Ministry of Water & Irrigation
وزارة المياه والري

Ministry of Water and Irrigation
Utilities Performance Monitoring Unit (UPMU)

Jordan Water Utilities Monitoring Report 2019

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Monitoring Report
2019

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Abbreviations:

AW	Aqaba Water Company
BMZ	German Federal Ministry for Economic Cooperation and Development
CMMS	Computerized Maintenance Management System
EMRC	Energy and Mineral Resources Commission
EoY	End of Year
FFA	Field Force Automation System
GI	Galvanized Iron
GIS	Geographic Information System
GIZ	German International Cooperation
Hr	Hour
IT	Information Technology
JOD	Jordanian Dinar
Km	Kilometer
KPI's	Key Performance Indicators
KWH	Kilo-Watt Hour
Lcd	Litter per capita per day
MCM	Million Cubic Meter
MWI	Ministry of Water and Irrigation
NA	Not Available
NCC	National Call Centre
NGWA	Northern Governorates Water Administration
No.	Number
NRW	Non-Revenue Water
NSPI	National Strategy Performance Indicator
O&M	Operation and Maintenance
OMS	GIZ Operations Management Support Project
PBC	Performance Based Contract
PE	Poly-ethylene
PIs	Performance Indicators
PMU	Programme Management Unit
PSP	Private Sector Participation
Subs.	Subscribers
UPMU	Utilities Performance Monitoring Unit
W&WW	Water and Wastewater
WAJ	Water Authority of Jordan
WTPs	Wastewater Treatment Plants
YWC	Yarmouk Water Company

UPMU Vision

Enhancing the capabilities of Jordanian water utilities to provide the best services to customers in an effective and efficient manner.

UPMU Mission

Monitoring the Jordanian water utilities on agreed set of indicators, setting performance targets to evaluate, compare, recommend incentives and penalties accordingly taking into consideration enhancing the financial sustainability of the utilities.

1. Foreword

This performance monitoring report was prepared by the Utilities Performance Monitoring Unit (UPMU), which was established under the Ministry of Water and Irrigation and linked to H.E. the Minister. Unless otherwise stated, the report is based on data and information provided by the Miyahuna-Amman, Aqaba (AW) and Yarmouk (YWC) Water Utilities.

Monitoring is extremely important for building strong utilities. It helps them to determine how efficiently their operations and activities are being conducted, and to assess the productivity of management and employees. It also enables the utilities to evaluate their results against a set of Performance Indicators (PIs), which will help with the following:

1. Assessing performance, possibly against KPI or performance targets.
2. Assessing the achievement of national policy targets and the overall development of the sector.
3. Creating transparency and accountability within the sector and individual utilities through public reporting.

These results can then help the MWI to improve the utilities' overall performance, reach its goals, and ensure the continued provision of high-quality water and wastewater services.

This first annual report documents the performance of the Miyahuna-Amman, AW and YWC water utilities in the year 2019, and is comprised of four sections: Service quality, Operational efficiency, Water resources efficiency, and Financial performance. Performance is assessed against 10 KPIs and 33 lower level PIs, along with National Strategy Indicators (NSPI). The results are then used to assess the utilities' performance and their adherence to the Ministry of Water and Irrigation's strategic goal of improving and sustaining high quality water and wastewater services.

Although the main task of the UPMU is to monitor Jordan's water utilities, the UPMU views supporting the utilities in addressing the challenges they face as pivotal to the overall efficiency of the water sector.

For this report, the UPMU conducted the review and assessment in accordance with the KPIs for water and wastewater services, customer services, financial and human resource indicators that it had previously developed in cooperation with the three water utilities. The updated monitoring tool was submitted to H. E. the Minister of Water and Irrigation on 02/03/2020.

While these indicators form the basis for the routine monitoring of all utilities, UPMU might deem it necessary to collect additional data to fulfill its mandate.

UPMU believes that its review and evaluation of the water utilities' 2019 variables and indicators establishes a reasonable basis for the findings contained herein.

2. Description of UPMU

The "Utilities Performance Monitoring Unit" (UPMU) was established in accordance with WAJ Law No. 18 and its amendments in Article (10) to enhance the water sector principles of transparency and good governance, and to improve the legal and contractual relationship between the Ministry of Water and Irrigation (MWI) and the water utilities.

To meet these objectives, the UPMU performs the following tasks:

1. Monitoring the utilities' performance and issuing performance reports.
2. Setting and developing KPI baselines and mechanisms for their calculation and using them as a basis for comparing and evaluating the utilities' performances.
3. Developing and reviewing the necessary documentation for establishing the utilities and developing their tasks/duties (i.e. Development and Delegation Agreements, Establishment Contracts and Internal Bylaws).
4. Issue the basis and general evidence which describe the frameworks for developing internal working guidelines and procedures, such as staff and financial guidelines.
5. Reviewing, approving and accrediting company business plans and setting targets in cooperation with the utilities and in accordance with water policies.

A steering committee has been established to supervise UPMU, chaired by H.E the Minister of Water and Irrigation, with the following members:

1. H.E. Secretary General of WAJ
2. H.E. Secretary General of MWI
3. H.E. Secretary General of JVA
4. Director of Legal Affairs in MWI
5. Assistant Secretary General for Financial Affairs – WAJ
6. Donors Representative
7. King Abdullah II Centre of Excellence Representative

The figure below shows UPMU's approved organizational structure:

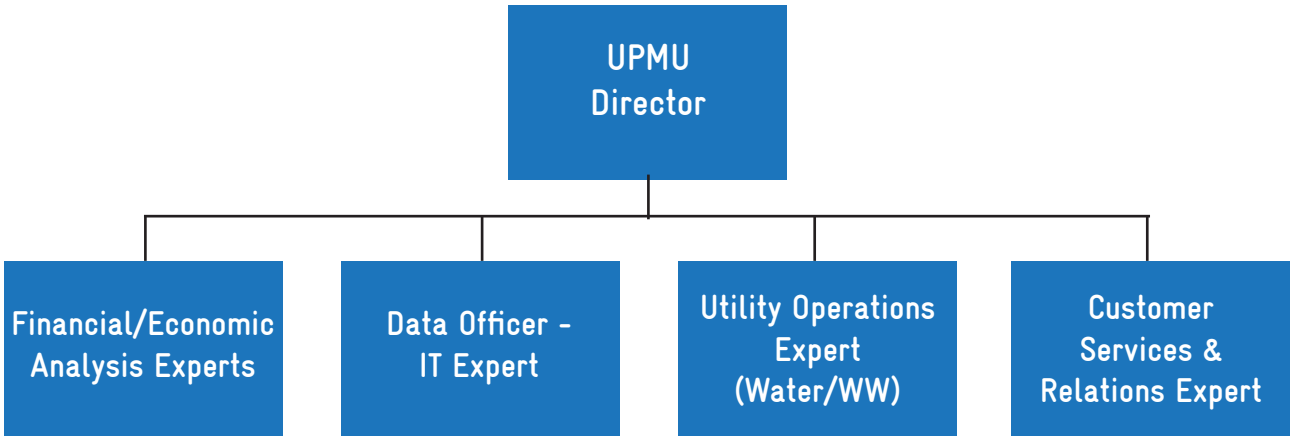


Figure 1: UPMU Organization Structure - March 2020

3. Explanation of the rationale of the annual report

3.1 Objective of the report

This first annual report is based on data from 2019. It builds on the monitoring and reporting framework which UPMU introduced in its May 2020 report that covered the first three quarters of 2019.
This annual report will:

- Establish baseline data for the performance of Jordan's water utilities.
- Evaluate the utilities' operations, showing where they are doing well and where they face challenges in performing their mandate in the different fields.
- Provide a single, consolidated source of information for policy makers and stakeholders for Jordan's water utilities.
- Establish UPMU's role as a mediator through which representatives from the different utilities can meet and exchange their approaches to issues of shared concern.
- Contribute to transparency and accountability, while revealing the challenges and offering pathways for improvement.

