

Finally, the calibrated hydraulic model will be useful for other operational needs such as the definition of UKT emergency response plan, the planning of major water supply shutdowns in order to integrate new assets or carry-out repairs on trunk mains or the modelling of water quality across the whole service area (ex: chlorine decay from Bovilla WTP to end-users).

Period	***Tasks***	***Entity responsible***
Q1 2020	**Preparation of technical specifications and tender documents** for the hydraulic modelling software and IT hardware required for 1 team **Identification of suitable internal candidates** to be trained as staff for the hydraulic modelling team **Preparation of technical specifications and tender documents** for the hydraulic measurements to be done on the backbone network for calibration data (flows, pressures, etc.)	UKT
Q2 2020	**Procurement process** for the hydraulic modelling software and IT hardware required for 1 team, including provision for initial training by the selected supplier / **procurement process** for the hydraulic measurements to be done on the backbone network for calibration data (flows, pressures, etc.)	UKT
Q3 2020	**Completion of internal recruitment**, reception of procured hydraulic modelling software and IT hardware and launch of training sessions **Launch of construction of strategic hydraulic model** by UKT hydraulic modelling team **Launch of hydraulic measurements** to be done on the backbone network Option: a one-year technical and operational assistance from a hydraulic modelling specialized firm could be considered to provide intensive on-the-job training to the UKT hydraulic modelling teams in addition to the supplier training	UKT
Q4 2020	**Launch of calibration of strategic hydraulic model** based on the hydraulic measurements and **initial technical audit of network performance**	UKT

Cost and Benefit Analysis

Cost:

- *Estimated CAPEX: ~40k€ per team (x1) / ~40k€ in total*
- *Estimated OPEX: 2 FTEs (Full-Time Equivalent), to be recruited among current engineering staff. Staff grading to be determined to evaluate recurrent HR OPEX in k€/year. ~10k€ per year for software maintenance. 150 k€ one-shot for the hydraulic measurements*

Estimated benefits: UKT will be able to define and design to cost its capital works programme on the water infrastructure thanks to the calibrated hydraulic model, while improving the operational knowledge on current network performance and detecting current technical shortcomings on the infrastructure.

Performance monitoring

% coverage of total network included in the up-to-date calibrated hydraulic model in use in UKT Engineering Directorate

FOPIP Action - NET-3: Carry-out the energy efficiency assessment of electromechanical assets

Action objective: UKT total energy consumption in 2018 reached approximately 23 475 MWh, with energy OPEX contribution reaching 357 million ALL or almost 3 million € (this expense including cost for active, peak and reactive energy consumption).

Even though UKT mid-term corporate strategy has considered the decommissioning of Qafë Moll pumping station, through the construction of a new gravity transmission system for the water from Shen Mari springs, and most of the boreholes, thanks to the multi-stage extension of Bovilla WTP, it should consider undertaking the evaluation of potential energy savings on the existing electromechanical assets, for the scenario where they need to be kept in operation longer than planned (reasons: deferral of capital works for Shen Mari project, water demand projections that require to maintain borehole production).

SEURECA recommends to UKT to undertake the energy efficiency assessment of current electromechanical assets to identify pumps with poor energy performance that could be replaced and ensure quick-wins in energy OPEX reduction.

Description of the action: 56% of UKT total energy consumption (13 055 MWh in 2018) is related to the daily operations of Qaf Moll pumping station. This UKT site is equipped with 7 high-lift pumps used to transfer water from the Shen Mari springs from an elevation of 740 m to an elevation of 950 m before its flows by gravity towards Tirana.

Energy consumption per cubic meter for Qaf Moll pumping station is therefore approximately 1.075 kWh/m^3 in 2018 when considering the production figures provided by UKT for this site (12.2 Mm^3/year).

Concerning the boreholes, the three main production sites are:

- “STACIONI LAKNAS” with 1.8 Mm^3 in 2018;
- “STACIONI BERXULL” with 2.7 Mm^3 in 2018;
- “STACIONI PISHINA” with 3.2 Mm^3 in 2018;

Energy consumption per cubic meter calculated for the above groundwater production sites is:

- for “STACIONI LAKNAS”: around 0.690 kWh/m^3 (energy consumption of 1 250 MWh in 2018);
- for “STACIONI BERXULL”: around 0.490 kWh/m^3 (energy consumption of 1 320 MWh in 2018);
- for “STACIONI PISHINA”: consolidated data for 2018 energy consumption not available;

It is difficult using benchmarks to compare UKT energy consumption per cubic meter with other water utilities as it is strongly related to local operational conditions. The critical performance data to be monitored is however the pump specific energy consumption in Wh/m^3/mwc to assess the efficiency of the pumping group (pump + motor) and determine if and when it needs to be replaced in order to decrease energy OPEX.

As per interviews with UKT water operations staff, this yearly assessment is not done currently within the organization. Specific energy is the quantity of energy required by the pumping group to lift 1 m^3 of water at 1 metre elevation. It is calculated as shown by the formula below:

$$\text{Specific Energy}\left[Wh/m3/mwc\right]=\frac{\text{Active Power}\left[kW\right]\times 1000}{\text{Flow}\left[m3/h\right]\times\text{Total Head}\left[mwc\right]}$$

To convert specific energy into efficiency percentage, the following formula can be used:

$$\text{Efficiency}\left[\%\right]=\frac{2.725\times 100}{\text{Specific Energy}\left[Wh/m3/mwc\right]}$$

Reminder: 100% efficiency corresponds to 2,725 Wh/m^3/mwc, 80% efficiency to 3,406 Wh/m^3/mwc, 60% efficiency to 4,542 Wh/m^3/mwc, 40% efficiency to 6,813 Wh/m^3/mwc…

Best practices require to undertake flow, pressure and active power measurements for each pump to determine its specific energy (active power is the power consumption by the pump and the motor).

Once specific energy has been determined for each pump, energy savings can be calculated (amount of energy saved if the current pumping system is replaced by a new one of better performance). The yearly financial gains can be compared to the costs of investment to replace the pump, as a payback time.

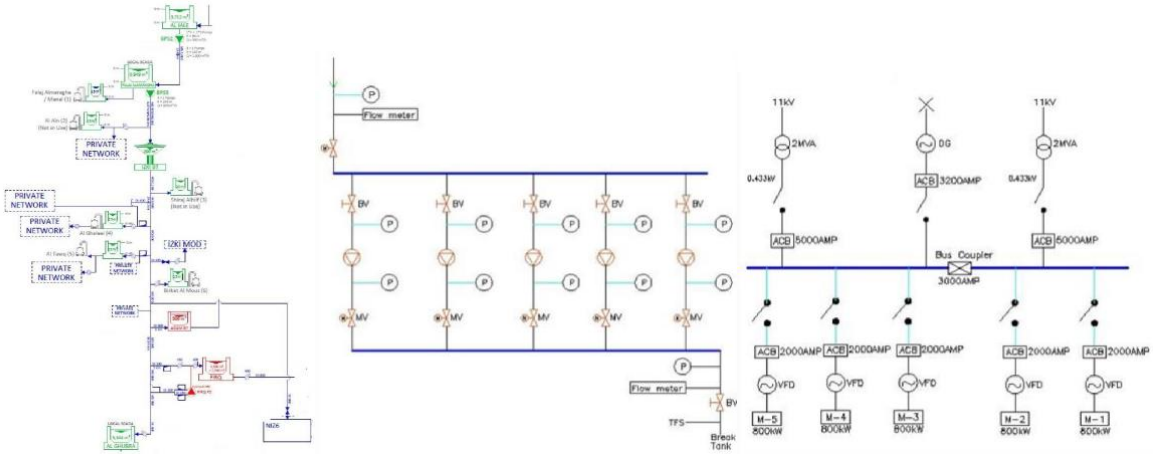
The energy gain depends on the specific energy targeted for a new pumping group which is highly dependent on nominal flow. Energy gain depends also on the following parameters: yearly average pump run hours per day and cost of energy kWh.

Payback time is the time after which the investment is reimbursed thanks to energy gain (operational savings / investment costs). It depends on the following parameters: yearly energy gain, cost of investment (including hydraulic and electrical equipment to be replaced) and cost of manpower for replacement works.

This assessment is important for UKT as many production sites are working in a degraded operational mode and therefore might not be energy efficient anymore. Energy OPEX are currently amongst UKT top cost centres, close performance monitoring of pumps would allow avoiding any leap forward which could be harmful in case of a raise in energy prices over the next few years.

It is recommended that UKT implements the following technical methodology, starting with a phase of diagnosis and technical analysis (hydraulic and energetic) of the targeted pumping stations and well fields (Qaf Moll first, then Pishina, then Berxull, etc. from the largest energy consumer to the smallest).

It starts with a detailed mapping and inventory of the pumping station and its electromechanical and electrical assets, based on the initial data collection (digital and paper drawings, asset descriptive sheets) and its field verification for completeness and correction of the information. The data can be visualized in various formats: P&IDs, PFDs, SLDs, electrical schematics, etc. Other data should also be analyzed such as the historical operational data (electrical billing, pumped volume, etc.) and the current operational scheme of the station.



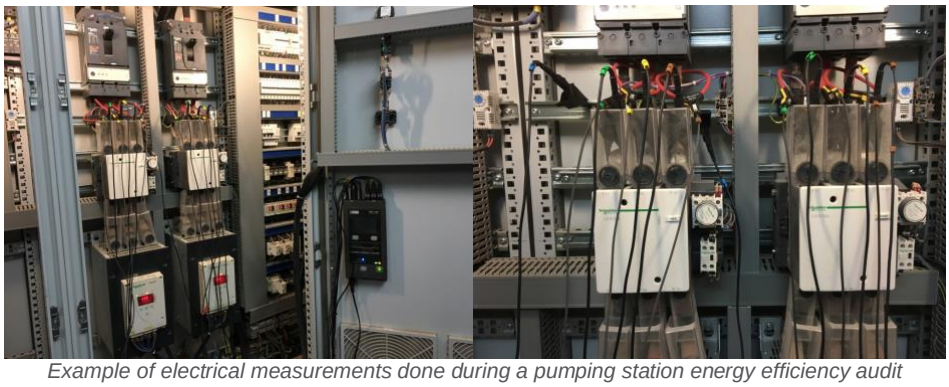
Example of hydraulic diagram, P&ID and SLD of a pumping station

Information collected in the field by UKT engineering and operational staff should be the following (non-exhaustive list):

- Pumping station: number/characteristics of discharge/suction lines, altimetric dimensions, number of pumps installed, number of pumps in operation/stand-by, regulation with frequency variators and with shut-off valves, automated or manual operation, etc.;
- Pumps and motors: brand, model, nominal flow rate, nominal total head, nominal efficiency, NPSH, nominal speed, power, voltage, amperage, frequency, cosø, etc.;

- Electrical equipment: number of transformers, capacity, primary and secondary voltages, electrical instrumentation available for the station and for each pump, etc.;

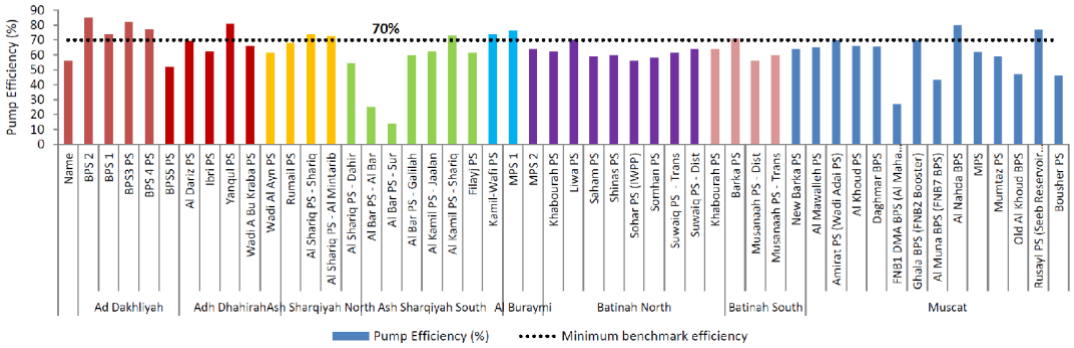
Hydraulic and electrical measurements shall cover, where feasible, the following parameters: flow rate, suction pressure, discharge pressure, V, A, kW, kVA, kWh, kVAh, kVAR, kVARh, cosø, Hz, vibrations, speed with tachometer, thermography. They will be more or less long depending on the type of operation of the pumping station: there will be fewer measurement combinations in a station that pumps directly from one tank to another tank than in a station that pumps directly to the network, due to the variation of the pumped flow between one configuration and the other.



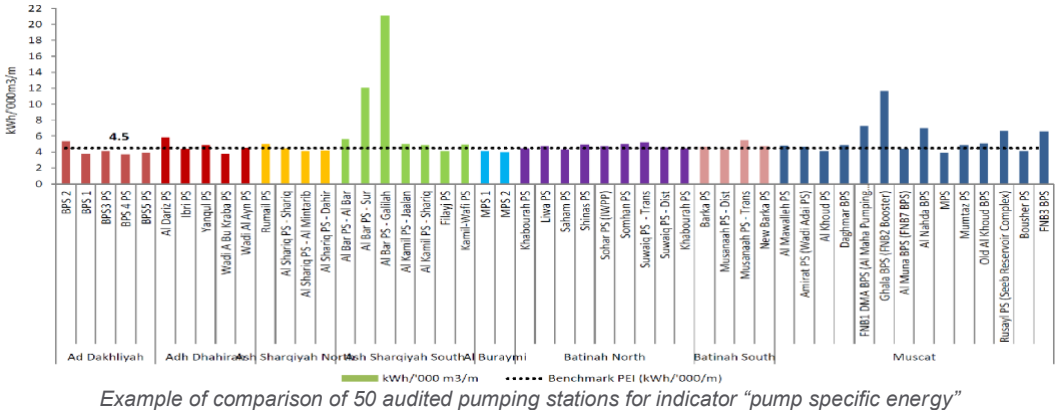
Example of electrical measurements done during a pumping station energy efficiency audit

Data collection and field measurements will allow calculating the energy efficiency performance indicators: real efficiency versus theoretical efficiency (in %), energy consumption per cubic meter pumped (in kWh/m^3), specific energy consumption per cubic meter pumped (in kWh/m^3/m), reconstruction of the pump curves (total manometric height versus flow), etc.

The baseline of the energy efficiency performance indicators mentioned above, and their comparison with reference values, will allow the identification of pumping stations and well fields that need to be intervened quickly to optimize energy consumption.



Example of comparison of 50 audited pumping stations for indicator "pump efficiency"



Example of comparison of 50 audited pumping stations for indicator "pump specific energy"

The team in charge of the energy efficiency audits should be composed of 2 staff, one from the Engineering Directorate and one from the Operations Directorate.

Period	*Tasks*	*Entity responsible*
Q1 2020	**Preparation of technical specifications and tender documents** for the energy efficiency equipment required for 1 team **Identification of suitable internal candidates** to be trained as staff for the energy efficiency team	UKT
Q2 2020	**Procurement process** for the energy efficiency equipment required for 1 team, including provision for initial training by the selected supplier	UKT
Q3 2020	**Completion of internal recruitment**, reception of procured equipment and launch of training sessions **Important Note:** the energy efficiency team is not a full-time team. It could be mobilized to support the yearly asset management programme and based as suggested above on one staff from Engineering Directorate and another from Operations Directorate	UKT
Q4 2020	**Launch of energy efficiency audits** focusing initially on Qaf Moll, Pishina, Berxul, etc., and preparation of energy OPEX reduction action plans	UKT

Cost and Benefit Analysis

Cost - estimated CAPEX: ~20k€ per team (x1) / ~20k€ in total

Cost - estimated OPEX: 25% of 2 FTEs (Full-Time Equivalent), i.e. 3 months per year, to be mobilized among current engineering and operations staff. Staff grading to be determined to evaluate recurrent HR OPEX in k€/year

Estimated benefits: progressive reduction of energy OPEX before deployment of key capital works (new trunk mains and storage reservoirs, tunnel for Shen Mari spring) and decommissioning of pumping stations

Performance monitoring

At pumping station level: Pumped volume and energy consumption (active, peak, reactive) on a monthly basis and based on actual measurements

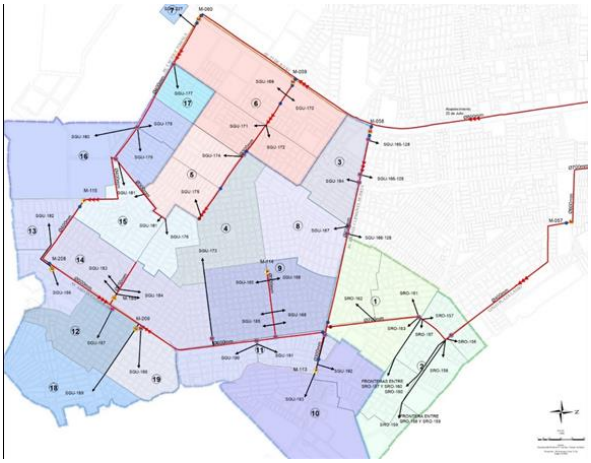
At pump level: Number of hours in operation on a monthly basis and based on actual measurements

KPIs: Wh/m^3 for each PS, efficiency and Wh/m^3/m for each pump

FOPIP Action - NET-4: Implement macro-zoning (DMZs) in UKT service perimeter and then split them progressively into DMAs, in parallel of a pressure management programme

Action objective: in order to refine top-down water balance calculations geographically and improve overall operational network monitoring in liaison with the future SCADA system, SEURECA recommends splitting Tirana water system into several isolated hydraulic macro-zones (DMZs) with proper flow, pressure and telemetry equipment, followed by a division of each DMZ into several DMAs.