3.2 How the data was collected and analyzed

With GIZ's support, UPMU updated the variables and indicators which the previous monitoring unit had used and established an approved list of variables, Key Performance Indicators, Lower Level Performance Indicators, and Strategy Indicators to meet the UPMU's tasks and goals in the most efficient and effective manner.
The Excel spreadsheets which the previous PMU used for data collection differed slightly from utility to utility. A single Excel spreadsheet was therefore produced to unify data collection. This tool automatically imports data from all the utilities into a single file (see figure below) which calculates all indicators automatically and consolidates data from all utilities into one master sheet, making it easier to analyze trends and make comparisons between utilities.
This is the first report based on the new tool, and UPMU expects the reporting procedure to evolve and improve over time as monitoring and analysis capacities increase and adjustments are potentially made to policies and strategies in the sector. The reporting utilities will also be able to internally assess their performance against the defined indicators, improving transparency and ensuring that they are not surprised by the results and conclusions in future UPMU reports.

Figure 2: Home page of master sheet

The UPMU supported the utilities in completing the new Excel spreadsheets within the reporting deadline by explaining the variables involved and providing training on using the new system. This ensured the accuracy of the data and helped to ensure that people understood the results.

Nevertheless, there were a number of challenges in compiling and verifying the data which required close cooperation between the UPMU and the different utilities to explain the data sets and their sources, translate terminology, and ensure ownership of the end results.

Different levels of process automation and digitalization within the utilities meant that some data were readily available whilst others had to be manually gathered and compiled through spreadsheets. Other technical issues that emerged included financial and commercial bottlenecks and differing time scales between the two processes, and commercial data not matching financial data (e.g. annual revenue).

Once the data had been collected and verified, the monitoring tool consolidated the three utility sheets into a master report. UPMU experts then examined the numbers and information outputs, analyzing and correlating the various sets of indicators and clustering them to allow for a better overview of the issues that the report raised. They also went back to the utilities to verify and clarify certain results to ensure that they had a full understanding of some of the outputs before producing the final analysis.

The outputs were then discussed and crossed-checked internally amongst the different categories to provide a more comprehensive overview of the performance and comparison of related indicators. Figures and tables were produced to support the report's conclusions, with comments and recommendations to help the stakeholders understand the various outcomes.

This first annual report will be published and shared with the stakeholders to improve transparency and develop a better understanding amongst sector management and others of the utilities' current status. The outcomes will be used to identify and prioritize areas where improvements and interventions are necessary.

4. Performance Indicators[1]

4.1 Service quality

The first group of indicators, which looks at aspects that describe the quality of service experienced by the utilities' customers, addresses water quality, service reliability, complaints, and the responsiveness of the service providers, as well as commercial & customer processes.

For this report, the UPMU team reviewed all performance indicators and identified the following 14 for inclusion in the Service Quality sub-chapter:

Ser.	Cluster	PI Name	PI Level	Unit	No. of Variables
1.	Quality Assurance & Control	Microbiological water quality compliance	KPI	%	2
2.		Water quality tests performed	PI	% of req. tests	2
3.		Physical-chemical water quality compliance	PI	%	2
4.		Effluent quality compliance	NSPI	%	2
5.	Supply Mode & Efficiency	Continuity of supply	KPI	% of time	2
6.		Water consumption per capita (residential subscribers)	KPI	Liters/capita/day (lcd)	2
7.		Subscribers receiving continuous supply	PI	%	2
8.	Commercial & Customer Processes	New connection efficiency	KPI	% of requests	2
9.		Percentage of inactive subscribers	PI	%	2
10		Metering ratio	PI	%	2
11.		Subscriber meter replacement ratio	PI	%	2
12.		Meter reading ratio	PI	%	2
13.	Customer Relationship & Complaints	"No Water" complaints	KPI	No./1000 active subs.	2
14.		Billing complaints	PI	No./1000 subs.	2

Table 1:Service quality cluster and indicators

[1]See annex IV PIs calculation

4.2 Operational Efficiency

The second group of indicators, which looks at operational efficiency, is divided into four clusters.

a. The first cluster analyses employees' efficiency, capability, and capacity building.

b. The second cluster is concerned with increasing the use of technology to improve energy efficiency.

c. The third cluster focuses on aspects that have a direct influence on making operations more efficient and cost effective.

d. The fourth cluster looks at bulk metering, which can give a better understanding of the percentage of Non-Revenue-Water (NRW).

4.3 Water Resources Efficiency

This third group consists of two clusters, one KPI and five PIs.

a. The first cluster uses four different indicators to analyse water losses, which include both real losses (i.e. physical losses from the network) and apparent losses (i.e. unauthorized consumption, metering inaccuracies and data handling errors).

b. The second cluster consists of two PIs that represent actual water losses in the network and describe the volume of water supplied by the utilities per capita.

Ser.	Cluster	PI Name	PI Level	Unit	No. of Variables
1.	Staff Utilization & Efficiency	Employees per 1000 subscribers Water & Wastewater (W&WW)	KPI	No/1000 subscribers	3
2.		Employees per 1000 subscribers W[2]	PI	No/1000 subscribers	2
3.		Training per employee	KPI	Hr/employee	2
4.		Percentage of staff trained	PI	%	2
5.	Energy Efficiency	Average unit energy consumption	PI	KWh/m^3	4
6.		Renewable energy utilization	NSPI	%	5
7.	Response Time & Repair Efficiency	Speed of repair of failures	PI	%	4
8.		Preventive maintenance of pumps	NSPI	%	2
9.		Corrective maintenance of pumps	NSPI	%	2
10.		Sizing of pumps	NSPI	%	2
11.	Bulk metering	Operational well and reservoir meters	NSPI	%	2
12.		Calibration of well and reservoir meters	NSPI	%	2
13.		Metering of import and export points	NSPI	%	4

Table 2: Operational efficiency cluster and indicators

Ser.	Cluster	PI Name	PI Level	Unit	No. of Variables
1.	Water Losses	Non-Revenue Water	KPI	% of system input	2
2.		Water loss per subscriber	PI	Liters/subscriber/day	4
3.		Water losses per mains length	PI	m^3/km/day	3
4.		Water losses per connection per day[3]	PI	Liters/connection/day	5
5.	Network Efficiency	Inefficiency of use of water resources	PI	%	5
6.		Water resources use per capita/day	PI	lcd	4

Table 3:Water resources efficiency cluster and indicators:

[2] A new indicator will be added in the monitoring tool
[3] A new indicator will be added in the monitoring tool

4.4 Financial Performance

While the main aim of the water sector is to provide high quality water and wastewater services, achieving financial sustainability is both a vital target and a major, critical challenge for Jordan's water utilities for the following reasons:

1. High Non-Revenue-Water
2. Strict limitations on raising water tariffs
3. High energy costs and increasing electricity tariffs
4. Insufficient funding to support infrastructure and maintain daily operations to meet increases in demand for water and wastewater services

Therefore, taking the above constraints and challenges into account, water utilities must work in a transparent, accountable, economic & efficient manner to improve financial performance. If the utilities are not allowed to raise tariffs, the government must fulfill its promises to provide subsidies. Incentives should also be offered as a motivation to improve performance and ensure the utilities' continuous development.

Ser.	Cluster	PI Name	PI Level	Unit	No. of Variables
1.	Financial Efficiency	Collection Efficiency (Customers)	KPI	%	4
2.		Collection ratio	PI	%	2
3.		Electricity costs as percentage of total O&M costs	PI	%	2
4.		Delay in accounts receivable	PI	month	2
5.		Operating cost coverage ratio (collection)	PI	%	2
6.	Financial Sustainability	Operating cost coverage ratio (revenues)	KPI	%	2
7.		Operating cost coverage ratio (billing)	PI	%	2
8.		Total cost coverage ratio	PI	%	2
9.	Profitability	Unit total cost water services	PI	JOD/m³	3
10.		Average water charges for billed consumption	PI	JOD/m³	4

Table 4: Financial performance cluster and indicators

5. Performance of water utilities in 2019

5.1 Utilities key data

The table below shows key data for the three water utilities:

	Square area[4] km²	Water subscribers	Sewer subscribers	Employees	Water distributed [MCM]	Authorized consumption [MCM]	Amount billed in period[5] [Mio JOD]
Miyahuna-Amman	7,584	731,858	544,018	1,583	244.993	150.223	134.438
AW	6,905	43,651	37,349	361	27.114	17.307	21.902
YWC	28,990	350,974	148,957	1,460	100.694	54.552	47.532

Table 5: Utilities key data

5.2 Service Quality[6]

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
1.	Quality Assurance & Control	Microbiological water quality compliance	%	99.9	100	100
2.		Water quality tests performed	% of req. tests	100	100	100
3.		Physical-chemical water quality compliance	%	99.8	100	100
4.		Effluent quality compliance	%	99.4	100	91.1

Table 6: Quality Assurance & Control EoY 2019

[4]See annex I which shows the service areas of each utility.
[5] Amount billed in period includes water and wastewater as well as other billing.
[6] See annex III, which shows all the values in one table.

Figure 3:Quality Assurance & Control. The red arrow indicates the minimum acceptable water quality threshold.

*Minimum acceptable threshold for water quality is 95%

Comments and/or recommendations:

• As presented in the quarterly report Q1 to Q3 2019, water quality remains very high, with the microbiological water quality compliance of the three utilities rated as excellent. Assessments of the procedures for monitoring and responding to cases of non-compliance will form part of the inspections protocol that the UPMU will develop and implement.

• The three utilities are also rated as excellent for water quality tests performed and physical-chemical water quality compliance.

• For effluent quality compliance, only YWC at 91.1% is below the Jordanian minimum acceptable threshold of 95%. YWC needs to focus more on its Wastewater Treatment Plants (WTPs) efficiency.

5.2.2 Supply Mode & Efficiency

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
5.	Supply Mode & Efficiency	Continuity of supply[7]	% of time	21.3	100	5.4
6.		Water consumption per capita (residential subscribers)	lcd	64.8	79.5	56.7
7.		Subscribers receiving continuous supply	% of total	0.9	96.6	0.0

Table 7:Supply Mode & Efficiency EoY 2019

[7] Continuity of supply: Number of hours per week that the system is pressurized / (7*24)

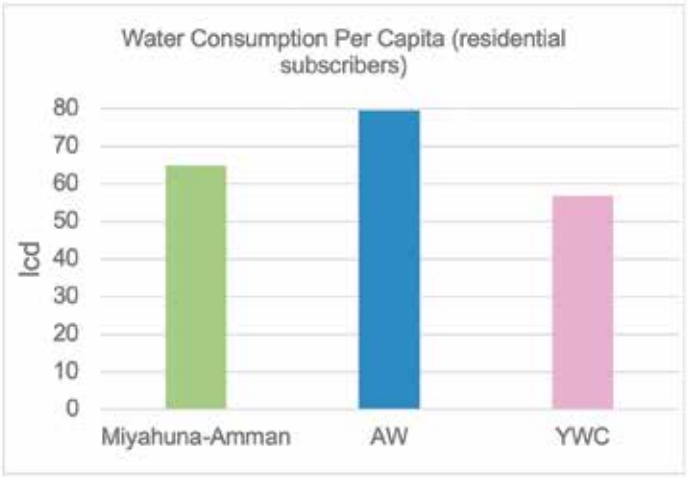


Figure 4:Water Consumption Per Capita

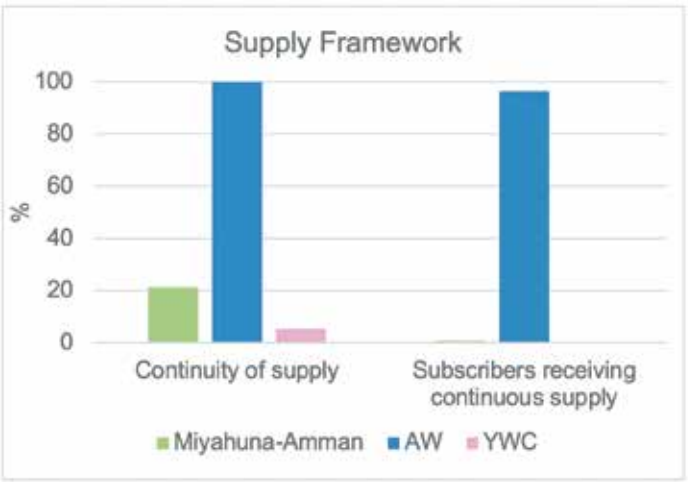


Figure 5:Supply Framework

Comments and/or recommendations:

• UPMU reports on the percentage of time that subscribers receive water. For AW, as expected with continuous supply, the system is pressured 168 Hrs. per week, Miyahuna-Amman almost 36 Hrs. and YWC 9 Hrs.

• However, and when comparing residential water consumption in lcd for the three utilities, the following points need to be considered and will form part of upcoming discussions between UPMU and the utilities:

• Varying residential customer billed volume bands to examine the equality of geographical water distribution.

• Increased consumption by some customers leads to reduced supplies for others.

• Seasonal variations mean that water quantities are insufficient to meet the growing demand during summer. The correlation between increased consumption and increased no water complaints must therefore be analysed.