Description of the action: the feasibility, preliminary and detailed design studies for the macro-zoning of the Tirana water system should be conducted thanks to a calibrated hydraulic model (currently not available within UKT) to be deployed in priority for the backbone structure of the water supply system across UKT service perimeter, and then refined towards secondary and tertiary networks.



These studies will be used to determine the optimum number of macro-zones, the instrumentation and telemetry equipment required (flowmeters, pressure sensors, GPRS and/or radiofrequency data logging and data transmission units), the installation and/or replacement of boundary valves needed, and related CAPEX for electromechanical and civil works. Operational data would be sent to the future UKT SCADA system. The future UKT hydraulic macro-zones would then be subdivided into DMAs: an example is shown in the map below for a network operated by VEOLIA with two hydraulic macro-zones divided into 18 DMAs for approximately 455 km.

The above example of hydraulic macro-zones and DMAs has been established to help monitor and tackle down NRW, which stands at similar levels as those from Tirana.

Considering hydraulic macro-zones between 100 km and 200 km, the initial estimate for UKT service area would be between **a minimum of 10 DMZs and a maximum of 20 DMZs**, the final amount being defined thanks to the hydraulic model.

Splitting DMZs into several DMAs will allow carrying-out bottom-up water balance calculations to effectively decrease physical and commercial losses and improve current allocation of financial and human resources for leakage management and reduction. Considering an average length of 20 km per area, UKT would target **a maximum of 100 DMAs** to cover the whole of UKT service perimeter. This could be achieved progressively over a 5-year period, i.e. 20 DMAs per year, to spread the CAPEX required for this strategic operational NRW project, as one of the pillars to reach 24h/24h supply in Tirana.

In addition, UKT design standards should include hydraulic zoning and DMA monitoring as technical requirements when building new extensions for the water supply network or rehabilitating specific supply areas in the city and surrounding villages.

In parallel of the hydraulic zoning, UKT should consider implementing pressure management areas: the average elevation in Tirana is 110 metres above sea level. Current reservoirs top water levels range from a minimum of 93 m.a.s.l. to a maximum of 226 m.a.s.l. The weighted average of reservoir capacity and related top water level shows that Tirana is mostly supplied from an average elevation of 185 m.a.s.l., which indicates that pressure management with PRVs in some areas of the service perimeter could be considered by UKT in order to decrease leakage flows and improve continuity of supply.

UKT has a grid of control points inside network manholes across the service area where staff can manually perform temporary measurements with pressure gauges on a daily basis. An example of pressure measurements done by UKT in main distribution area 1 (supply from " DAJT GURORE" reservoir - capacity 10 000 m^3) during summer days in May 2019 and June 2019 show operating pressures ranging from a minimum of 1.0 bar and a maximum of 6.2 bar depending on elevation and the time of day.

Pressure management would target to decrease operating pressures within the DMZs and DMAs for a:

- Reduction of flow rates for leaks and customers;
- Reduction of frequency of bursts and therefore requirements for repair interventions;

This would jointly lead to a reduction of excessive customer consumption due to high pressure (and less problems on customer internal plumbing fixtures), energy, repair and reinstatement costs, as well as to a deferral of pipe renewal investment thanks to extended asset life. It should be highlighted that a successful pressure management programme relies also on:

- The implementation and the enforcement within UKT of by-law regulations for minimum operating pressures to be provided 24h/24h for each customer at ground level;
- The definition and the execution of a customer-oriented communication plan to present and explain by-law pressure requirements in order for:
    - Customers to understand that pressure reduction will not decrease the quality of service, being aimed at decreasing leakage for common benefit;
    - Public and private urban developers to integrate the need for booster units to supply new multi-storey buildings as UKT would only supply the new structure with the by-law pressure (value to be determined);
- For existing multi-storey buildings, some customers located in the highest floor levels might be affected by the pressure reduction. By combining the use of a calibrated hydraulic model and building construction details (number of floors, number of apartments, etc.), UKT would be able to determine the structures that might require the implementation of a new or the preservation of an existing booster unit for the building.

UKT should target the integration of future DMZs/DMAs/PMAs flow and pressure data into the SCADA system while defining technical standards for all areas in terms of electromagnetic flowmeters, pressure points, PRVs, data logging and telemetry equipment, etc. in order to restrict the number of suppliers, bring uniformity to the overall measurement and control chain while facilitating maintenance efforts, and standardizing implementation works and IT integration to the SCADA system.

This action is strongly articulated with action n°2 “develop and implement UKT calibrated water infrastructure hydraulic model”, in terms of content and calendar.

The macro-zoning (DMZs), micro-zoning (DMAs) and pressure management programme (PMAs) should follow a standard engineering process, i.e. with feasibility, preliminary and detailed design studies, to be done in-house with cross-contributions from Engineering Directorate and Operations Directorate, and based on field visits, hydraulic tests and operational tools such as the hydraulic modelling and GIS to validate technical milestones along the engineering process.

Once the DMZs, DMAs and PMAs scheme is technically approved and multi-year CAPEX/OPEX budget is determined, UKT should move towards progressive implementation, starting with DMZs (electromechanical and civil works to be done over 1 year) and then DMAs (electromechanical and civil works to be done over 2 years). Pressure management areas can cover both DMZs and DMAs depending on the final hydraulic design.

Period	***Tasks***	***Entity responsible***
2020	Completion of action n°2 “develop and implement UKT calibrated water infrastructure hydraulic model	UKT
2021	Engineering and procurement process for the electromechanical and civil works required for the implementation of DMZs, DMAs and PMAs	UKT
2022 **2024**	2022: continuous implementation of DMZs 2023-2024: continuous implementation of DMAs	UKT
2022 **2024**	2022-2024: baseline assessment of physical and commercial losses at DMZ et DMA levels then detailed NRW reduction action plans area by area	UKT
Cost and Benefit Analysis *Cost - estimated CAPEX: ~50k€ per area (x120) / ~6M€ in total*		**Performance monitoring**

Estimated benefits: Improvement of the day-to-day operational monitoring for the water supply network *Performance assessment of macro-zones will allow better allocation of CAPEX (ex: pipe renewal programme) and OPEX (ex: leak detection and location) initiatives thanks to the refined geographical coverage*	*Progress of action could be monitored by calculating the % coverage of DMZs/DMAs of network length and customers.*

7.2.3. Medium/Lower priority actions

The following list of medium-long term recommendations was integrated into the above "action sheets" to further develop the Network performance function according to the approach of continuous improvement:

- After implementing the first DMZs, start the deployment of DMAs and PMAs with adapted design and implementation criteria as per the IWA best practices, and using the calibrated hydraulic model to breakdown DMZs into resilient DMAs;
- Initiate and refine DMZs/DMAs water balance calculations (real and commercial losses split) – use of UKT geotagged water delivery points and customer service billing database to define monthly billing per DMZ/DMA;
- Start geotagging visible and invisible leaks detected and repaired by UKT;
- Improve the reporting of repair interventions by increasing the number of reported attributes (material, DN, main/connection/valve, GPS coordinates, etc.) - interlink with GIS when available;
- Refine the corporate pipe renewal programme by using interventions data.

8. O&M and Asset Management

8.1. Summary of key findings

8.1.1. Asset management

A requirement for a successful asset management program is having sound and useful data.The underlying data that is used to make asset management decisions must be properly organised, easy to access and accurate. To ensure data accuracy, best-management practices must be employed in the collection, storage and dissemination of data.

The asset information in UKT is existent and usually in digital format mainly Word, Excel and Autocad. Even the existent information is disseminated by several departments without one common source or asset register database. The fact of having information disperse increases the difficulty of access to the information, for asset management, maintenance and capital investment planning. The research process of the information is time consuming of qualified personnel and when found the information still subsists doubts about the accuracy of the information.

The tool to support asset management is the CMMS which is a software package designed to maintain a computer database for an organization's maintenance operations intended to improve the effectiveness of maintenance, the quality of management decisions and the verification of regulatory compliance.

The main functions of a CMMS are :

- Organizing the assets into a hierarchical tree;
- Link the assets to their alphanumeric data;
- Create and schedule work orders for curative maintenance, linked to the assets;
- Organize preventive maintenance;
- Manage the human resources.

A CMMS is also used to manage the vertical assets (treatment plant, pumping stations). It can include a mapping interface. Moreover, some advanced GIS can provide the main functions of a CMMS as the management of work orders. The new generation of CMMS uses web and mobile technologies. It is also available in SaaS mode.

The main benefits of a CMMS implementation are :

- To get a database of all the assets in particular vertical, searchable, exploitable and shared with the whole service;
- To have data update features including from a mobile app;
- To ensure the traceability of the interventions on each asset and calculate adequate indicators (eg: asset availability rate, failure rate);
- To organize the interventions et to optimize the human resources (the good team in terms of skills, at the right place, with the appropriate equipment);
- To be able to use a decision support tool to prioritize renewal and investment priorities in order to optimize the CAPEX ratio / operational gains (network efficiency, failure rate for examples) and reduce maintenance costs of assets;
- Reduce corrective maintenance costs by implementing a preventive maintenance policy and monitor its efficiency with the appropriate indicators;
- Support stock management software which permits :

- The referencing of parts
- Management of entrances and exits of coins
- The financial valuation of the stock
- Inventory management (warning system on minimum level for example).

8.1.2. Risk Management

Risk management should be seen as the management of the utility such that the required levels of service are met while costs are minimized. The Risk review, level of maturity of the UKT is almost non-existent. Here the organization and the procedures need to be established from scratch. Failures are evaluated in function of its frequency and criticality.

Managing risks is a process that is initiated by identifying all risks that can adversely have an impact on any of the company's objectives. Once risks are identified they should be ranked according to their risk index. For those risks considered non-manageable the Utility mas proceed with the required corrective actions in order to mitigate them, optimizing this way its expenditures and contribute to increase confidence on the production facilities.

UKT performs informal condition review, based on visual inspections for AGA, the monitoring of UGA is limited to pressure measurements with a manometer, and monitoring of volumes supplied. The pressure measurements have as only objective checking if the area is being supplied as previewed on the operation plan.

The Department of Operations monitors the activities of repairs and maintenance teams with work orders. The Works order identify the equipment, locations and date of intervention recorded and registered, all information is stored in paper without any further treatment. Annually the information is reported only identifying the number of repairs per month. Is recommended to divide the information by type of work and include a report on the causes of the failure for for further analysis treatment by the technical department.

8.1.3. Standards

UKT does not have any official Operations Manual with standard operating procedures for each activity. However a few standards have been defined.

For water activities: the engineering department has developed standard drawings for water connections which specify: Materials, Type of fittings, Dimensions of regards, and The scheme of installation of fittings.

Despite the existence of these standard drawings, they appear not to be communicated to operational teams. For instance, during a site visit performed under this project, the engineer in charge of works was unaware of these standards and works on site were not compliant. Also the materials and fittings used on this rehabilitation were different from what is specified on the UKT standard.

8.1.4. Inventory Management

UKT has a centralized warehouse in charge of storage as well as vehicle's maintenance. The Head of the warehouse reports to the finance department, his team has one person in charge of the registration and two warehouse workers in charge of cross-checking all entries and exits with the requests.

In part of the warehouse, spare parts are not organised and stored in proper conditions (e.g. pipes are stored outside and exposed to sunlight). This issue was already highlighted in the assessment report.

The Warehouse manager provides the vehicles, tools, equipment and materials which the Operations Department requests through a specific form. All inputs and outputs of warehouse are registered on the warehouse software installed on a single desktop and accessed by the 2 assistants. This system is not

connected with the ERP, the information is therefore transferred on paper and data is updated on the ERP.

UKT has not defined minimum stocks for spare parts. Annual forecasts are prepared every November/December, submitted to the Finance Department for approval and then sent to the Procurement department for purchase. If unexpected procurement is necessary during the year, UKT has agreements with authorized suppliers that will provide the spare parts and be refunded on the following year.

8.1.5. GIS implementation

A Geographic Information System (GIS) is a computer software capable of organizing and presenting spatially referenced alphanumeric data. More generally, a GIS is an information system conceived to gather, store, process and analyse data. It is an essential information system for water utilities as it gathers and geolocates all the physical assets of the utility, enabling efficient management.

The implementation of a GIS makes it possible to establish an exhaustive inventory of horizontal assets and to set up procedures for updating data. It also allows cartographic data to be shared and distributed to all internal or external departments. It is a real foundation of a business information system.

Actually, the Engineering Directorate uses AUTOCAD software (a computer-aided design software were alphanumeric data is not stored in a database but simply represented as a drawing). This kind of software is adapted for construction purposes.

At the moment, UKT has an incomplete and inaccurate representation of its network under AUTOCAD, which is a key weakness for efficient utility management. Furthermore, there is no procedure for updating plans under Autocad and UKT does not have any means of knowing its current infrastructure with certainty.

The deployment of a proper GIS system should be considered a priority for proper asset knowledge and management. This implementation must be integrated into the global digital strategy of the information system.

8.1.6. Deploy a telemetry and a SCADA system to the entire perimeter

SCADA (Supervisory Control and Data Acquisition) is an industrial monitoring system that processes in real time a large number of measurements and remotely control installations as water facilities. As a central system for efficient management of water utilities, the deployment of a unified SCADA over the entire perimeter service allows:

- To supervise the operation of the system and thus improve the knowledge of the operational teams;
- To control the risks;
- To improve the quality of the service: increased responsiveness, anticipation of incidents;
- To improve safety and health;
- To reduce operational costs.

The deployment of a SCADA system requires substantial preparation including the development of the instrumentation and the remote management and automation of sites by the deployment of sensors and remote management satellites or even PLCs (e.g. Water level probe in the tanks, Water level probe in the boreholes, Continuous analyzers of water quality (chlorine, turbidity, etc), Pressure sensors, etc).

Currently, only the Bovilla Treatment Plant is equipped with a SCADA system while the rest of the system facilities (tanks, pumping station, boreholes) are operated manually. The Bovilla's automation can be improved by developing the PLC's programs and the SCADA and renew some continuous analysers.

Beyond the lack of automation of the facilities, the operational management has no vision, no reporting on the functioning of the sites, except for the Bovilla plant. Data acquisition is the basis for knowing and mastering how the water supply works precisely. It is a prerequisite for the development of many projects, including hydraulic modelling, which is essential for the implementation of service continuity.

8.2. FOPIP Recommendations - Actions for implementation

8.2.1. Recommendations

We are proposing selected high priority actions to be implemented in the FOPIP and which focus on the following areas:

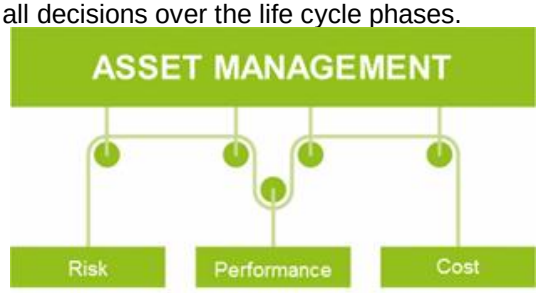
6 high priority actions to improve UKT O&M performance	
O&M-1	Develop and implement an integrated Computerized Maintenance Management System (CMMS)
O&M-2	Standardize O&M practices
O&M-3	Initiate risk management in O&M activities
O&M-4	Improve Stock management
O&M-5	Implement an integrated GIS system
O&M-6	Deploy a telemetry and SCADA system to the entire perimeter

8.2.2. Actions

The following section aims at describing in detail the actions that were identified as potential quick wins to improve UKT's operational performance in the area of O&M and Asset Management that could be implemented by UKT as soon as possible.

FOPIP Action - O&M-1: Develop and implement an integrated Computerized Maintenance Management System (CMMS)
Action objective: Modernizing UKT's asset and maintenance management system and increase the overall performance in this function. Deploying a program to monitor and optimize planned and unplanned maintenance. Introducing a tool to register and follow the maintenance activity, to improve the quality of service level. Creating value for the company and its customers leading to operational and financial performance.

Description of the action: Assets and Maintenance management needs to move from random visual inspections and run to fail to a solid asset management strategy. The asset management will empower UKT to ensure that all activities over the lifecycle of the assets are aligned with its objectives. It shall consider assets as a whole whose value and function must be maintained and strive to find the right balance between risk, cost and performance for all decisions over the life cycle phases.



Balance of Asset Management (source:Seureca)

The CMMS is an essential tool for managing and controlling the maintenance operations that are responsible for maintaining assets and reduce their failure with a direct impact on their operation availability. The implementation of the CMMS may be divided in 3 Phases.