• There must be a thorough discussion with the three utilities regarding the Department of Statistics' population figures and reported average household size (Miyahuna-Amman 5.4, AW 4.8 & YWC 7.0).

• Review the documentation and calculation method of the continuity of supply for the three utilities, which are not clear and need further analysis.

5.2.3 Commercial & Customer Processes

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
8.	Commercial & Customer Processes	New connection efficiency	% of requests	87.5	100	85.4
9.		Percentage of inactive subscribers	%	9.4	3.4	12.7
10		Metering ratio	%	91.5	97.5	87.7
11.		Subscriber meter replacement ratio	%	5.8	3.7	12.7
12.		Meter reading ratio	%	99.5	93.8	102.1

Table 8: Commercial & Customer Processes EoY 2019

Figure 6:Commercial & Customer Processes

Comments and/or recommendations:

• AW has the highest level of service efficiency for new type 1 & 2 connections at 100% within target time. Miyahuna-Amman is close to 90%, while YWC's new connection efficiency is 85%. However, YWC found it challenging to compile the manual registers and spreadsheets which managed new connection documentation from its 10 regional operating units, and the new connection procedure (water & wastewater) needs streamlining and optimizing.

• Regarding inactive subscribers, the percentages for the three utilities varied from 3.4% (1,500 subscribers) for AW to 9.4% (68,653 subscribers) for Miyahuna-Amman and 12.7% (47,020 subscribers) for YWC. Of a total of 1,126,483 subscribers 117,173 are inactive, which is equivalent to 10.4%. This has serious repercussions on unauthorized consumption and subscriber accounts receivable, and the utilities' field inspection functions and debt recovery escalation measures therefore need more digitalization and optimization.

• The metering ratio normally measures the proportion of subscribers that have metered water connections. Since no new subscriber connections are activated in Jordan unless a water meter is installed, the metering ratio is 100% for the three utilities. The metering ratio needs to be reviewed.

• The three utilities have been engaged in water meter replacement. YWC does not have smart water meters installed and 12.7% of mechanical water meters have therefore been replaced. It is proposed that Miyahuna-Amman and AW share their experiences of smart meters with YWC.

• The meter reading ratios for the three utilities are high. Since AW has a relatively lower meter reading ratio, more back-office billing transactions are triggered to complete the remaining 6.2% of the billing cycle. The reading ratio for YWC is greater than 100%, and it has been agreed that future reports will only reflect YWC's real reading transactions for active subscribers.

5.2.4 Customer Relationship & Complaints

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
13.	Customer Relationship & Complaints	"No Water" complaints per 1000 subscribers	No./1000 active subs.	211.3	70.8	243.2
14.		Billing complaints	No./1000 subs.	16.8	33.3	25.2

Table 9:Customer Relationship & Complaints EoY 2019

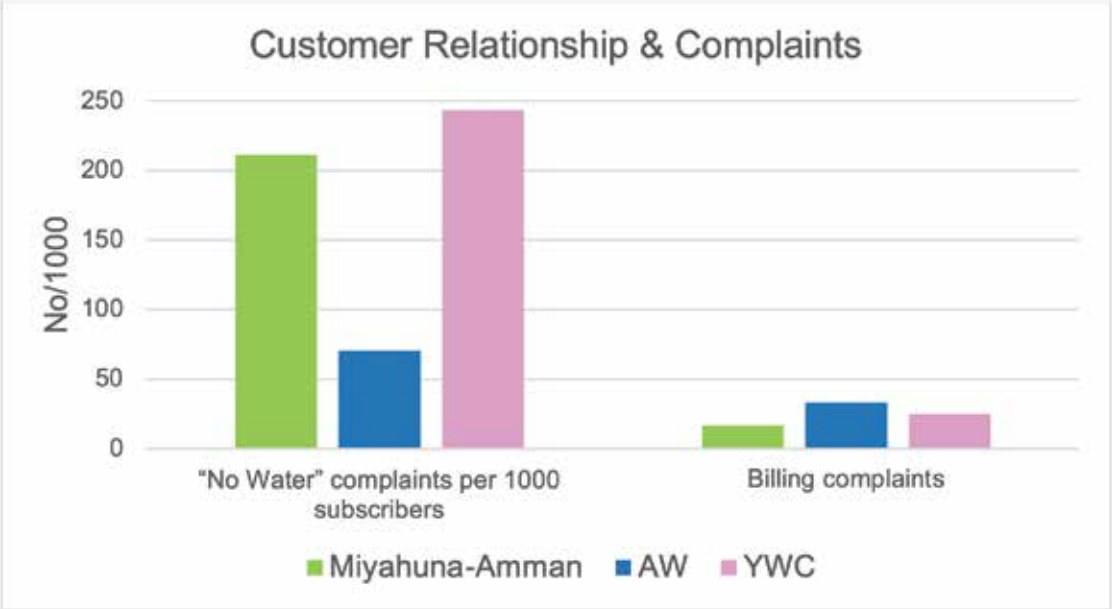


Figure 7:Customer Relationship & Complaints

Comments and/or recommendations:

• The annual percentage of no water complaints for Miyahuna-Amman and YWC is quite substantial at 21.1% for Miyahuna-Amman and 24.3% for YWC. For AW, with a continuous water supply, the annual percentage of no water complaints is 7% of subscribers. Repeated "no water" complaints should be identified and quantified to arrive at a more transparent picture of the percentages. Moreover, the use of GIS in identifying complaints' clusters and hot spots is encouraged, including seasonal effects on increases in consumption and no water complaints. It is important to note that there should be discussions with utilities related to indicators baselines, benchmarks, and performance targets in the future.

• The percentages of billing complaints are relatively small compared to no water complaints at 1.68% for Miyahuna-Amman, 3.33% for AW & 2.52% for YWC respectively. The highest percentage of billing complaints is for AW, which may be attributed to more accurate billed consumption due to smart metering under a continuous supply regime and a 93.8% meter reading ratio with more back-office billing (see commercial & customer processes).

5.3 Operational Efficiency[8]

5.3.1 Staff Utilization & Efficiency

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
1.	Staff Utilization & Efficiency	Employees per 1000 subscribers (W&WW)	No/1000 subscribers	1.2	4.5	2.9
2.		Employees per 1000 subscribers W	No/1000 subscribers	2.16	8.26	4.15
3.		Training per employee	Hr/Employee	11.9	26.7	1.8
4.		Percentage of staff trained	%	43.1	110.0	14.2