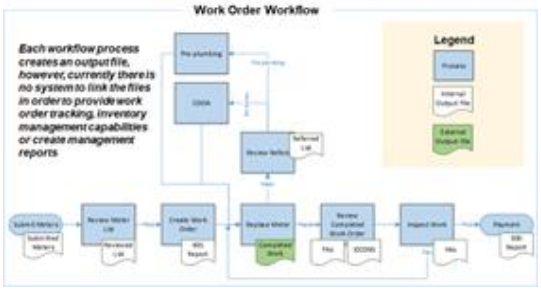
Phase 1 will be the development of an Asset Management Plan where UKT will:

- Identify all assets and components as equipment, sensors etc;
- Organise assets by asset type, asset system, etc,
- List the activities required by the suppliers to ensure the maintenance for each component;
- Identify the resources available and required to perform all maintenance activities including sub-contactors.

The information collected during the Phase 1 will allow UKT to define the requirements for the CMMS and build the terms of reference for the procurement phase.

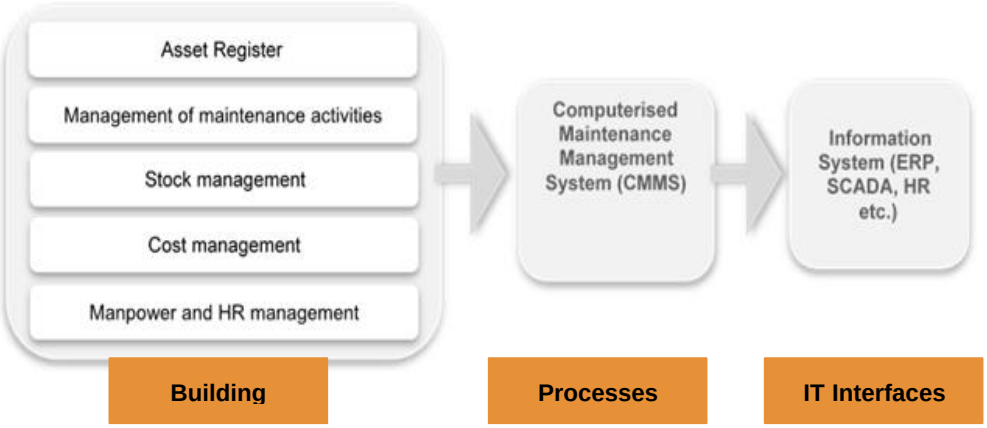
Phase 2 can be subdivided in 3 major pillars:

- Building Blocks which represent all areas that will be managed by the CMMS.
- The CMMS and is how UKT organises its internal processes and how information flows between the different directorates and departments. To define how the CMMS operates the processes UKT shall focus on the development and formalising of O&M procedures covering asset management processes such as updating asset inventories, risk analysis, asset condition and performance monitoring, analysis of causes of failure, key performance indicators, creating and updating maintenance plan and management of documents. An important part of this will be to identify the maintenance plans, i.e. the task lists for each asset class based on their criticality rating (which informs the task specifics) and their condition grade (which sets the frequency of intervention).



- The IT interface, where UKT will specified with which IT tools there will be an interface and what information will be changed between them and how. An example is the time spent by the maintenance team in a specific work will be registered on the Working Order, after being validated by the Head of maintenance the Human Resources will know if someone has worked extra hours and at the same time the Head of maintenance when planning an activity will have access to staff

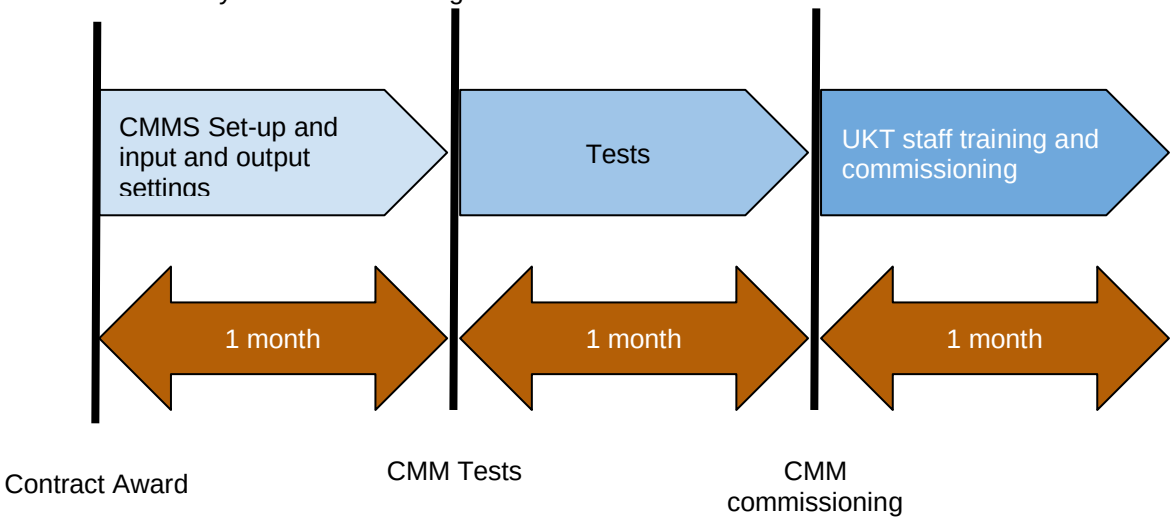
availability in terms of extra hours exceed, holidays etc. this exchange of information will only be achievable if the IT interface is defined and implemented.



Example of CMMS structure inputs and outputs (source:Seureca)

Based on Phase 1 and 2, UKT will be able to prepare the Terms of Reference and launch the procurement process this will be Phase 3. The Procurement department must ensure compliance with the Asset Management team requirements and that the implementation plan is compatible with the UKT Objectives.

The final Phase is the implementation and training of UKT staff by the supplier. The timeline for the CMMS implementation is briefly described in the figure below.



Period	*Tasks*	*Entity responsible*
Q1 2020	**Development of asset management plan** ● Identify all assets and components as equipment, sensors etc; ● Organise assets by asset type, asset system, etc,	Asset Management Department
Q2 2020	**Development of asset management plan** (Continuation) ● Identify all assets and components as equipment, sensors etc; ● Organise assets by asset type, asset system, etc,	Asset Management Department
Q3 2020	**Development of asset management plan** (Continuation) ● List the activities required by the suppliers to ensure the maintenance for each component; ● Identify the resources available and required to perform all maintenance activities including sub-contactors.	Asset Management Department
Q4 2020	**Definition of ToR** and **Procurement Process**	Asset Management, ITt and Procurement Departments
Q1 2021	CMMS Set-up and settings, Tests and UKT staff training	Supplier Asset management and IT Departments

Cost/benefit analysis

Cost:

- *CAPEX - CMMS (30 K€)*
- *OPEX:*
  - *Cost of Asset Management Team (1 engineer and 2 technicians for the survey for a period of 9 months)*
  - *Software opex (5k€/year)*

Benefits:

- *Increase Practical life span of assets*
- *Reduce downtime of assets*
- *Automatic work orders*
- *Reduction of maintenance costs*
- *Increase productivity*

Performance monitoring

- *Time of equipment out of service / year*
- *OPEX / m3*

FOPIP Action - O&M-2: Standardize O&M practices

Action objective: Enhance operational standards to improve productivity and reduce OPEX. Apply a Lean management approach on the development of the internal processes and standards for: the construction of water and wastewater connections; repairs.

Description of the action:

The construction of connections, installation and replacement of water meters represents usually 40-60% of the activity of the terrain staff. Standardise the processes and the procedures linked to these activities will have a positive impact on the productivity, client satisfaction and as a result also reduction of OPEX.

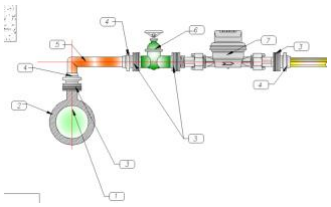
Productivity will be improved because executing repetitive tasks with the same type of fittings and dimensions shorten the time of execution. The time execution reduction allows to deliver a better service to customers by reducing the waiting time for the execution of its new connection. Another result of standardise the type of fittings is reducing unnecessary inventory and simplified procurement processes, which will also lead to better prices and quality by negotiating higher quantities of less articles.

The Standards should be developed by the engineering department with the support of the operation and maintenance department combining both experiences. The standards should be created at least for individual households and for buildings until 8 households, for buildings with more households or for other kind of customer as hotels or industries should be evaluated one by one by the engineering department.

Recommendations to improve water connections

Introduce a Valve in the junction with the main pipe and adopt fittings suitable specially for water connections will reduce the number of joints 4 vs.1 and the time of execution.

Example of a connection valve



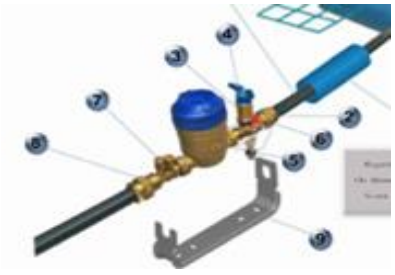
UKT standard

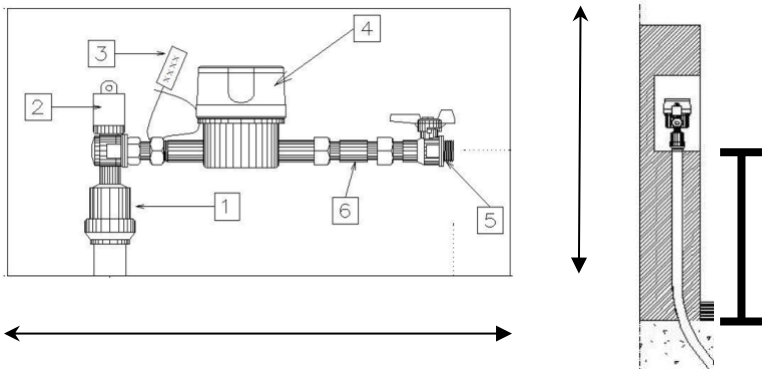
Today connections are executed when the network is not under pressure taking “advantage” of the intermittent supply. This procedure causes the entrance of debris stemming from the drilling into the network which increases the risk of blockage of strainers or water meters.

Under pressure drilling To DN 20-40 (source: Sainte-Lizaigne website)

Under pressure drilling to DN-50-200 (source: E.I.E. website)

The standards for the water connections should focus also in the location of the water meter chamber and ensure that the sequence and dimensions of the fittings are always the same. The location should be defined having in mind the simplicity of execution but also in consideration the readability and access to dial by the meter readers. Adopting a water meter support will also reduce the time to replace a water meter in case of aging, blocage or failure.



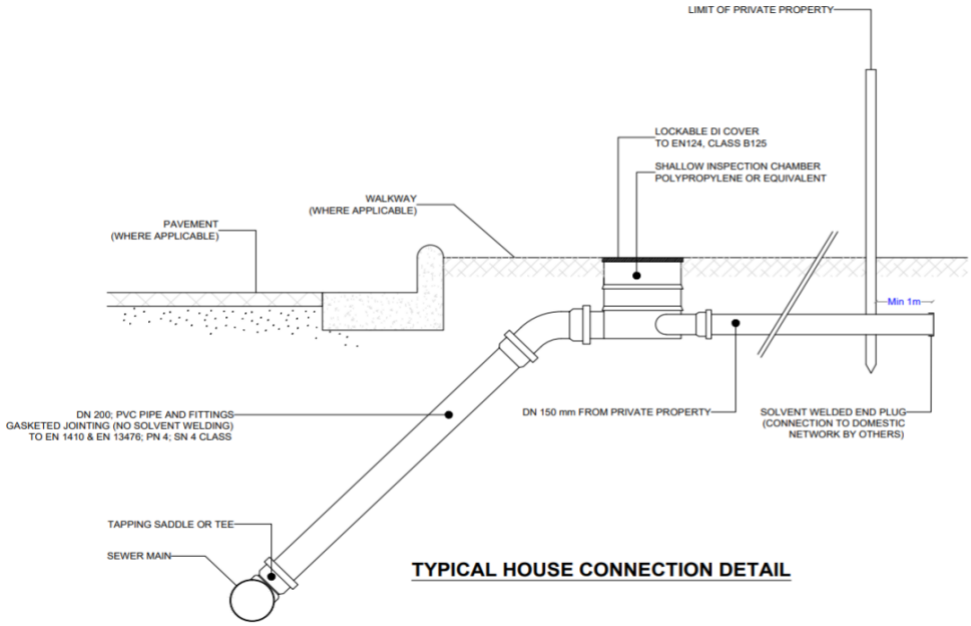


Example of a standard for a water meter chamber dimensions and positioning (source: Seureca)

Recommendations to improve wastewater connections

UKT does not have any standard for wastewater connections to avoid a multitude of solutions, which will create constraints on the network maintenance. The standard should define:

- Location of the connection manhole
- Dimensions, depth and materials on connection manhole
- Material and specs of manhole cover (class of resistance)
- Diameter of the connection
- Interconnection with main sewer



Example of a domestic wastewater connection located on the sidewalk (source: Seureca)

Period	Tasks	Entity responsible
Q1 2020	Information collection and development of the water and wastewater standards for houses and buildings	Engineering Dept

Q2 2020	Procurement process for materials for water and wastewater connections for quantities estimated on the annual budget.	Engineering and procurement Depts
Q3 2020	Training and deployment of the new standards for houses and buildings (water and wastewater)	Engineering Dept and suppliers

Cost/benefit analysis

CAPEX:

- *Connection valve and accessories (approx. 55 €/ connection, for 14.000 connections 770 k€)*

Benefits

- *Reduction of the connection construction time*
- *Less parts per connection and less joints*
- *Reduce risk of leakage*
- *More productivity*
- *Reduction of water meters replacement*
- *More flexibility in operations due to the existence of a connection valve*

Performance monitoring

Number of connections built following the UKT standards / total number of connections built

Number of water meters replaced per year

FOPIP Action - O&M-3: Initiate risk management in O&M activities

Action objective: Identify the critical assets to support decision making: Investment plans, renewal plans, cost-benefit analysis

Description of the action: Seureca believes that enhance asset management and maintenance at UKT will improve the quality and allow to respect the service level agreements in full transparency by providing elements that facilitate decision-making around 3 main trade-offs:

- Investment or risk exposure
- OPEX / CAPEX
- Short term / Long term.

One of the steps of asset management is the identification of the critical assets which is based on a relation between the asset condition and asset criticality. The asset condition is an evaluation of the asset which can be done visually by experienced staff or with measuring instruments which allows to increase the reliability of the analysis, the following table gives the guidelines to grade the asset condition:

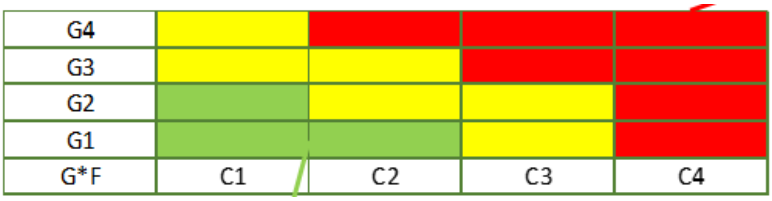
Grading score	Description
C1: Very good	The equipment provides optimum service. Its condition is like new.
C2: Good	The equipment provides a good level of service but has some minor signs of deterioration.
C3: Poor	The equipment is barely able to provide service. It shows signs of degradation.
C4: Very poor	The equipment does not provide service and has unacceptable signs of deterioration that may affect safety.

The analysis of the asset criticality is also graded in 4 levels split in 3 different topics:

Criticality	Safety	Health and Environmental impact	Production, contractual and regulatory impact
G1 : Medium	Minor lesion(s) with no lasting consequences First Aid	Pollution (solid, liquid, gas, odor) limited to the workshop One or more cases of intoxication and / or contamination, requiring no more than first aid	Outage for a few hours, AND No loss of production, OR No penalties, no financial loss
G2 : Serious	Mild injury (s) with limited and reversible effects Accident without stoppage of work	Pollution (solid, liquid, gas or odor) limited to the site One or more cases of intoxication and / or contamination, up to short-term hospitalization but not resulting in permanent disability	Outage for a few days, AND Loss of production, OR No penalties, no financial loss
G3 : Major	Mild lesion(s) with permanent impairment Accident with stoppage of work	off site or non-compliant pollution (solid, liquid, gas or odour), with reversible effects One or more cases of intoxication, contamination or long-term condition with prolonged hospitalisation and permanent disability	Outage for more than a week, AND Significant loss of production, OR Penalties, financial loss OR Noncompliance
G4 : Catastrophic	Death	off site or non-compliant pollution (solid, liquid, gas or odor), with irreversible effects One or more cases of death due to intoxication, contamination or long-term illness	Outage for several months, AND Unacceptable nonconformities, OR Complete and definitive shutdown of installations

The result of the asset criticality will be the highest value obtained of the 3 topics.

Crossing the results of the two tables will allow to build a matrix of risk exposure of each asset and highlight the priorities of maintenance. The results filled on the Risk exposure matrix will lead UKT to 4 main conclusions:



- Assets that will lay on column C4 will require a quick action like a complete refurbishment or replacement
- Assets on cells G4C2, G4C3 and G4C3 require careful monitoring, with heavy maintenance and maybe with refurbishment or replacement.
- Assets on yellow cells require a careful preventive maintenance and the refurbishment or replacement will be required on the next 3 years
- The Assets on the green cells shall continue with the regular inspections or keep on run to fail.

Based on the result it will be possible to update the maintenance plan and prepare a short and long term investment plan.

Period	*Tasks*	*Entity responsible*
Q1 2020	• Training of staff for asset condition review and risk analysis • Start the asset risk assessment survey (3 teams/ part time)	Engineering and Operation department

Q2 2020	Continuation of the asset risk assessment (3 teams/ part time)	Engineering and Operation department
Q3 2020	Conclusion of the asset risk assessment (3 teams/ part time)	Engineering and Operation department
Q4 2020	Update the maintenance plan, define the short term and long term investment plan	Engineering and Operation department
Q1 2021	Develop a procedure for continuous asset condition review	Operation department

Cost/benefit analysis

Capex: Purchase of equipment for condition review if nonexistent as thermometer, vibrations meter, amperemetre clamp, multimeter, camera and a tablet (approx. 12 k€ for 2 sets)

OPEX: Training sessions, Survey technique and procedures, Thermal assessment, vibrations assessment, electric assessment (30~45 k€)

Benefits

- *Increase Practical life span off assets*
- *Reduce downtime of assets*
- *Reduction of maintenance costs*
- *More accurate data for investment plan inputs*

Performance monitoring

- *Number of assets reviewed per year / total number of assets .*
- *Number of corrective maintenance / total number of maintenance*
- *Evolution of number of Assets in critical condition (C4) / Total number of assets from initial state*

FOPIP Action - O&M-4: Improve stock management

Action objective: Reduce costs of holding stock while ensuring adequate and sufficient stock is kept to ensure the continuity of the activity.

Description of the action: Stock management is an essential part of the activity of a Utility to ensure that corrective maintenance and repairs are executed with the minimum delay and avoid creating constraints motivated by the inexistence of spare parts or fittings. The constraints can be of three types:

- Inventory: spare part is not available because the stock have run out, or;
- Warehouse organization: The spare part exists but cannot be found because spares are not stored correctly.
- Deploy a new stock management software tool;

Currently the UKT Warehouse is supplied yearly following the also yearly procurement process of spare parts and fittings. The gap between procurements increases the requirements of area to host all the material, increases also the risk of shortage between deliveries which can create an inventory constraint and is not cost effective because increases the number of spares stocked for longer periods without being needed. This approach avoids the need to establish minimum quantities of stocks, currently UKT addresses this problem by relying on the usual suppliers that will provide the required parts and accept that costs transits to the following procurement process.

To mitigate the Inventory problems UKT should define annually with suppliers deliveries throughout the year based on an agreed schedule with possibility of adjustments, this strategy will reduce the area required of warehouse and will allow more flexibility for the warehouse management.

Best practices recommend also to define a minimum stock of spares for critical assets, especially because manufactures have changed the way they manage their own stocks moved from having spare readily for purchase to the just-in-time manufacturing, which increased the delivery period. To define the list of spares UKT shall identify all spares that are considered critical to ensure the continuity of the Utility activity. The list may be, which can be three types of spares:

- Critical spares - are spares parts used for critical assets identified on the risk analysis or spares for obsolete or unusual equipment that are difficult to find on the market;
- Comun spares - spares used daily as fittings for repairs on pipes or to build a connection;
- Others spares - spares not difficult to find on the market and with.

To perform a cost-effective selection of spares, UKT shall develop a process that takes into consideration a cost/benefit/risk analysis, aligned with its goals and objectives. The analysis shall include the following:

- **Failure mode identification**, is an event that is reasonably likely to occur and that would cause the loss of an asset functionality (ex: pressostat failure of a pump)
- **Consequences**, identify which are the risks safety, environmental and economic of not having the spare available on the warehouse (ex: Stopping the pumping due to the absence of the pressostat for more than 24 hours)
- **Lead time to procure**, is important to understand the supply chain and perceive how long it takes from the moment a failure is detected until the spare part is available on site. (ex: how long it takes to procure the pressostat)
- **Availability of spare** (i.e. obsolete), oftentimes manufacturers discontinue product lines, this seems to be more common with electronics, but is also true for other equipment. UKT will need to identify this equipment and understand which parts may be required to have in stock at the warehouse.
- **Probability of failure**, to calculate the probability of occurrence, UKT shall use its experienced staff familiar with common equipment and operating in a similar context and also the manufacturer experience to benchmark the probability. (ex: the pressostat is a robust equipment with a low rate of failures)
- **Predictability of the failure**, some equipment/components will fail over time due to wear or age / fatigue. UKT may manage this type of failure by conducting periodic inspections to measure the overall condition of the asset and order new parts prior to loss of functionality. (ex: components like chains, belts, sprockets, liners, and screws can be evaluated for wear during the periodic inspections)
- **Shelf life**, some components deteriorate with time as for example probes, sensors, ball bearings, batteries and gaskets. These timing considerations should be also considered in the decision.
- **Storage considerations**, Prior to procuring any spare parts one must evaluate his/her location to determine if the warehouse of facility has adequate storage conditions of humidity, temperature, etc.) and the available space. Staff also needs to ensure that it has the proper systems in place to track the spares and to perform maintenance tasks on the inventory if needed (i.e., a spare pump may require that the shaft be rotated periodically to distribute lubrication and prevent shaft deflection). Off-site options should be evaluated and consideration should be given to having the vendors store the parts as a service. (ex: If UKT plans to replace 2.000 water meters during the following year it can be agreed with the vendor to supply Quarterly 500 water meters)

The result of this process will be a list of spare parts consisting of the advisable and minimal stock to have in the warehouse. Annually the Warehouse Head and Head of maintenance department shall assess the past year to measure the impact of potential shortages of stocks and suggest improvements.

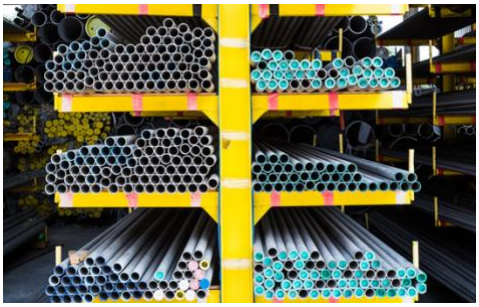
The organisation of the warehouse aims at reducing the time spent by staff in the warehouse and during interventions, with direct impact on:

- Time spent to locate a specific spare, equipment, tool or material, etc;

- Accuracy time to perform inventories for accountability audits;
- Entrance and exists from warehouse;
- Ensure the correct storage conditions.

Pipe storage: it is highly recommended that the pipe storage / loading area be reorganised with:

- Racks segregating pipes by size, pressure rating and material;
- easy access to the vehicles allowing to place the truck load boxes close to the racks to avoid travel long distances with pipes,
- A crane or allow the access of a mobile crane to load heavier pipes.



UKT pipe storage *Example of a pipe rack*

Pipe storage area should be covered, even PE pipes are not damaged but its exposure to sunlight may cause the pipe to bow if not restraint by racks, even this does not damage the pipe it can be inconvenient when the pipe is taken for installation. PVC and PP pipes cannot be exposed to sun and PP pipes have a limit of 6 month of open-air storage.

Storage of spares and equipment inside the warehouse needs to be improved. The first step will be reorganizing the building by areas, fittings, PPE's, valves, pumps, etc. The second step should be the installation of shelves in all areas to optimize the storage in height increasing the storage surface. The floor or lower shelves shall be used for heavier parts and in the top the lightest parts. The shelves installation must ensure the possibility of circulation of at least a manual pallet carrier.

Spares piles up on the floor (source: Seureca) *Area with spares in shelves (source: Seureca)*

Obsolete spares piles up on the floor (source: Seureca) *Shelf identified and organised by spare (source: Seureca)*

UKT requires a new stock management IT tool integrated with the CMMS or ERP or a stand-alone software but with online integration with the mentioned tools. All entries and exits of the warehouse must be registered on the software, this is already done by UKT staff, but are missing the following tasks:

- ERP integration, to assess more precisely the costs of each task performed by the UKT staff in their day-to-day activities;
- CMMS integration, to easily have an overall view about spares parts in stock and anticipate the procurement processes when needed;
- Minimum Stock alerts, is required to have a software with an alert system to signalise when the stock reaches the minimum level defined by the warehouse head.

Period	***Tasks***	***Entity responsible***
Q1 2020	• Procurement process for the stock management module; • Develop the list of spares identifying the minimum stocks and average consumption; • Develop a procurement process adapted to the UKT regulations with scatter deliveries;	Warehouse Head, Engineering, Operation and procurement departments.

Q2 2020	• Procurement process to comply with the updated inventor;
	• Procurement process for:
	  ○ Roof for pipe storage area
	  ○ Shelves for warehouse
	• Warehouse improvement;
	  ○ Reorganisation, put all spares in shelves and tag accordingly with the same codification of the stock module.
	  ○ Remove obsolete parts from warehouse.
		Warehouse Head and procurement department

Cost/benefit analysis

CAPEX

- *Roof for pipe storage area with racks (150 ~200 k€)*
- *Shelves for warehouse (15 k€)*
- *Stock management (5k€)*

OPEX - Warehouse reorganisation (3 Weeks - 6 workers)

Benefits

- *Reduce the stock-keeping cost*
- *Make inventories swiffer*
- *Better accountability control*
- *Safer environment with less risks for staff*

Performance monitoring

- *Ratio of accuracy between inventory and accountability;*
- *Average time to deliver a spare demanded on a work order.*

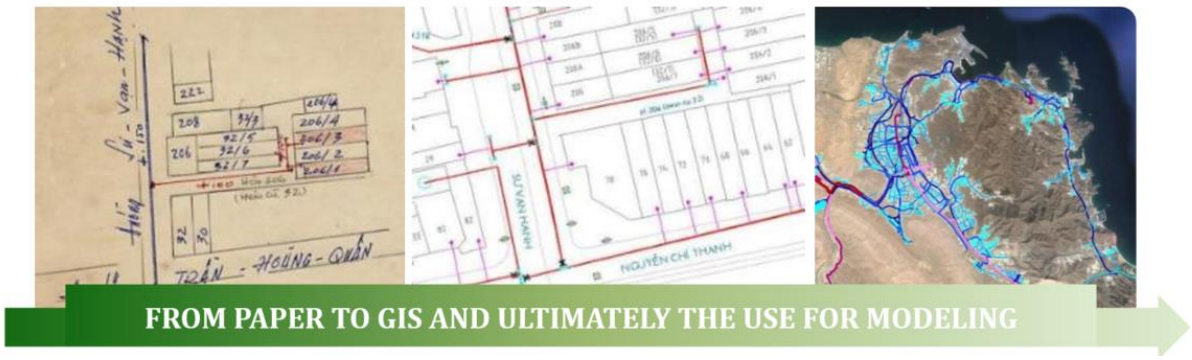
FOPIP Action - O&M-4 : Implementation of an integrated GIS system

Action objective: definition of the global strategy for a GIS implementation including the data collection.

Description of the action:

A modern asset base for drinking water and sewerage systems is structured through a GIS (Geographical Information System), a program that allows to organize, manage, combine and analyze data associated with geo-referenced objects such as points, lines, polygons, etc. The GIS is by definition a complete system: it integrates not only the hardware, the software and the associated databases but also the material and human resources to be implemented for its correct operation.

Today, GIS is a pillar of the operational efficiency of water companies as it allows the archiving and updating of internal knowledge on the infrastructure and all assets of water production and distribution (asset management).



Digitization of paper plans and GIS integration

The implementation of a GIS system comprises the following key activities:

- Perform a diagnosis of the Geographic Information System and other mapping applications currently used by UKT;
- Carry out a census of covered hydraulic systems without infrastructure cadastre, and set up an inventory of internal data sources (AUTOCAD plans, paper plans, etc.);
- Propose a unique data model adapted to the current and future needs of the UKT;
- Prepare the contracting of the services of elaboration and implementation of the GIS asset base.

The implementation of a GIS is not limited to the choice of software. The aim is to create a spatial database upstream, to structure the data within a data model and to provide the information to many users (asset management team, operational teams, marketing team…).

The implementation of GIS system is composed by several steps:

- Data collection (phase 1): audit of existing data (quantity, quality) and inventory of missing data
- Creation of the spatial database;
- Data collection (phase 2): data creation via field surveys;
- Data integration;
- Choice and implementation of the geographical information system (preliminary architecture studies, software).

The first phase of data collection shall include:

- Existing data in different format within the utility to be reused;

- Existing maps (paper maps, pdf, Autocad drawings…);
- Existing studies including geographical information;
- Existing background information.

Digitization and transfer of information from paper to digital format under GIS might be challenging but will be performed transparently and according to a methodology that needs to be carefully developed. The realization of task may require the assistance of a consulting firm specialized in data transformation and migration to GIS and CAD.

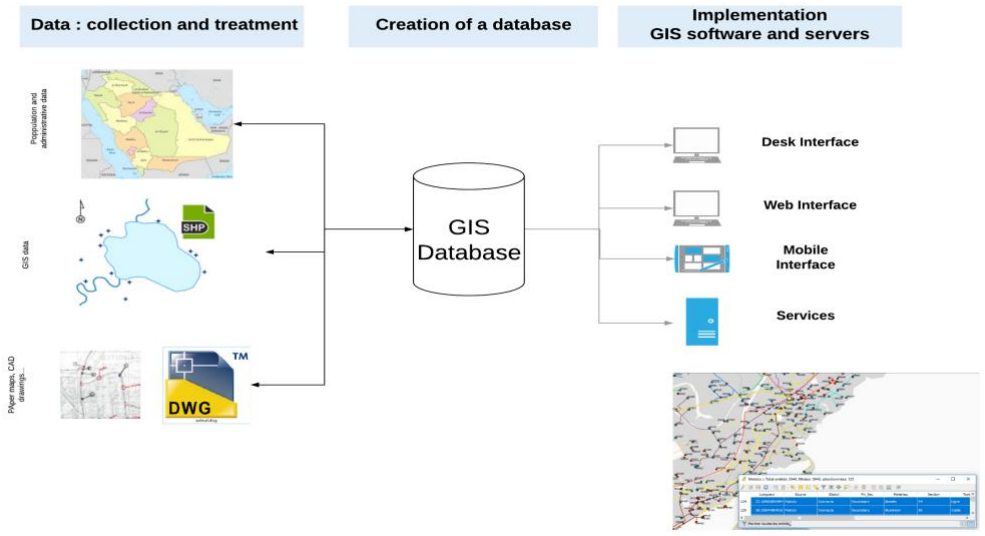
This step is correlated with the establishment of the spatial database (step 2). The objective is to define current and future functional requirements for the use of GIS. This includes the needs for operational functionalities as the simulation of water cuts into the GIS. The objective is to create a conceptual data model : it aims to formally write the data that will be used by the information system. It is therefore an easily understandable representation of the data, allowing the information system to be described using objects. The creation of this model integrates the needs of the business in order to describe the data in the most appropriate way. The spectrum of business needs must be extended to the whole of UKT's stakeholders (customers, operation, technical…).

It must be scalable in order to be able to meet future needs related to changes in the information system, in particular interfaces with other software such as CMMS or CRM. The choice of data storage technology and publisher is an essential step that should not restrict future technical choices (IS architecture, choice of applications, etc.). Once the database is functional, it is necessary to set up tools for creating data from the field for missing elements and/or to improve the accuracy of existing data according to the results of the audit. There are many topographic survey hardware and software available on the market. Service companies are able to carry out this step within the framework of a service contract supervised by a specialised prime contractor. It is essential that UKT technicians, who potentially have a very good knowledge of the network, participate in this topographic survey work. The collected data are gradually integrated into the spatial database. At this stage, open source desktop software (example QGIS) can be used to visualize the data, correct them and apply specific spatial processing.

The next step is to prepare for the implementation of the IT infrastructure and software suite. The choice of IT architecture is dictated by the functional needs of users and the urbanization choices of the information system. It is essential that the choice of GIS be made after the study of the urbanization of the information system.

In the future evolution of IT architecture, GIS should be at the core of the Information System. Other systems developed by several manufacturers could be implemented step by step, for example:

- Links with a CMMS to make criticity analysis and develop an asset management strategy;
- One of the interface will be the link to SCADA and Distribution Management System which will rely on GIS for network topology;
- Geolocalization of customers will enable to link GIS and commercial database;



The main choices are the use of technologies:

- Open, Source or software from publishing companies;
- Generalist GIS or GIS specialized in the water and sanitation sector;
- Web server for data distribution;
- Scalability with GIS standards (WFS/WMS) and uses of webservices;
- Thin and/or heavy client;
- Mobile application;
- SaaS or On premise.