Table 10:Staff utilization and efficiency EoY 2019

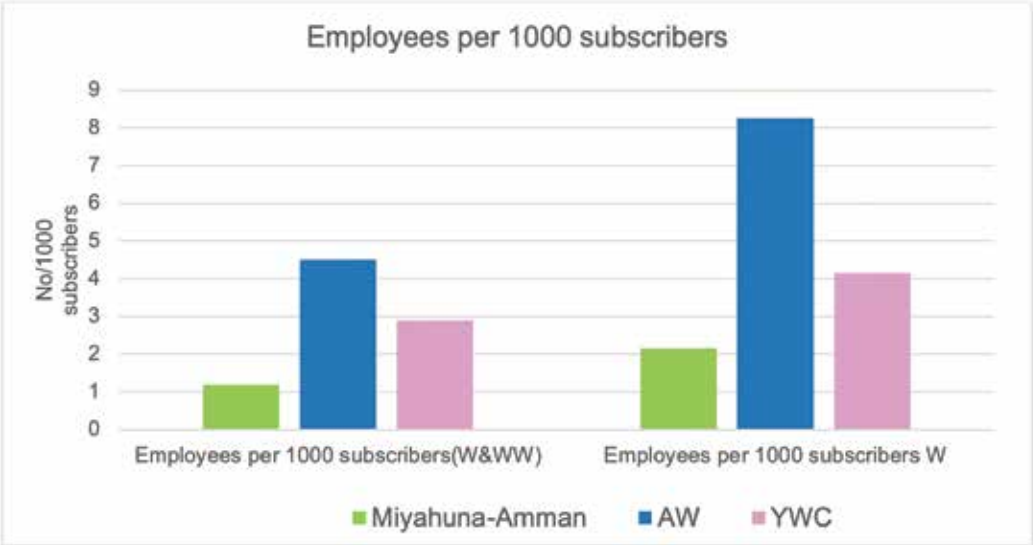


Figure 8:Employees per 1000 subscribers

[8] See annex III.

Figure 9:Training per Employee

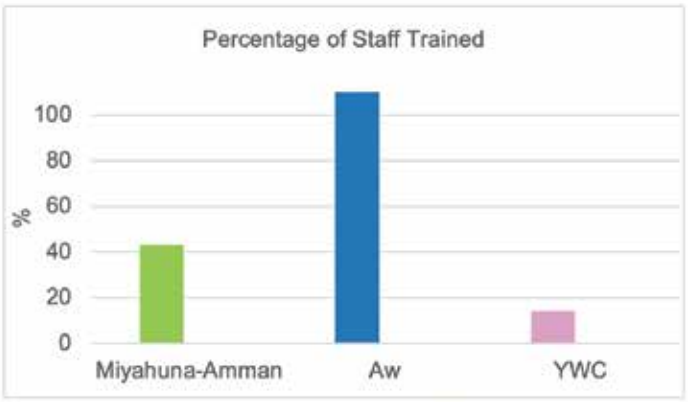


Figure 10:Percentage of Staff Trained

Comments and/or recommendations:

• Staff efficiency, expressed in employees per 1,000 subscribers, is generally good in Jordan. In Miyahuna-Amman, economies of scale are expected to result in larger utilities which need less staff per 1,000 subscribers.

• There is a huge difference in training per employee between AW and YWC, and YWC is encouraged to review its staff training needs.

• The above data shows that YWC has the lowest percentage of staff trained. The total number of employees trained at AW exceeded 100%, meaning that some of employees were trained more than once during the year. For future reporting, the utilities will be advised to report on the number of employees who participated in at least one training during the reporting period.

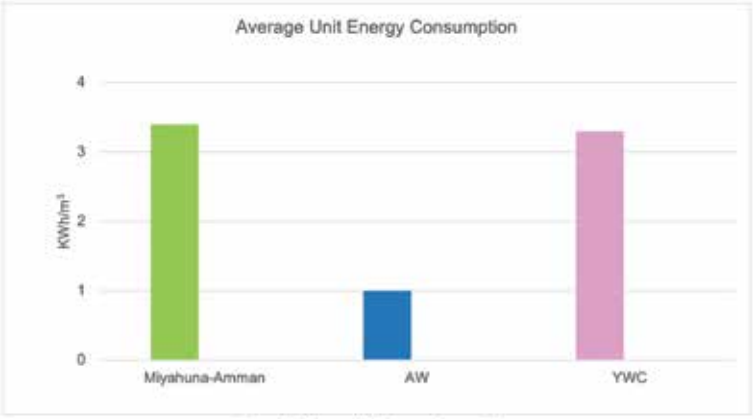


Figure 11:Average Unit Energy Consumption

5.3.2 Energy Efficiency

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
5.	Energy Efficiency	Average unit energy consumption	KWh/m³	3.4	1.0	3.3
6.		Renewable energy utilization	%	0.0	0.0	0.2

Table 11:Energy Efficiency EoY 2019

• The huge differences in average unit energy consumption are not surprising given Jordan's geography and the different utilities' modes of operation, and this indicator is a good example of why comparisons between the utilities cannot be based on numbers alone; they also require an understanding of the conditions under which the utilities are operating, and these should be considered in future benchmarking. For example, Miyahuna-Amman has to lift water from as low as 400 meters below sea level to as high as 1,000 meters above sea level, whereas AW's water is supplied by gravity from the mountains overlooking Aqaba.

5.3.3 Response Time & Repair Efficiency

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
7.	Response Time & Repair Efficiency	Speed of repair of failures	% of bursts	96.6	100.0	100.0
8.		Preventive maintenance of pumps	%	100.0	2.8	0.0
9.		Corrective maintenance of pumps	%	60.9	NA	225.0
10.		Sizing of pumps (Percentage of pumps running at the right curve)	%	87.9	0.0	50.0