A set of specifications is to be drawn up by a specialised consulting firm. It includes the purchase (or rental) of licenses, the possible implementation of software (if not SaaS), the configuration of software and servers, data integration and user training. In the case of UKT, we recommend that a pre-project study be carried out in order to integrate all the technical and functional requirements of the future GIS and estimate the cost of the project. It is necessary to carry out a call for tenders at least in Europe in order to identify robust and scalable solutions. The consultation must include at least 3 years of support and maintenance.

Project management on the UKT side should be jointly managed by the IT, Engineering and Operations Directorate by appointing a project manager in charge of internal coordination. He must report to UKT's senior management, given the strategic nature of this project. Quality internal reporting on the follow-up of this project should be set up to ensure the support of all stakeholders.

Period	*Tasks*	*Entity responsible*
Q1 2020	Set up UKT internal project team	IT, Engineering and Operations Directorates
Q1 2020	Initial data inventory (all available formats)	UKT project team
Q2 2020	Define and structure conceptual data models	UKT project team
Q2 2020	Preparation of tender documents to outsource tasks of elaboration and complementation of the GIS register	UKT project team
Q3 2020	Digitization and integration of the data collected in the inventory at the beginning of the project.	Contractor

Q4 2020	Field work to collect, verify and correct information with the tools and procedures set by the Company Intermediary quality control	Contractor UKT
Q1-2 2021	Integration of new data collected in the field and updating of the GIS register Final quality control	Contractor UKT

Cost/benefit analysis

Costs:

- *CAPEX : 400 - 600 kE*
- *OPEX : 20 - 40 kE*

Benefits:

- *Increase of the network knowledge*
- *Increase of the Traceability of the networks events*
- *Database for the definition of network renewal plan*
- *Database for KPI's implementation*
- *Reduction of NRW*
- *Increase in the quality of interventions for clients*
- *Development of new applications based on geographical data for the others department (ex: customers)*

Performance monitoring

% of network that is digitalised

FOPIP Action - O&M-5 : Deploy the telemetry and SCADA system to the entire perimeter

Action objective:

Developing a telemetry and a SCADA system for the entire perimeter has been identified as a priority for UKT in order to :

- Monitor their facilities on an ongoing basis ;
- Be immediately alerted in case of problems ;
- Record operating data to calculate operational KPI's and improve the operational efficiency.

The complete automation of the water supply is out of the scope of this proposal. It's necessary to renew the Bovilla's SCADA which has not been updated for 11 years and to improve the Bovilla's automation by developing the PLC's programs and the SCADA settings. Moreover, the project can include the repair or renewal of some continuous analysers of Bovilla's plant.

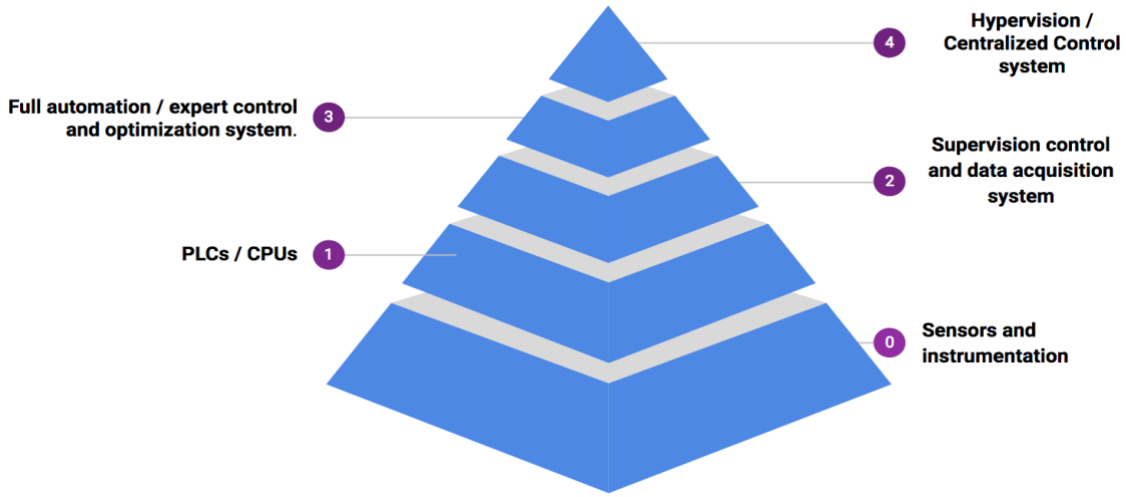
Description of the action:

SCADA (Supervisory Control and Data Acquisition) is an industrial monitoring system that processes in real time a large number of measurements and remotely control installations as water facilities. As a central system for efficient management of water utilities, the deployment of a unified SCADA over the entire perimeter service allows.

A SCADA is included into a global and standardized strategy delivered by the ISA-95 international standard. ISA95 is initially used for developing an automated interface between the business and control systems. This standard has been developed for global manufacturers and aims to provide a consistent terminology used as a foundation for supplier and manufacturer communications, while providing consistent information and operations models.

A Computer-Integrated Manufacturing (CIM) is an approach taking into account the use of computers to control the overall production process.

It is usually composed of 5 main hierarchical levels; each phase of the overall digitization project is presented as per the figure below:



Computer Integrated Manufacturing (CIM) Approach

The above levels refer to:

- Level 0: sensors and physico-chemical analysers, directly interfaced with the process and which provide the exchanges of information with the equipment installed on Level 1;
- Level 1: Programmable Logic Controllers (PLC), Control Process Units (CPUs), Operator terminals, local supervision software, which ensure the operation of different functional treatment units;
- Level 2: SCADA System - Centralized supervision system that provides follow-up and piloting of the whole installation of a production and its remote structures, through HMI (Human Machine Interface);
- Level 3: Manufacturing Execution System (MES), in which the archiving systems, support of resources and production optimization systems (full automation, historian, reporting tools, etc.) linking the company IT systems and the control systems (level 2 & 1);
- Level 4: Enterprise Resource Management (ERM) that manages the overall functions of the enterprise such as:
    - Databases and tools linking operations, dispatching, maintenance, works;
    - Hypervision;
    - Finance;
    - Supply Chain Management;
    - Commercial management, Client Relation Management.

Levels 1 and 2 of the CIM may also be gathered into a single “Process Control / Monitoring” block for simplification. The below lists gives an overview of the various tasks performed in the Level 2 – SCADA-HMI:

- Visualization and operation of process components (Human/Machine interaction);
- Controlled data exchange with the process control level, usually PLC;
- Alarm Management, trends and reports;
- Storage of historical data;
- User Management;
- Data Analysis and processing;
- Controlled data exchange with the administrative domain (MES).

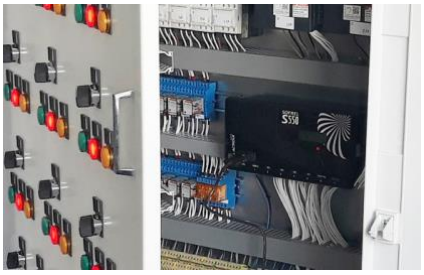
The present scope focuses into the level 0 to 2.

The objective is to be able to have within a control center room or via remote access to:

- Synoptic views of all the structures of the water production and distribution system (boreholes, reservoirs, pumping station);
- Real-time or minimum operating data in slightly delayed time for the facilities (tank levels, pump operation, flow rates, etc.);
- All alarms and associated operating faults of the facilities.

To do this, it is a matter of deploying a multi-level strategy:

- Development of on-site instrumentation (tank levels, flow rates, etc.);
- Implementation of a local data acquisition strategy (connection of equipment, remote management satellite...);
- Improvement of the automation and instrumentation of the Bovilla plant;
- Implementation of a communication network for data transfer including bidirectionality;
- Development of a real time data acquisition, processing and remote monitoring tool (SCADA) for the entire scope.
- Development of a data acquisition strategy for KPI's implementation, integrated into the global urbanisation project of the information system.



In a second phase, the development of local and intersite automation and remote control can be developed. The objective of this first phase is to set up a communication and IT architecture but also scalable equipment and software to achieve this second phase in the medium term.

This is a major project requiring extensive preliminary studies and support during the construction phase, given the significant investments to be expected.

This project significantly changes the way the facilities are managed on a daily basis and has an impact on work instructions and procedures. It requires the development of new skills in instrumentation and telemetry but also in communication and industrial IT networks. This project is necessarily associated with a change management program for the operations, information systems and even engineering department

The preliminary study must make it possible to:

- To carry out an exhaustive audit of the Bovilla plant in terms of instrumentation and automation
- To define specific recommendations for this plant;
- To carry out an audit of the other installations;
- To develop with UKT management the operational and organisational objectives of the project in the short, medium and long term;
- Determine the data acquisition and transfer strategy in relation to the objectives defined above;
- Establish the functional needs as well as the technical specifications for the entire project (telemetry, IT architecture including security, SCADA);
- To quantify the investments necessary for its implementation.

For UKT, it is essential to select a consultancy firm specialised in the industrial IT sector and having already implemented such studies in the water sector.

The next step is to draw up technical specifications for a consultation of companies at European level. We recommend that a single consultation be carried out as part of a design-build contract. It will be based on the conclusions of the preliminary study.

It is essential to appoint a project manager in charge of works supervision. Ideally, its mission can be an extension of the work assistance missions previously carried out in order to maintain coherence and continuity in the project objectives.

Project management on the UKT side should be jointly managed by IT, the Engineering and Operations Directorate by appointing a project manager in charge of internal coordination. He must report to UKT's senior management, given the strategic nature of this project. Quality internal reporting on the follow-up of this project should be set up to ensure the support of all stakeholders.

Period	***Tasks***	***Entity responsible***
Q1 2020	Tender for a consulting firm specialized in instrumentation, automation and SCADA for water supply : pre	UKT project team
Q2/Q3 2020	Preliminaries studies Financial agreement to start the project	Consulting firm UKT project team
Q1/Q2 2021	Terms of reference, tender and choice of a company for a design build contract	Consulting firm/ UKT project team
Q3/Q4 2021	Implementation	Design build companyConsulting firm/ UKT project team

Cost/benefit analysis

Cost:

- *CAPEX including studies: 700 - 1000 kE*
- *OPEX : 10 - 30 kE (not including Human Resources)*

Benefits:

- *Increase of the water supply knowledge ;*
- *Increase of the Traçability of the water supply events ;*
- *Create a Database for KPI's implementation*
- *Improve the knowledge of the operational teams;*
- *Control the risks (sanitation, security, incident) ;*
- *Improve safety and health ;*
- *Improve the quality of the service: increased responsiveness, anticipation of incidents ;*
- *Reduce operational costs by remote monitoring ;*
- *Global modernization and digitalisation of the service.*

Performance monitoring

8.2.3. Medium/Lower priority actions

The following table provides indications on a number of medium-long term recommendations to further develop the Operation & Maintenance / Asset Management function according to the approach of continuous improvement.

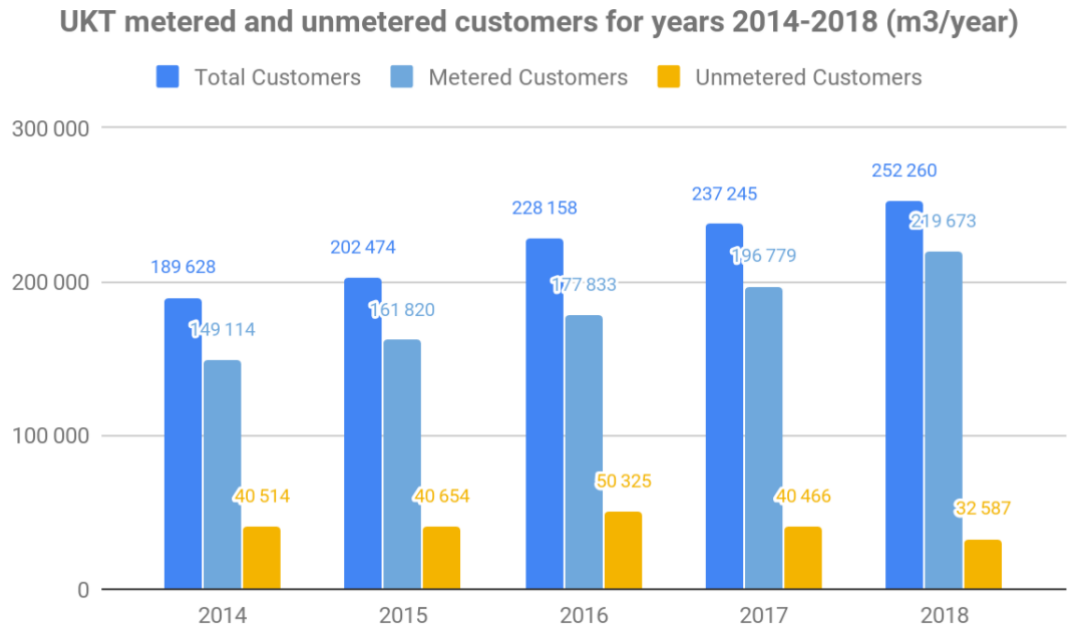
#	AREA	ACTION	BRIEF OBJECTIVE OF THE MEASURE	UKT TEAM IN CHARGE OF IMPLEMENTATION	FINAL OUTPUT EXPECTED AND KEY INTERMEDIARY MILESTONES	EXPECTED TIMELINE FOR IMPLEMENTATION	ROUGH COST ESTIMATE
1	O&M / Asset Management	Realize crossed comparisons of sample analysis between the two laboratories and/or an external and certified laboratory	The two labs are using different analysis techniques so this measure would increase the reliability of the results and detect possible non-conformities.	Water Quality Department	Improved water quality monitoring	Q1 2020	The task can be done internally
2	O&M / Asset Management	Set up written procedures to calibrate measuring instruments	To ensure that measurements are accurate and increase confidence in the results	Asset Management Department	Improved water quality monitoring	Q1 2020	The task can be done internally
3	O&M / Asset Management	Study the possibility of additional pretreatment	To enhance resilience of water production system, a pretreatment stage may avoid a production interruption when turbidity increases after rains.	Infrastructure Planning Department	Improved water system resilience	Q2 2020	Cost with studies depending on the solution between 5K€ to 10 K€
4	O&M / Asset Management	Georeference analysis results and non-conformities and integrate them into the GIS.	Georeferencing analysis will help the water quality department identify risk areas and provide alerts to the population and inform the operations teams of the areas affected. Provide information to support the investment plans.	Water Quality Department and Infrastructure Planning Department	Reduced staff time response to water network contaminations.	Q4 2020 (depends of the GIS setup)	Can be done internally with GIS and data from LIMS or other digital records
5	O&M / Asset Management	Realization of a specific study related to organoleptic issues	The study shall identify possible optimizations on the treatment process (sector, reagents) and operational tasks (treatment rate ...) to improve bacteria detection	Water Quality Department	Enhanced water quality	Q2 2020	Cost with studies approximately 5K€
6	O&M / Asset Management	Develop an Asset Management Policy, Strategy and Plan.	The Utility must define a clear policy and set goals for maintenance activities to comply with the level of service required by regulations and customers. It includes the definition of technical and economic corporate objectives	Asset Management Division	Reduced OPEX cost and increase assets resilience	Q1 2020	The task can be done internally with advisory services or training (costs: 25k€)
7	O&M / Asset Management	Creation of an asset Register	UKT must have sound and useful data to increase confidence on asset management decisions. The information must be properly organised, easy to access and accurate.	Infrastructure Planning Department	Improved assets maintenance and reduce opex costs	Q3 2020	Asset register may be associated to Risk assessment - no costs if carried out simultaneously
8	O&M / Asset Management	Prepare a preventive maintenance plan based on the risk assessment with a schedule of interventions and completion of the Work Orders	To be cost-effective in the long term, maintenance plans need to be developed in full consideration of the "criticality" ranking of assets and consider an optimum mix of preventive, condition-based, and failure finding tasks.	O&M Division	Improved assets maintenance and reduce opex costs	Q1 2021	The task can be done internally.
9	O&M / Asset Management	Develop work procedure for maintenance activities	Standard procedures introduce more reliability on tasks performed by the staff and allow to identify improvement areas. Procedures shall be developed with specific H&S instructions, to reduce risks for staff and also for customers.	O&M Division and Healthy and safety department	Improved productivity.	Q1 2021	The task can be done internally.
10	O&M / Asset Management	Introduction of shifts in network repairs.	Shifts may increase the rate of use of equipment and create a rotating system of stand-by elements to provide quick response to events and reduce the impact of failures, especially in the case of bursts, and reduces the average cost per repair or intervention.	O&M Division and HR Department	Increased the availabity of equipment for more productivity	Q1 2020	The task can be done internally
11	O&M / Asset Management	Improve water quality monitoring practices	Consider the use of the Colilert 18 Method for bacteriological detection, install online analyzers on the entire system including raw water reservoir to reduce the consumptions of chemicals and improve the product quality, develop a schedule for annual tank washing and procedures for work execution and reporting.	Water Quality Department	Enhanced product quality and reduce OPEX	Q3 2020 and Q3 of 2021 for On-line Analysers	- Tank washing - done internally OPEX - 3K€ per tank) - Colilert 18 Method: CAPEX: 10k€ OPEX 5€/test - Online analysers - CAPEX - if SCADA in place 2k€/ sensor
12	O&M / Asset Management	Implementation of a LIMS software, dedicated to the laboratory	To provide a software capable to manage the analysis equipment, the chemicals inventories, the sampling strategy, to schedule the sampling interventions (in particular the self survey), to manage the legal water quality parameters, the water quality results, and the non compliant results, to realize the internal and the external reporting.	Digital department with the Engineering department support	Improveds reporting, increased efficiency for the water sampling plan, secured water quality.	Q2 2021	CAPEX (software license) : 15 K€ (on premise mode) OPEX = 3K€ SaaS mode (around 50-100 € /month/user) Implementation can be done by UKT.
13	O&M / Asset Management	Update the remaining years of life of assets.	For proper investment planning UKT shall update the assets condition review based in the records from maintenance and inspections and not only on the accounting depreciation of the asset to have a more accurate value of the real needs for investment planning.	Infrastructure Planning Department	Better and more accurate investment planning.	Q4 2020	The task can be done internally with the information collected on the Risk assessment (considering the Risk assessment completed on the Q3 2020)

10. Commercial and Customer Management

10.1. Summary of key findings

10.1.1. Customer metering

The total number of customers in UKT service perimeter has increased 33% over the last 5 years and has reached approximately 252 000 customers in 2018. Metering coverage has improved, from 78.6% in 2014 to 87.1% in 2018, with less than 33 000 unmetered customers.