Table 12:Response time & Repair Efficiency EoY 2019

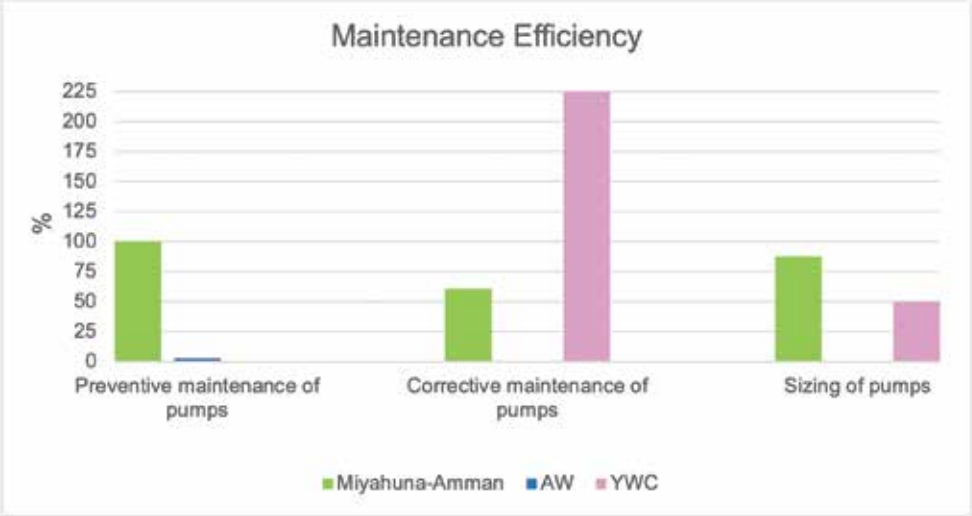


Figure 12: Maintenance Efficiency

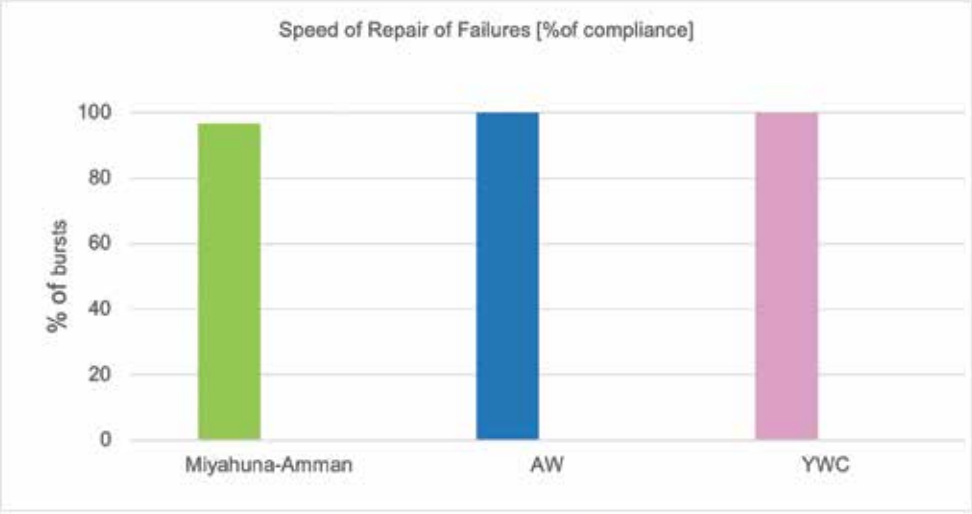


Figure 13: Speed of Repair of Failures

Comments and/or recommendations:

• While the three utilities are performing well in responding to failures within target times, the UPMU needs to further elaborate the variables and reality on the ground for this indicator. It is planned that UPMU staff will coordinate and cooperate with the National Call Centre (NCC) to collect more accurate and detailed data for future reports.

• Miyahuna-Amman is implementing a program of preventive pump maintenance within the prevailing resource limitations. AW reported that while preventive maintenance is being carried out it is not recorded in its computer maintenance management system (CMMS). YWC is not carrying out preventive measures, and no recording system exists.

• On average, YWC's pumps are repaired 2.25 times a year. Comparing this figure with Miyahuna-Amman demonstrates the negative effect on corrective maintenance of having limited or no preventative maintenance.

• Pump size directly impacts on optimal energy consumption, and its impact on electricity expense (KWh/m^3) will be analysed in the financial efficiency subchapter.

5.3.4 Bulk Metering

Comments and/or recommendations:

• Regarding operational wells and reservoir meters, all of Miyahuna-Amman meters are operational, eliminating the need to estimate bulk water volumes. By contrast, a lack of meters means that AW must estimate 42.4% and YWC 67.1% of their distributed volumes. AW and YWC are therefore advised to address this serious issue.

• The calibration of bulk water meters for wells, reservoirs and import/export points is also a fundamental prerequisite for reliable NRW calculation. It is therefore worrying that none of the utilities calibrated their well and reservoir meters during 2019, even for operational meters.

• YWC needs to implement procedures to ensure that all its import and export points are metered.

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
11.	Bulk Metering	Operational well and reservoir meters	%	100.0	57.6	32.9
12.		Calibration of well and reservoir meters	%	0.0	0.0	0.0
13.		Metering of import and export points	%	100.0	100.0	83.3

Table 13:Bulk metering EoY 2019

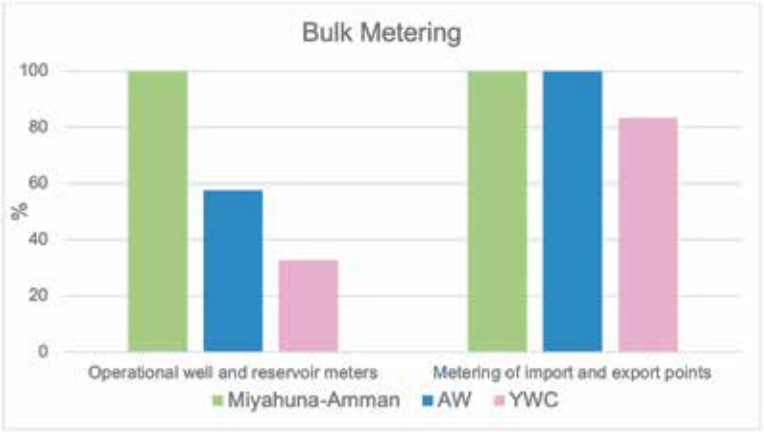


Figure 14: Bulk Metering

5.3.5 Number of sewer blockages

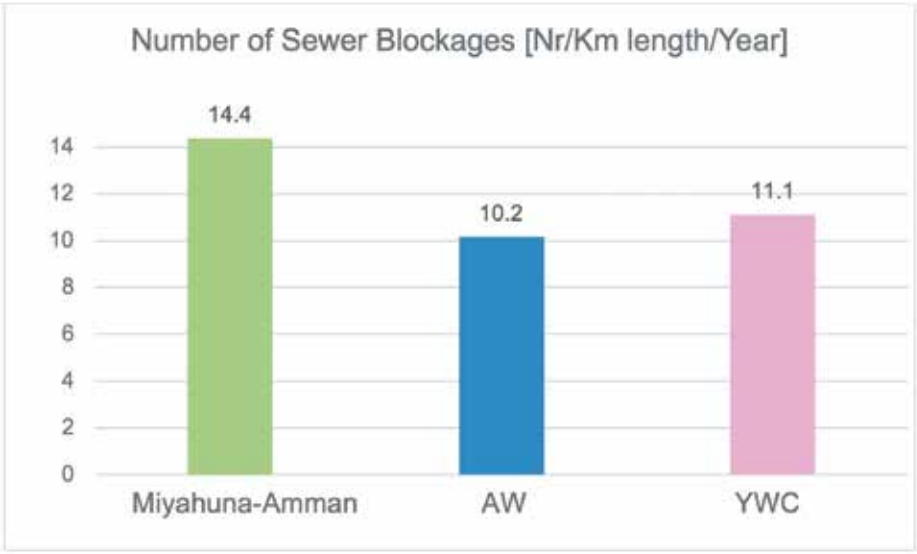


Figure 15: Number of Sewer Blockages

Comments and/or recommendations:

• The number of sewer blockages per km of length per year is very high in all three utilities, suggesting that the network has insufficient capacity.

• A hydraulic study for these networks should be carried out as a priority, as the problem will escalate unless the network is enhanced.

5.3.6 Treated Wastewater

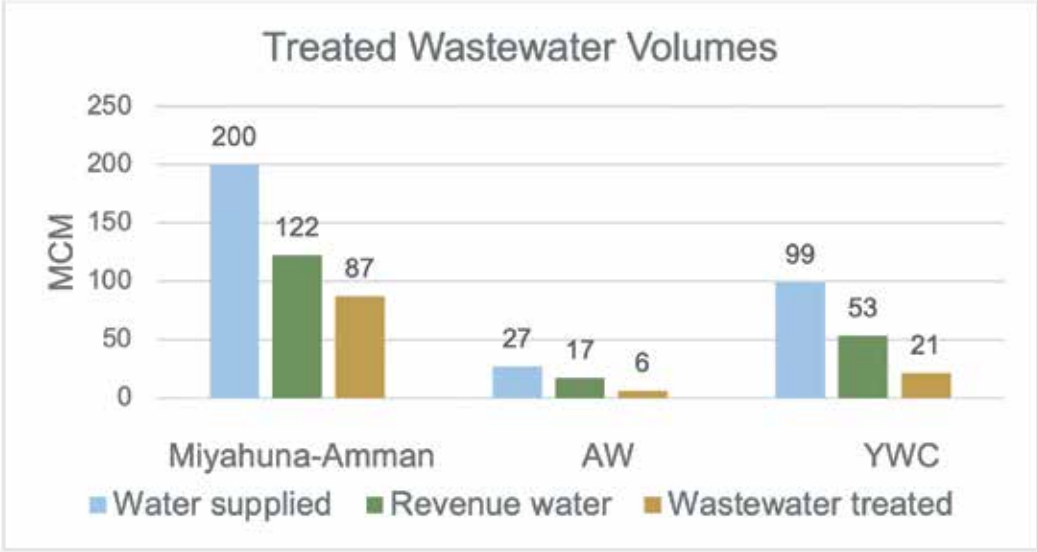


Figure 16: Treated Wastewater Volumes

Comments and/or recommendations:

• Similar to the comment above, treated wastewater in MCM is analysed to highlight the volumes of wastewater treated vs. water supplied.

• Considering the conservative scenario of revenue water that ends up being discharged into the wastewater network, the volumes of treated wastewater are small, despite the additional volumes from illegal use that are discharged into the sewerage network.

• Future discussions with the utilities will focus on water volumes that do not reach the WWTPs, since these volumes are valuable and can be re-used and billed for irrigation and other purposes.

5.4 Water Resources Efficiency[9]

This section on water resources efficiency provides an overview on the volumes of water that the utilities produce, distribute, and lose in the supply chain.

5.4.1 Water Loss

The previous Q1 to Q3 2019 report showed that the analysis could be distorted if the UPMU's monitoring procedures only look at the percentage of the total volume that is unbilled.

Therefore, to gain a better understanding of NRW and to potentially guide utilities toward the most effective measures, the UPMU is using four different indicators to assess NRW. Moreover, NRW will be further elaborated in chapter 6.1

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
1.	Water Loss	Non-Revenue Water	% of system input	38.7	36.2	46.1
2.		Water loss per subscriber	m^3/subscriber/day	0.355	0.616	0.360
3.		Water loss per mains length	m^3/km/day	25.5	25.5	11.6
4.		Water loss per connection per day	m^3/connection/day	1.25	1.32	0.58

Table 14: Water losses EoY 2019

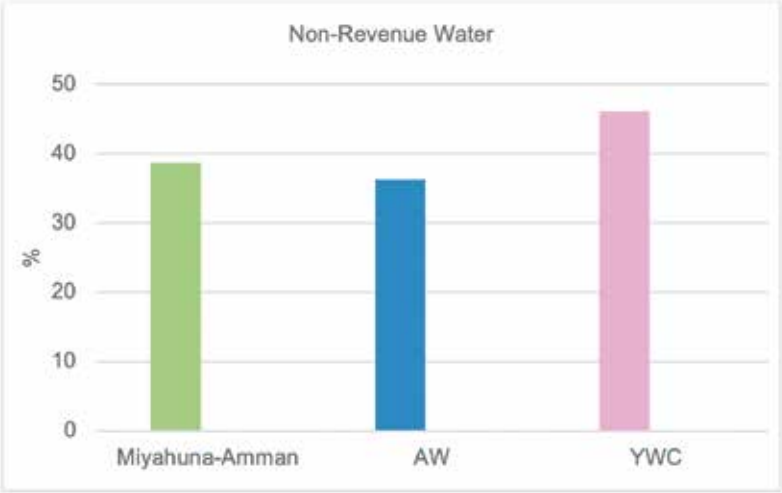


Figure 17: Non-Revenue Water

[9] See annex III.

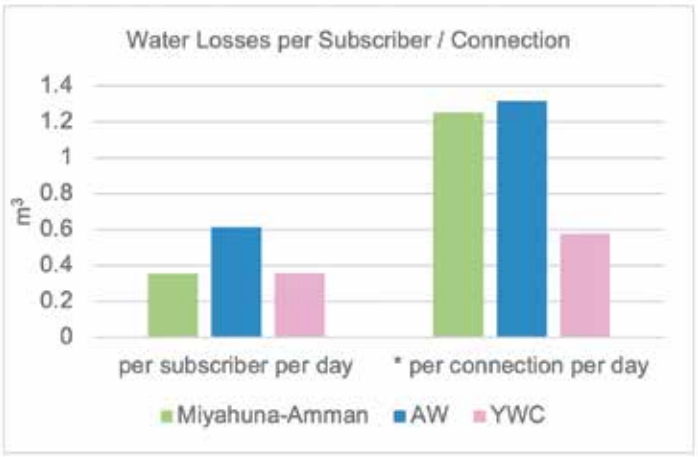


Figure 18: Water Losses per Mains Length per Day

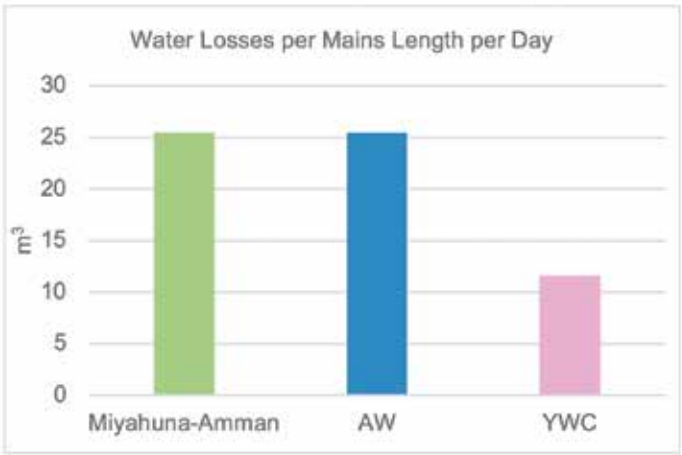


Figure 19: Water Losses per Subscriber / Connection

Comments and/or recommendations:

• Water losses remain high according to international standards with NRW values above 35%. This is of particular concern for a water-scarce country such as Jordan.

• However, while this indicator is easy to understand and has been widely used, it is important to look at variations in different water loss related indicators. Losses per subscriber/network km length and per connection are therefore also analysed.

• While YWC has the highest NRW ratio, losses per connection or per subscriber are the lowest in abstract terms (see charts above).

• There will be future discussions with the utilities about the impact of volume of water distributed and supply hours so that interpretation of the figures above is both common and accepted by the utilities and UPMU. This is a precondition for a better understanding of the main causes of water losses and to plan for targeted measures to curb NRW.