The remaining unmetered customers are mostly apartments located in old communal housing buildings where individual meter installations would require significant financial resources needed to refurbish internal plumbing in poor conditions.

10.1.2. Meter reading, billing

Generally, the meter reading process is performing sufficiently well with the use of tablets for digital meter reading. It is our understanding that DUNEA is currently supporting UKT in improving this specific process.

It was however identified that the billing process could be improved in order to avoid having monthly billing sessions that are dependant on the timely meter reading exercise but rather a rolling billing along the month based on the continuous meter reading exercise. This would reduce billing delays and substantially improve UKT's cash flow.

Additionally, industry best practices generally recommend that the metering and billing of key accounts should be delt with separately. It is often seen that key accounts are equipped with automatic meter reading technologies and meters are read more often to ensure these large amounts are billed precisely and regularly, as they represent a large component of the utility's revenue.

10.1.3. Management of illegal connections and fraud

A specific Task Force has been created to fight illegal connections and fraud which accounts for a large component of the very high Non-Revenue Water. However, the assessment showed that the Task Force team's focus is more on ensuring connections interrupted due to non-payment are not reconnected rather than investigating and identifying new illegal connections across the city. Below are some recommendations to assist the Task Force in structuring their strategy:

- Setup of a free number in the Call Center for denunciation of illegal connections with protection of identity of the person;
- Legal support to bill the estimated volume of the theft with penalty;
- Implementation of amnesty periods for "massive" regularization without penalties
- Setup a dedicated team for continuous field investigation using mobile devices (tablets);
- Register the number of the meter seals in the database;
- Comparison with other customer databases (electricity, telephone, land use, etc)

- Consider installing smart devices for monitoring areas where theft is common to occur:
  - Fire hydrants usage and consumption;
  - Construction sites consumption;
  - Public water outlets (for prepaid usage or for water trucks).

10.1.4. Revenue collection and debt recovery

Revenue collection remains a challenge for UKT with less than 80% annual collection rate. A Task Force working on risks and particularly Debt Recovery has been set up to address the issue of unpaid debt which have substantially accumulated over the years.

UKT already has a system of non-payment penalty (up to 10% of the amount billed) which is automatically generated by the billing system, but follow-up of the client reminders and payment remains manual. Automatising the issuing of sms for instance to remind pending payments could support the work of the team. Additionally, parameterizing the system to organise debts by age is essential to prioritise the effort.

Additionally, discussions with the Risk Task Force revealed that 1 billion Lek is invoiced every year to customers who no longer exist. This is a major issue which distorts the billing and proportion of unpaid bills. An update of the customer database is strongly recommended at this stage and procedures should be implemented for continuous update.

10.1.5. Customer Management

The Customer Management process is well established within UKT and the Sales Manual provides detailed instructions on how it should be handled. The assessment however highlighted that the overall process is split across a number of departments which hinders data flow as well as generate inefficiencies along the process. International best practices show that integrating the entire customer management business process under one department helps to improve efficiency and to increase levels of service for a better customer experience.

Integrated customer management can be supported by dedicated tools which, thanks to their functionalities, help to integrate the entire business process: from receipt of a request for a new connection, metering, billing, revenue collection all the way to customer complaint handling and customer satisfaction measurement.

Digital technologies help utilities provide to customers real-time access to the relevant information for them, without the need to contact traditional communication channels, which are time consuming (visits to customer support centers) or do not provide immediate answer (waiting time in call center, services which might not be 24 hours available).

The first level is therefore to provide to customer online platforms where they can have access to this information, without entering in contact with an employee: visualization of invoices, history of payments, history of readings, meter reading schedule, information about network emergencies affecting the continuity of the quality of the service can be made available on websites and mobile applications; information of general interest can also be communicated through social media channels, which are the most frequently accessed by customers. Information about the customer account can also be communicated by IVR in the call center, thus eliminating the waiting time to contact an operator.

The second level is to enable the customer to perform direct interactions with the company in a fast and effective way, using digital platforms. Communication of self-reading, electronic payment of the invoice, sending a request or complaint and checking its status until final resolution are actions which the customer can perform anytime, in an easier way, by entering its website account or using a mobile application.

To achieve a good performance with digital technologies, the following actions and initiatives are encouraged:

- Innovation in the field of smart metering: the purpose is to find solutions balancing the expected results with a cost-effective technology, which could allow a larger use of these technologies;
- Effective communication campaigns on the advantages of using the electronic invoice in terms of

speed of the service, but also as an environmentally friendly approach;

- Diversification of the payment channels, by using new technologies and platforms allowing a fast payment of the invoice;
- Set up of customer accounts on the website and mobile applications providing the relevant information to customers and allowing both sides communication: from the customer to the company and from the company to the customer, with corresponding feedback provided;
- Use of social media channels to provide relevant information to customers;
- Monitor customer feedback by online customer satisfaction surveys and analysis of customer interactions through all available communication channels;
- Implementation of integrated customer information systems, business intelligence systems and use of big data techniques in order to monitor the processes performance, measure in real time, relevant KPI's and their trends, get an in-depth view on customer behavior and influencing factors.

10.2. FOPIP recommendations - Actions for implementation

10.2.1. Recommendations

Based on the initial assessment phase, a first set of recommendations were submitted to UKT in order to improve day-to-day management of its customer meters and increase its performance, i.e. to increase and consolidate the revenues from water sales and decrease Non-Revenue Water levels through the reduction of commercial losses.

Each one had a priority level (HIGH/MEDIUM/LOW). Based on the first list, SEURECA is proposing under this FOPIP report the following 2 high priority actions to be implemented by UKT, which could be considered by the Company as the 2 strategic pillars to progressively improve commercial performance in Tirana and surrounding villages under UKT management.

2 high priority actions = 2 strategic pillars to improve commercial performance	
CUST-1	Develop and implement UKT Corporate Metering Strategy
CUST-2	Clean-up the customer database through a full-scale commercial field survey

10.2.2. Actions

The following section aims at describing in detail the actions that were identified as potential quick wins to improve UKT's operational performance in the area of Commercial and Customer Management that could be implemented by UKT as soon as possible.

FOPIP Action - CUST 1: Develop and implement UKT Corporate Metering Strategy
Action objective: in order for UKT to progressively reach water metering management in line with international best practices for water utilities, SEURECA recommends developing and implementing a corporate metering strategy structured around a modern meter asset management programme. This will ensure that metering accuracy is kept as high as possible to reduce commercial losses and avoid revenue erosion over time.

Description of the action: the proposed corporate metering strategy for UKT should target the following principles for success:

- Water sales to be based on the use of revenue meters (and not on consumption norms), for all customer groups;
- In the specific case of housing buildings, block meters to be used for the billing of apartments, or at least as balance meter to invoice the volume difference between what's measured by the block metering and what's measured by the sum of apartment meters;
- Meters to be owned by the utility, to ensure optimum accuracy;
- 100% of revenue water to be accounted based on meters to improve corporate water balance and NRW calculations, critical for OPEX and tariffs assessment, and performance monitoring;
- New connections to be automatically equipped with water meters provided and owned by UKT, especially during CAPEX initiatives aimed at increasing water supply coverage in currently unserved areas of UKT service perimeter;
- Meter asset management strategy and implementation to be handled by the company to ensure that the customer metering accuracy, and therefore the revenue stream, remains at its top value thanks to a streamlined annual meter replacement programme (safeguard against future revenue erosion over time thanks to proactive and data-driven approach to meter management, supported by an effective organization, robust and efficient processes and systems, as well as capable and motivated staff);
- Implementation of corporate meter and service connection standards and design guidelines to ensure that in-house and sub-contractor teams carry-out meter works to reach out the quality defined by UKT. Procurement to be structured in order to support the internal standards;
- Specific attention should be given to "key accounts" (i.e. monitoring, customer relationship management, bill adjustments, etc.) while all other accounts need to be treated fairly and equitably at a defined service level.

Due to limited budget availability, it is very unlikely that all the actions described here above can all be implemented rapidly. A prioritization of the investments must be considered, with a priority given to the actions that may procure rapid pay back, and to the ones requiring only low CAPEX.

This leads to consider in a first stage some investments in order to get a much finer knowledge of the potential revenue increase resulting from the improvement of the metering (in coverage and in accuracy) – so that the limited financial means can be put in priority where the current losses for the utility are the highest and the easiest to recover.

Hence, the following actions **can be implemented within the next two years**:

- Upgrading metering normative framework, and actions toward relevant stakeholders in order to make possible the generalization of invoicing on the base of block metering;
- Implement pilot project for block metering and then deploy block metering over 100% of the area;
- Assessment of key account meter performance;
- Launch UKT meter asset management programme.

Metering normative framework:

The upgrading of the metering normative framework will give UKT the means to justify towards the relevant stakeholders and the customers the relevancy of implementing block metering. It would consist on the following process:

- Prepare a standard about minimum required accuracy for block meters, and about specifications on block meters installation. These specifications could be supported by objective material from meter suppliers (catalogues) or recommendations from international best practices;
- Submit this standard to the relevant stakeholders, in order to have it approved;

The issue of metering from block meters must also be clarified, with a modification of the standard customer contract, to be submitted to the same approval process. Either the company invoices this difference to the organization in charge of managing the building or increases each individual invoice proportionally to the reading of each individual meters.

UKT internal meter technical specifications show that meter technology is single/multi-jet type (up to DN 40 mm) and for larger water meters (above or equal to DN 50 mm) it is horizontal Woltmann type.

UKT internal meter technical specifications for meter accuracy are not restrictive enough, as they require new meters to be certified MID R80 (R is equal to the ratio Q_3/Q_1, Q_3 being the nominal flow and Q_1 the minimum flow), which for a DN 15 mm with a Q_3 equal to 2.5 m^3/h means a Q_1 of 31 l/h.

R80 water meters are not recommended for utility revenue metering (in France they are used by condominium entities to split water charges among apartments). In Tirana, due to the operating conditions (intermittent supply, low pressures in some areas, individual customer roof tanks for water storage), the use of R80 water meters aggravates the level of commercial losses due to undermetering.

It is therefore recommended increasing the accuracy requirements for UKT revenue meters, from R80 to R160 as a minimum (Q1 of 15 l/h for DN 15 mm) to improve performance on low flow rate range.

As all DN 15 mm to DN 40 mm water meters are single/multi-jet type devices, they are designed to operate in a horizontal position to keep the highest accuracy category. If installed otherwise (inclined, vertically or others), they are degraded into the lower accuracy category, which cannot be accepted by UKT for billing purposes. Therefore, UKT needs to systematically force its staff to install water meters fully horizontally if the meters are single/multi-jet units.

For large meters (equal to or above DN 50 mm), in order to have revenue meters as accurate as possible (for improved billing and water balance calculations), the following items should be avoided:

- Installing water meters with the same nominal diameter as the service connection supplying the building (risks of oversizing the meter);
- Using horizontal Woltmann or multi-jet water meters for billing purposes, which are less accurate than single-jet water meters at equivalent DN (return on experience from VEOLIA);

The financial impact of a wrong choice in terms of meter sizing appears not only at the purchase of the meter but also during its normal operating conditions: an oversized water meter will be less accurate at low flows than a correctly designed one leading to non-negligible commercial losses.

Pilot project for block metering:

Tirana housing is typical of Balkan and CIS countries, with many people living in vertical brick or concrete buildings of different elevations (the majority having between three and five stories). Metering the overall water delivered to each building by installing a block meter on the main service line is fundamental for UKT, not only for billing purposes but also for NRW and water balance calculations.

Achieving a block metering coverage of 100% of buildings in Tirana is one of the urgent tasks UKT needs to tackle in order to decrease commercial losses. Billing procedures and regulations should be reworked with the relevant stakeholders in order to allow that:

- In buildings that are equipped with a water meter on the main service connection, including metered and unmetered apartments:
  - Apartments which are metered are billed based on the readings collected once per month by UKT meter readers;
  - The volumetric difference between the volume measured by the main water meter and the sum of volumes measured by the apartment meters is allocated between each remaining non-metered apartment based on the number of registered persons in each apartment;

- In buildings that are equipped with a water meter on the main service connection, including 100% of metered apartments:
  - Apartments which are metered are billed based on the readings collected once per month

by UKT meter readers;
- The volumetric difference between the volume measured by the main water meter and the sum of volumes measured by the apartment meters is billed to the condominium (if it exists and if it is contractually/financially liable) or allocated between each apartment based on the number of registered persons in each apartment or the weighted ratio of their metered consumption over the overall building consumption.

Block meters would act as the main revenue meter to ensure that 100% of the water measured and supplied to a specific building can be invoiced by UKT, therefore counteracting the risks of low-performing individual meters and the impact of customer roof tanks.

The objective of the pilot project for block metering will be:

- To get a reliable and accurate assessment of the potential revenue increase that could result from full block metering across UKT service perimeter;
- To test and overcome any potential difficulties that may be raised by the implementation of the meters: problems of access to the private premises of the building, technical issues, etc.

The pilot project would include the following steps:

1 – Definition of the building sample: The definition of the sample will consist in selecting in the customer database a sample of buildings, statistically representative of the building coverage of Tirana. The representativeness shall be appreciated according to a set of criteria:

- Size of the building (i.e.: number of apartments and number of dwellers);
- Age and/or general condition of the building;
- Situation of the apartments regarding individual metering (full, partial or nonexistent individual metering); buildings already equipped with individual metering should be preferred, but some non-equipped buildings shall also be included in the sample;
- Administrative situation: building not managed, managed by a condominium entity, etc.

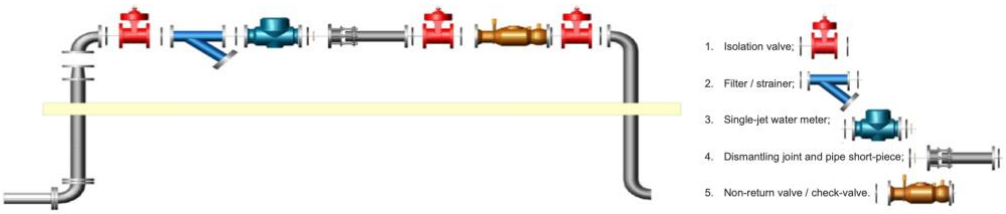
Given these various criteria, a minimum number of 100 buildings shall be selected.

A visit shall then be paid to each preselected building to check the feasibility of block meter installation within the premises of the building. An official letter shall be sent to the organization in charge of building management to inform it and to get an approval about the conditions of block meter installation.

2 – Perform consumption profile survey in the selected buildings: This stage is facultative. The survey of consumption profile will allow to define the most adapted specifications for meter types and accuracy. It can be done by installation of ultrasonic flowmeter equipped with data logger. A period of one week (5 working days and 2 week-end days) for each measuring point would be necessary to get a good knowledge of the consumption profile.

3 – Through consumption profile analysis, select the most adapted meter type: The goal is to measure the consumption profile of the building in order to optimize the size and performance of the meter – especially in terms of starting flow, and transition flow from the 5 % accuracy zone to the 2 % accuracy zone.

4 – Purchase and install block meters in the selected sample of buildings: Block metering standard installation for buildings could be done as shown in the figure below (this is of course for large meters i.e. meter installation DN 50 mm and higher):



Proposal of standard block meter installation

5 – After 6 months: Compare the readings of the block meters with the sum of individual invoicing (by individual meters or by norms) for each equipped building. Based on this comparison, a precise assessment of the potential additional revenue resulting from block metering, according to each category of building will be possible.

At the same time, the pilot project will have made possible a precise evaluation of the total costs of block meter installation. Based on these results, a robust financial modelling of the full block metering coverage will be possible (additional revenue, additional OPEX, CAPEX), technical and financial basis on which the utility shall be able to apply for a funding in good conditions.

Assessment of key account meter performance:

Meter accuracy is particularly important in the case of non-domestic customers as they are consuming much more water than domestic ones, with very often variable and specific flow rates and hydraulic constraints, which implies that the design, installation and meter accuracy monitoring of such meters is crucial to maintain revenues from non-domestic consumers at their maximum. This is particularly true in a context such as Tirana where non-domestic customers revenue contribution is essential to UKT operations.

For the top 100 customers, UKT could undertake temporary flow measurements (one week), with the ultrasonic flowmeters used for the block metering pilot project and/or with pulse modules and data loggers installed on the existing meters, to determine consumption profile (min/max/average flows). This will allow determining if the current meters are correctly sized for the customer consumption behaviour. If not, UKT would then replace them with new meters purchased and owned by the utility, in order to maximize revenues for the top 100 customers.

The ongoing Automatic Meter Reading (AMR) project, mentioned by UKT during the initial assessment phase, is the perfect framework to undertake the proposed assessment described above. The AMR coverage of key accounts should be determined using a “Pareto” approach, i.e. equipping the “X%” of accounts that amount to “Y%” of UKT revenue (40%, 50%, 60%. value to be determined by UKT after a cost-benefit analysis).

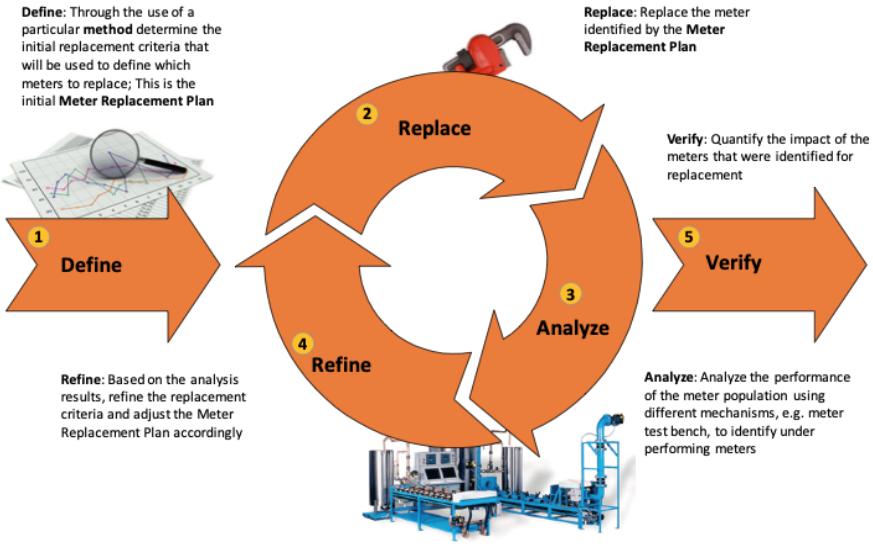
Launch UKT meter asset management programme:

UKT would also need to start a meter asset management programme in order to:

- Safeguard against revenue erosion over time by actively managing meter population to minimize deterioration of measurement accuracy;
- Avoid large peaks in workload and capital budget by smoothing out meter replacements over time i.e. by setting consistent annual replacement targets.

Governing principles of this meter asset management programme would be:

- Use cost-benefit analysis to drive meter replacement decisions;
- Set clear rules to prevent meters from exceeding their acceptable maximum lifetime;
- Balance objectives with the need to keep the solution simple and manageable with limited resources;
- Embrace an iterative approach to meter selection and prioritization.



Iterative approach for successful meter management and replacement programme

Replacement criteria is / are factors that are used to identify meters that need to be replaced.

Replacement criteria can range from one factor, such as meter age, to a combination of factors, such as age, brand, technology type and rate plan. There are different methods that can be used to define the meter criteria that will determine which meters to replace. The different methods range in complexity. One method might require only data analysis while another might require field work and the use of a meter test bench facility as shown in the figure below:

	Replacement criteria	Advantages	Disadvantages
Less Complex	**Meter age:** Only one factor considered: meter age	• Easy to implement with no need for meter testing or data logging • Age known without need for field visits (assuming well-managed database is available) • Simple forecasting over a long time period with no need for iteration	• Age not a good proxy for meter performance • Not easy to determine the best maximum age for all meter types and brands • No direct link to economic benefit of replacement

	Meter index Only one factor considered: total flow through meter since installation	• Relatively easy to implement with no need for meter testing or data logging	• Same as age plus
			  • Index in database may not be meter index if register has been replaced
			  • Rolling forecast required as index is less predictable than age

	Meter accuracy Incorporates several factors related to the meter (1)	• Replacement criterion directly linked to objective of minimizing accuracy loss • No need for assumptions on accuracy deterioration over time	• Requires meter testing and data analyses • Iterative planning process required in order to always incorporate latest test results into selection and prioritization process
More Complex	**Payback period** Incorporates several factors related to the meter and account information e.g. rate plan (2)	• Considers cost of replacement and expected revenue gain (which depends on meter accuracy and size of account)	• Requires assumptions about building flow patterns (or data logging) • Analytically most complex solution • Iterative planning required

Meter replacement criteria advantages and disadvantages

If UKT embraces the proposal of internalizing meter management operations for its revenue meters, it is recommended to reinforce meter asset management with the implementation of a meter test bench facility in order to be able to follow top-market replacement criteria, either “meter accuracy (1)” or “payback period (2)”. Implementing a new meter test bench facility within UKT, to be complemented with the accreditation of test benches and operating staff by the relevant stakeholders, will allow not only collecting revenue from the

periodical verification of the individual water meters (instead of subcontracting the tests as it is done currently) but it will also enable to:

- Perform tests of meters in service in case of customer complaints, which stresses the need for a full accreditation that will show that UKT MTF acts independently from any conflict of interest;
- Perform tests of meters in service and removed from service in order to estimate the accuracy and the behaviour of water meters to refine and update the company meter asset management programme.

Modern test benches operated by VEOLIA in France and China

Period	*Tasks*	*Entity responsible*
2020	**Strengthening of the UKT metering normative framework** including improvement of meter technical specifications, sizing and installation guidelines, etc.	UKT
2020	**Pilot project for block metering:** identification of building sample, initial flow/volume measurements, procurement and installation of pilot block meters, assessment of successes and threats **Launch of assessment of key account meter performance** (size of sample to be determined)	UKT
2021	**Target: 100% block metering coverage** of Tirana and surrounding villages	UKT
2021 or 2022	Based on the progress and success of UKT metering normative framework strengthening: launch of UKT meter asset management programme (**only if all revenue meters become UKT property**)	UKT

Cost/benefit analysis

Cost - estimated CAPEX: it is very difficult to estimate the investment budget required for all the above actions as baseline data is not enough to determine a rough estimate

Estimated benefits: the above actions are critical to ensure that UKT revenue stream is quickly consolidated and improved

Performance monitoring

For block metering: % of metering coverage of buildings in UKT service perimeter / follow-up of common needs volumes

For key account meter performance: % of large users audited, number of meter sizing validation or meter sizing redesign

FOPIP Action - CUST-2: Clean-up the customer database through a full-scale commercial field survey

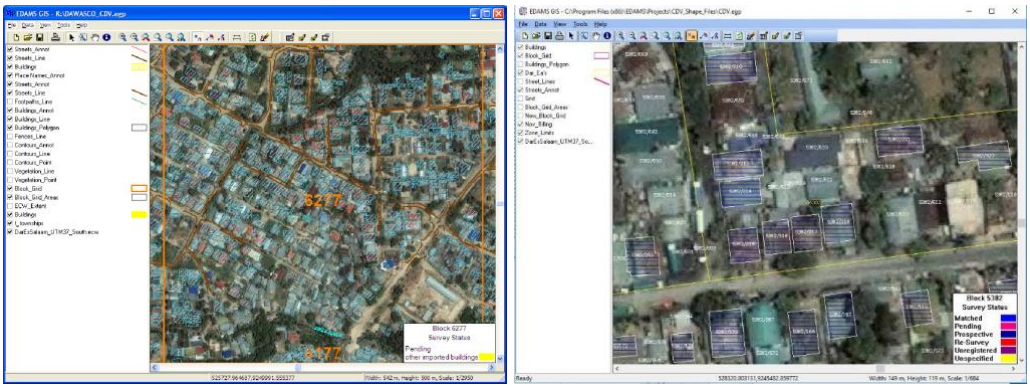
Action objective: the strategic objective of this action is the implementation of a reliable and updated customer database within UKT, based on field inspections in the entire area of Tirana and surrounding villages, which will serve to structure and consolidate the commercial management procedures, increase the income of UKT and reduce commercial losses

Description of the action: SEURECA recommends following the technical approach described hereafter, which has proven to be a result-oriented methodology adapted for a water utility such as UKT, and would therefore be based on:

- A cleanup of the current database to eliminate errors and inconsistencies accumulated year after year: duplicate users, users billed in an incorrect category (e.g. commercial use customer billed as a residential user), users with zero billed consumption or cut-off accounts with continuous use of water, etc.;
- A field data survey and geo-referencing campaign to audit all properties, service points and users;
- A modernization of the data model of the customer database that allows an efficient commercial management, such as the cycle reading-invoicing-collection;
- An implementation of a commercial management based on a database of properties (connected or without connections; active or inactive) in order not to lose the census of the service points when the contract is voluntarily cancelled by the client's request or by the UKT due to non-payment;
- A dynamic interaction with the meter database that allows an updated and iterative programming of the renewal of the UKT meters;
- An identification of priority areas where efforts to reduce commercial losses will be concentrated (renewal of meters, regularization of unregistered customers, detection of fraud in registered customers, etc.) as well as efforts to increase coverage in unserved areas;

More specifically, the following tasks should be implemented with a bottom-up approach, i.e. from the buildings/properties on-site to the databases in head-office:

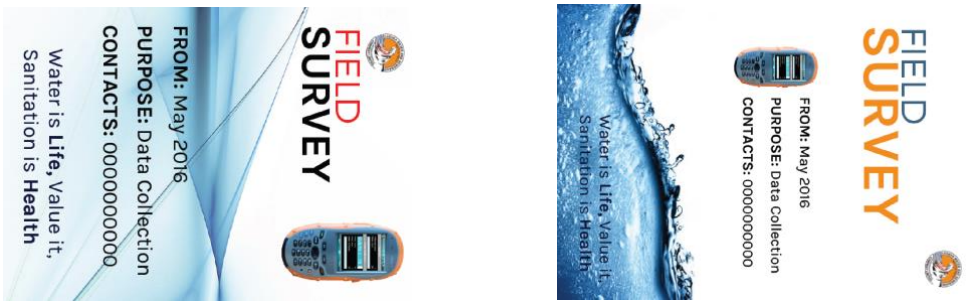
- Prepare a GIS and a database of buildings/properties for the project: it is very possible that several mapping sources will have to be combined depending on the service areas of UKT: official cadastral backgrounds, creation of polygons on "raster" background maps belonging to UKT or of open use, etc.



Example of GIS with database of buildings/properties used for full-scale commercial field survey

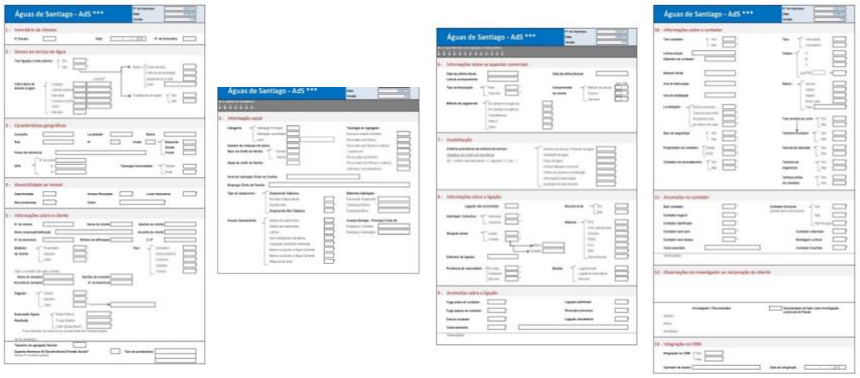
- Determine the current areas with drinking water and sewerage services under UKT operations;
- Develop the required links between the customer database and the buildings/properties database;

- Develop and implement the strategy, programme, and user communication vectors prior to beginning field data collection. Communication will be very important as the general public will have to allow UKT staff to access the buildings/properties, and cooperate with them during the field survey phase;



Example of posters proposed by a water utility before launching commercial field surveys

- Determine the quality level of the current customer database, prepare the conceptual model of the final database and perform a gap analysis;
- Determine the database fields and attributes required for checking during the field surveys. The data to be collected will be categorized by building, property, user, meter, etc.;
- Design technical tools for data collection;



Example of tablets and survey sheets/questionnaires used for commercial field surveys

- Develop the technical tools for evaluating the quality, accuracy and integrity of the surveyed and digitized data;
- Create restricted fields to prohibit incorrect formats and errors during data collection and digitization. This involves improving controls for data capture to include, among others, drop-down menus, restrictions for moving to the next stage if data is incomplete, and so on;
- Undertake data collection by visiting all buildings/properties in areas with services to, for example,

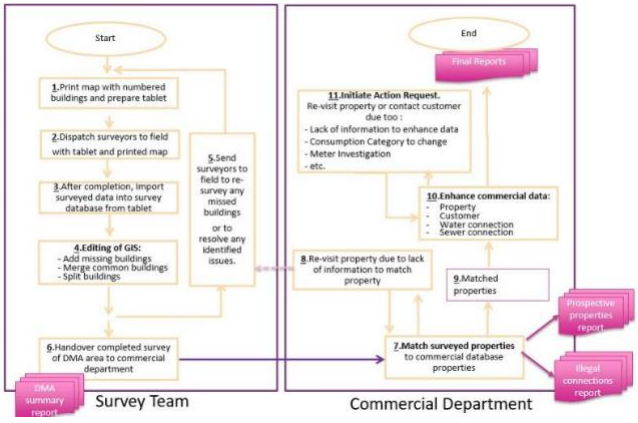
determine the existence of water and sewer connections on properties, identify properties which are unregistered / unmeasured / measured and billed as unmeasured, categorize customers in line with the tariff structure, etc.;

- Survey the GPS coordinates of users and meters;

Example of GPS coordinates for customers obtained during commercial field surveys

- When feasible, assign customers to DMZs, DMAs, pressure zones, etc.;
- Determine the best method to load new data without interrupting or delaying the UKT reading and billing processes;
- Develop a system to store survey results in a temporary database capable of combining / comparing the surveyed data with existing data, and that can integrate them into the commercial management database after a few procedures of internal commercial analysis and final validation;

UKT should carry out a pilot census in a pre-selected sector in order to validate in the field the methodology and tools used, to train the census teams, to adjust the necessary logistics (equipment, organization of the working groups) and to establish the definitive procedures that will be applied for the replication to the rest of the service perimeter.



Example of commercial field survey workflow validated after a pilot deployment

The updating of the data contained in the UKT customer and meter databases must be carried out at the same time as progress is made in the collection and digitalisation of data in the field, thanks to the system developed for the processes of pairing, comparison and detection of inconsistencies between the field data and the official UKT data, and subsequent regularisation of the users.

Parallel processes to field data collection are based on the following:

- The pairing aims to relate the properties visited, in which water and sewer connections were found, to the users listed in the UKT commercial database. In the event that unlisted properties are detected, additional tasks will be activated which may be inspections/audits made by the UKT, or calls from the UKT customer service center to collect additional information and regularize the users' reading and billing process;

- Data comparison and inconsistency detection aims to list the fields that need to be updated, when the field and database information do not match. Certain fields can be updated automatically and others will generate additional tasks of inspection and commercial correction (examples: user found with meter and listed as not measured, accumulated volume index read in field substantially different from the last registered reading, user found as commercial and listed as residential);
- The progressive regularization of users must be accompanied by additional tasks that may be of a legal nature (in case of fraud), of a commercial nature (in case of the need to phase or pardon payments), of a technical nature (adaptation of illegal water and sewage connections to the internal standards of UKT), etc.;

As soon as the database updates are ready in complete areas (example: DMAs), the final data will be analyzed in detail to determine the volume of commercial losses that can be easily reduced through the following non-exhaustive list of actions:

- Elimination of fraudulent connections or installation of new meters;
- Replacement of blocked or defective meters;
- Billing adjustments for meters not read over an extended period of time;

Finally, the action "clean-up the customer database through a full-scale commercial field survey" is intrinsically linked to other actions suggested in this FOPIP report, for example:

- the data collected in the field during the commercial field survey will update and complete the meter database, and thus improve the process of defining the annual program of substitution of UKT meters under the meter asset management programme;
- the strengthening and modernization of UKT commercial management procedures will allow keeping the content of the commercial database up to date and complete, in order to avoid future large-scale censuses;
- the cross analysis between user cadastre, infrastructure cadastre (GIS) and zoning of networks will allow fine-tuning the calculations of physical/commercial losses and network performance indicators, and the action plans determined to reduce losses within each hydraulic system. The user cadastre will also allow to refine the spatialization of water demand within the UKT hydraulic model for Tirana and surrounding villages;

SEURECA recommends using existing field staff from the Commercial Directorate to form the census teams in charge of auditing properties and water delivery points in the service perimeter. This staff will be mobilized 2 years for this census project and will then need to be allocated again to new projects.

Period	***Tasks***	***Entity responsible***
Q1 2020	**Preparation of technical specifications and tender documents** for the commercial field survey equipment required for 25 teams **Identification of suitable internal candidates** to be trained as staff for the commercial field survey team - recruitment to be done among existing staff from the Commercial Directorate	UKT
Q2 2020	**Procurement process** for the commercial field survey equipment equipment required for 25 teams	UKT
Q3 2020	**Completion of internal recruitment**, reception of procured equipment, launch of internal training sessions and **launch of pilot sector census**	UKT
Q4	Continuation and completion of commercial field survey and	UKT

2020 Q4 2022	cleaning-up the customer and meter databases for Tirana and surrounding villages	

Cost/benefit analysis

Cost

- *Estimated CAPEX: ~1k€ per team (x25) / ~25k€ in total*
- *Estimated OPEX: 25 FTEs (Full-Time Equivalent), to be recruited among current commercial staff. Staff grading to be determined to evaluate recurrent HR OPEX in k€/year. OPEX to be calculated for a 2-year census project.*

Estimated benefits: increased revenue from water and wastewater sales through regularization of fraudulent users, improvement of metering, regularization of customer tariff category, etc.

Performance monitoring

- Monthly nb of properties planned in census
- Monthly nb of properties visited unsuccessfully
- Monthly nb of properties visited successfully
- Monthly nb of customers updated in UKT commercial system database
- Monthly nb of customers regularized in UKT commercial system database

10.2.3. Medium/Lower priority actions

The following table provides indications on a number of medium-long term recommendations to further develop the Commercial / Customer Management function according to the approach of continuous improvement.

#	AREA	ACTION	BRIEF OBJECTIVE OF THE MEASURE	UKT TEAM IN CHARGE OF IMPLEMENTATION	FINAL OUTPUT EXPECTED AND KEY INTERMEDIARY MILESTONES	EXPECTED TIMELINE FOR IMPLEMENTATION	ROUGH COST ESTIMATE
1	Commercial / Customer Mgmt	Pursue court action for old bad-debt write-off (over 9 years)	Reduce yearly amount of unpaid debt which weighs on UKT balance sheets	Finance Department	Coherent amount of unpaid debt in UKT balnace sheet	2022	To be assessed
2	Commercial / Customer Mgmt	Organise communication/information campaign to raise awareness on the necessity to pay for water (water has not price but water supply has a cost). Campaigns should particularly take place prior to the tariff increment every 2 years.	To reduce illegal connections, increase revenue collection and customer satisfaction through the population's understanding of the company's objectives and challenges	Public Relations Depa	Communication campaigns	2021-2022	To be assessed depending on the communication strategy. The creation of Water User Committees will greatly suppor the implementation.
3	Commercial / Customer Mgmt	Develop a Customer Strategy and instigate cultural change to consistently turn the Company into a "customer-focused" organisation	To clarify goals and approach in terms of customer experience and customer satisfaction, and ultimately, increase revenues	Sales Department	UKT Customer strategy	2021-2022	Can be done internally - only man-hours

11. Summary and way forward

The assessment performed in July-August 2019 aimed at identifying UKT's strengths and weaknesses via an analysis by business process. Through discussions with UKT teams and a workshop aimed at reaching a common understanding of UKT's maturity level in its various functions as a water and sanitation company, it was possible to establish a mapping of priority areas for the Company's overall performance.

Following the assessment, this report developed an action plan composed of a series of high priority recommendations to improve UKT's financial and operational performance along the following key axes:

	Category	Proposed High-Priority Actions to improve UKT's organisational, financial and operational performance
CORP-1	Corporate / Governance	Set up governance process and improve reporting mechanisms
CORP-2	Corporate / Governance	Set up corporate performance monitoring system
CORP-3	Corporate / Governance	Organise the Digital function and strategy across UKT
CORP-4	Corporate / Governance	Implementa global data management system
HR-1	Organization / HR	Revise UKT organisational structure
HR-2	Organization / HR	Improve HR Management in line with industry best practices
HR-3	Organization / HR	Implement a Talent Management strategy within UKT
FIN-1	Financial Management / Accounting	Streamline and systematise Financial Mgmt/Accounting Practices
NET-1	Network Performance	Set-up operational leak detection and location teams
NET-2	Network Performance	Develop and implement UKT calibrated water infrastructure hydraulic model
NET-3	Network Performance	Carry-out the energy efficiency assessment of electromechanical assets
NET-4	Network Performance	Implement macro-zoning in UKT service perimeter, then split into DMAs, in parallel of a pressure management programme
O&M-1	O&M / asset Management	Develop and implement an integrated CMMS
O&M-2	O&M / asset Management	Standardize O&M practices
O&M-3	O&M / asset Management	Initiate risk management in O&M activities

O&M-4	O&M / asset Management	Improve stock management
O&M-5	O&M / asset Management	Implement a GIS system
O&M-6	O&M / asset Management	Deploy the SCADA system to the entire perimeter
CUST-1	Commercial / Customer Management	Develop a Corporate metering strategy
CUST-2	Commercial / Customer Management	Clean-up customer database

Priority has been given to recommendations presenting “quick-wins” for the Company with relatively low investment requirements. However, in time, UKT’s alignment with international standards and best practices in terms of network performance, digitalisation and data integration will require capital expenses which have to be budgeted.

Moreover, the focus has also been made on the alignment of operational practices with international standards in order to support UKT in the operation and maintenance of the new assets being built under EBRD funding. But more generally, this action plan proposes

With support from its ambitious management team, prioritised investment and adequate capacity building of its strong staff base, UKT will be able to move towards first-class utility practices. Standardising practices on its various business processes as well as leveraging on the use of adapted and performant digital operational tools (customer management, maintenance management, geographical information system, etc).

For the successful implementation of the recommended actions, the commitment of UKT’s top management will be essential and it is highly recommended that these recommendations be consolidated within the revised UKT Business Plan. Sufficient budget will need to be allocated to the various departments and individuals will have to be appointed in charge of each action to ensure actual implementation.

13. Annex A - UKT proposed revised Organisational Structure

14. Annex B - Supporting guidelines on HR / Organizational performance improvement recommendations

The following tables provide supporting guidelines for the implementation of the proposed HR/Organisational performance improvement measures.

Develop clear job descriptions
Action objective: To develop clear job description or role profiles based on: tasks and responsibilities, required qualifications and core competencies per each position.

Description of the action: For a clear job description it is necessary to outline the details of who performs the specific type of work, how that work is to be completed, and the frequency and the purpose of the work as it relates to the UKT's mission and goals.

Job descriptions may be used for a variety of reasons, such as a tool for recruiting, determining salary levels, conducting performance reviews, clarifying missions, establishing titles and pay grades and creating reasonable accommodation controls, as well as for career planning, training exercises and legal requirements for compliance purposes. In order to develop a clear job description, HR department shall follow the proposed steps:

Step 1: Perform a job analysis - this process of gathering, examining and interpreting data about the job's tasks will supply accurate information about the job so that UKT can perform efficiently.

- Interview employees to find out exactly what tasks they are being performed.
- Observe how tasks are performed.
- Have employees fill out questionnaires or worksheets.
- Collect data on jobs from or other resources such as salary surveys and the results should be documented and reviewed by the employee that is currently in the position - and his or her supervisor - for any changes regarding the knowledge, skills, abilities, physical requirements, environmental factors and credentials/experience of the position:
  - ➔ Knowledge - Comprehension of a body of information acquired by experience or study
  - ➔ Skill - a present, observable competence to perform a learned activity.
  - ➔ Ability - competence to perform an observable behavior or a behavior that results in an observable product.
  - ➔ Physical Conditions - the physical attributes an employee must have in order to perform the job duties with or without reasonable accommodation.
  - ➔ Environmental factors - working conditions (inside or outside the office).
  - ➔ Minimum Qualification - the minimum level of education, experience and certifications acceptable for the position.

Step 2: Establish the essential functions - once the performance standard for a particular job has been made, essential functions of the position must be defined. To establish the performance standard:

- Ensure that the tasks as part of the job function are truly necessary or a requirement in order to perform the job.
- Determine the frequency at which the task is performed or how much time is spent performing a task.
- Determine the consequences of not performing the function and whether this would be detrimental to the company's operation or result in severe consequences.

- Determine if the tasks can be redesigned or performed in another manner.
- Determine if the tasks can be reassigned to another employee

Step 3: Organize the data concisely - the structure of all job descriptions should be standardized within UKT so that they have the same appearance, and the following topics should be included:

- Date - when job description was written.
- Job status - full time or part time.
- Position title - name of the position.
- Supervision received - to whom the person reports.
- Job summary - an outline of job responsibilities.
- Essential functions - tasks, duties and responsibilities.
- Competency or position requirements- knowledge, skills and abilities.
- Quality and quantity standards - minimum levels required to meet the job requirements.
- Education and experience - required levels.
- Physical factors - type of environment associated with job: indoor/outdoor.
- Working conditions - shifts, overtime requirements as needed.
- Unplanned activities - other duties as assigned.

Step 4: Add the disclaimer

It is a good idea to add a statement that indicates that the job description is not designed to cover or contain a comprehensive listing of activities, duties or responsibilities that are required of the employee.

Step 6: Finalize

Draft the job description for upper management review and approval. A draft allows upper management a chance to review, add or subtract any details before the final job description is used for employees and management. Once returned from management, the job description should be reformatted with any changes. It should be sent to management one final time for final approval and signatures. The final job descriptions should be kept in a secure location and copies used for job postings, interviews, compensation reviews, and performance appraisals; employers may also post them on the company's intranet.

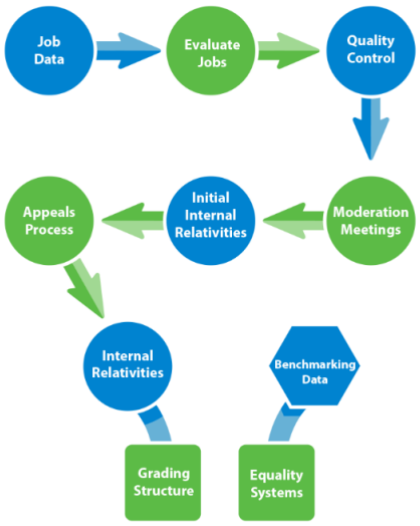
Establish a Grading & remuneration system
Action objective: UKT grading & remuneration system shall include strategic issues, competitive practices, the organizational culture and the affordability of pay, to consider the organization's financial resources with regard to its ability to pay employees in the form of salaries.

Description of the action: When developing a grading & remuneration system the key strategic issues to consider are the objectives of UKT and the extent to which salary will be used to attract and retain employees capable to successfully achieve its objectives. Also grading & remuneration system shall be adjusted according to the needs, goals, and the available resources of UKT and may be used to:

- recruit and retain qualified employees.
- increase or maintain morale/satisfaction.
- reward and encourage peak performance.
- achieve internal and external equity, etc.

The UKT grading & remuneration system presents an interactive model that allows scenario planning with

short and long term impacts displayed for individuals, grades, gender impact and the company and may include the following components:

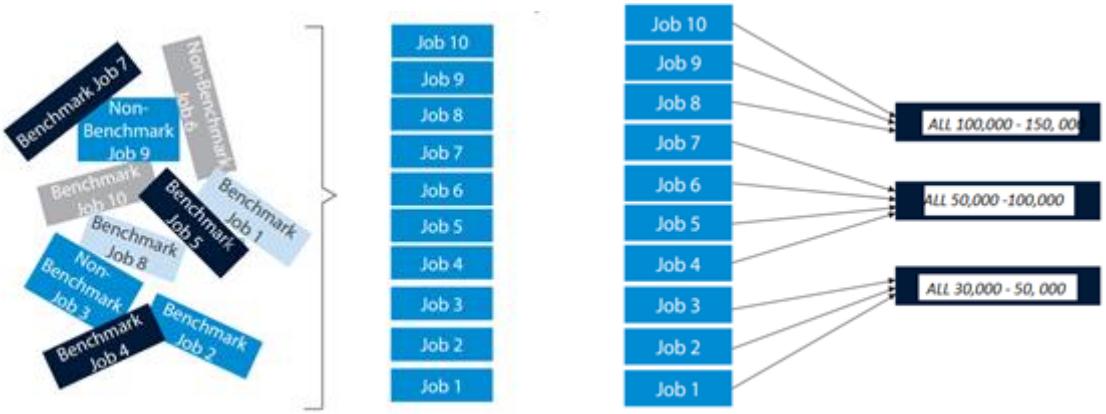


Job Descriptions: define in writing the responsibilities, requirements, functions, duties, location, environment, conditions, and other aspects of jobs.

Job Analysis: Conduct a general task analysis by major departments and get input from the heads of marketing, finance, sales, administration, production, and other appropriate departments to determine the organizational structure and primary functions of each. This shall be followed by interviews and meetings with department managers and key employees, as necessary, to determine their specific job functions.

Job Evaluation: Rank the jobs within each head department, and then verify ranking by comparing it to industry market data concerning the ranking, and adjusting it if necessary. On the basis of required tasks and forecasted plans, UKT shall develop a matrix of jobs crossing lines and departments and then compare the matrix with data from both the company structure and the industry wide market and after an assessment, present it to the compensation committee for review and adjustment.

Pay Structures: UKT should provide a framework for administering its employee compensation program. An effective administration of the compensation program would require a balance between the pay levels for employees inside the company - internal equity - and the pay levels those employees could command in the company's recruiting markets - external equity. A Salary Structure may be developed by evaluating market pay levels for the majority of the jobs, named as a "benchmark jobs". The market pay levels for all benchmark jobs can be arranged from highest to lowest to assess the relative value of each job. After that UKT shall assess the value of all company jobs based on external and internal factors as a means of arranging the jobs from highest to lowest value, to create a job-worth hierarchy and determine the number of pay grades, or monetary range of a position at a particular level, within each department.



Develop a salary administration policy: UKT shall develop and document the strategy for merit raises and other pay increases, such as cost-of-living adjustments, bonuses, annual reviews, and promotions and meet with the compensation committee for review, adjustments, and approval. After that make presentations to managers and employees to inform them on the program. It is important to work with the HR department staff to establish effective implementation procedures, to develop appropriate data input forms, and to create effective monitoring reports for the employees.

FOPIP Action -3: Creation of GIS section

Action objective:
In order to provide an effective and efficient water supply system it is recommended that a GIS department (Geographic Information System) to be established within the water utility company.
This department through GIS applications will ensure a better monitoring of the whole territory, a better management of assets and infrastructure, a better service to the consumer and shorter time of responding to system defects.

Description of the action:
In order to provide an effective and efficient water supply system it is recommended that a GIS department (Geographic Information System) to be established within the water utility company.
This department through GIS applications will ensure a better monitoring of the whole territory, a better management of assets and infrastructure, a better service to the consumer and shorter time of responding to system defects.
A water supply system becomes effective through monitoring, modernization, rehabilitation, development and automatization of the routing of water from the source to the consumer arduous one that involves a multitude of technologies that are in a constant evolution.
The water supply company currently does not have a GIS department, which will allow them to store data and monitor the service delivery in a digital way. The lack of this department leads to a lack of information for executives and specialists of this company, as they find it difficult to precisely determine a possible defect in the water supply system, which leads to an increase of time of repairing the defect.
GIS applications allows the water utility company keep record of pipes, valves, fittings, hydrants and meters together with their characteristics and status); determining and prioritizing repair and replacement works; and closing valves to redirect water flow. GIS allows you to view, question, interpret, understand and visualize data in many ways that reveal relationships, patterns and trends in the form of maps, reports and charts. GIS application allows decision makers to view the spread of the system in the territory and to store information

about the surrounding areas like property owners, property papers category of use of the land etc.
GIS, it can be seen as the science and art of obtaining, storage, manipulating and analysis of reliable information about the environment for proper decision-making.

Period	*Tasks*	*Entity responsible*
Q1 2019	Task 1: Drafting terms of reference for the company that will set up the system of Web GIS	
Q2 2019	Task 2: Procurement process for setting up the Web GIS system	
Q3 2019	Task 3: Field data collection and base line analysis of the water supply system	
Q4 2019	Task 4: Digitalization of the water supply system, pipes, valves, fittings, hydrants and meters together with their characteristics and status	
Q1 2020	Task 5: Drafting terms of reference for the GIS experts that will be employed in the water supply utility	
Q4 2020	Task 6: Employment of the experts	
Q4 2020	Task 7: Training sessions from the company that has design the Web GIS system to the GIS experts employed from the water supply utility.	
Q4 2020	Task 8: Tender for purchase office supplies.	

Cost/benefit analysis	**Performance monitoring**
(indicate cost (CAPEX+OPEX) as well as benefits if can be quantified *This action would increase the UKT performance level and aligned it with its strategic intent.*	*(indicate KPI to monitor improvement of performance through this action)*