5.4.2 Network efficiency

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
5.	Network Efficiency	Inefficiency of use of water resources	% of what	12.5	18.1	20.9
6.		Water resources use per capita/day	lcd	142.8	404.2	112.9

Table 15:Network efficiency EoY 2019

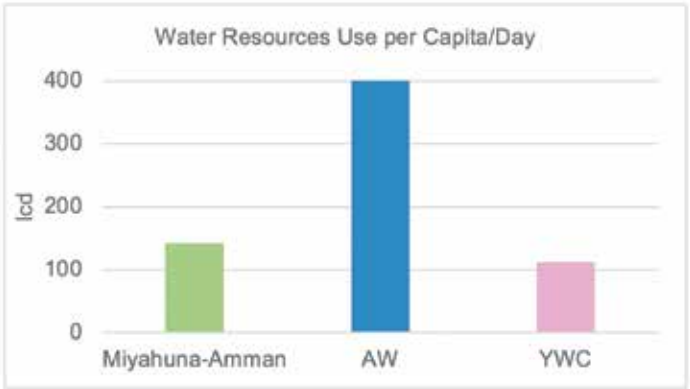


Figure 20:Inefficiency of Use of Water Resources

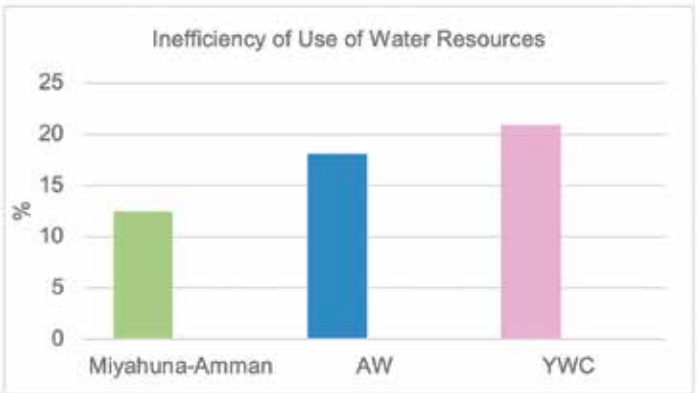


Figure 21: Inefficiency of Use of Water Resources

Comments and/or recommendations:

• The inefficiency of water resource usage is calculated by multiplying NRW volumes by an estimated real losses ratio. The utilities currently estimate this ratio at about 50%, and the UPMU will encourage and support them to develop a better understanding of the situation and to provide estimates that are based on some further analysis.

• Miyahuna-Amman is the best performer regarding measures which influence the efficiency of water use, which could potentially be attributed to the measures in the table below.

See also the Bulk metering chart above.

Variable name	Unit	Miyahuna-Amman	AW	YWC
Mains rehabilitated	km	12	0	0
Average zone pressure network length	km	8,135	0	0
District Metering Areas network length	km	8,135	0	0

Table 16:Measures influencing water use efficiency

• Per-capita consumption of water resources is by far the highest for AW, probably due to the influence of commercial and large customers.

5.5 Financial Performance[10]

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
1.	Financial Efficiency	Collection Efficiency (Customers)	%	99.3	94.8	75.7
2.		Collection ratio	%	95.5	94.8	73.7
3.		Electricity costs as percentage of total O&M costs	%	60.1	23.9	54.9
4.		Delay in accounts receivable	months	8.6	6.0	14.4
5.		Operating cost coverage ratio (Collection)	%	90.5	84.7	44.9

Table 17:Financial efficiency EoY 2019

[10] See annex III.

5.5.1 Financial Efficiency

Comments and/or recommendations:

• Collection efficiency is a strong indicator for the utilities' liquidity and their ability to meet their financial obligations.

• Collection efficiency for customers in AW and Miyahuna-Amman ranges from 94.8% to 99.3% of current billings, while collection for YWC is much lower at 75.7% of issued bills. This is likely to have a negative impact on YWC's liquidity and its ability to meet its obligations as their customers' willingness to pay will decrease due to increased and aged outstanding receivable balances.

• Management should therefore present a board-approved plan with quarterly milestones to be reported separately to the UPMU on how the utility intends to increase collection ratios and reduce outstanding receivables over the next 12 months.

• Utilities are also advised to set a target plan for collecting outstanding receivable balances for current and prior years.

• Regarding collection efficiency, AW's ratio is 94.8%. This figure is considered high as the billing system for AW does not segregate collection from billing vs. other collections. This explains the high collection efficiency ratio as it includes the total amount collected during the period and not only collections related to billing.

• The similarity between AW's collection ratio and collection efficiency (both 94.8%) results from AW's system not segregating the different types of collection, which means that total collection equals the total collected from residential and non-residential subscribers.

• In general, the cost of electricity is highly influenced by the geographic conditions and the Electricity Tariff. For example, AW's supply is largely reliant on gravity, whereas Miyahuna-Amman and YWC largely rely on pumping. On the other hand, the Electricity Tariff has tripled over the past eight years (from 41 fils/kwh in 2010 to 126 fils/kwh in 2018), while the water and wastewater tariff only increased by 15% during the same time frame. Since electricity is the highest part of O&M costs, searching for effective and cost saving sources of renewable energy becomes more important.

• As shown in the chart above, YWC has the longest collection period at 14.4 months, with 8.6 months for Miyahuna-Amman and 6.0 months for AW. It is worth noting that this indicator includes all types of receivables. The collection period is therefore very long.

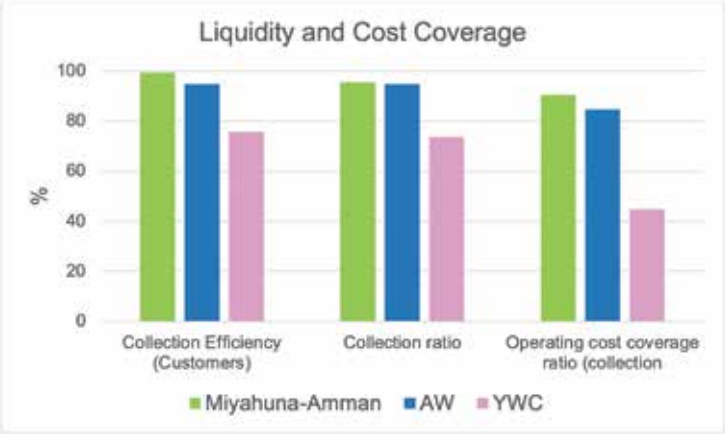


Figure 22: Liquidity and Cost Coverage

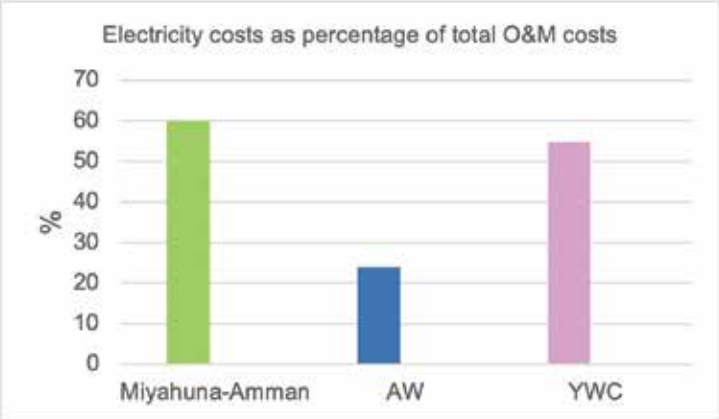


Figure 23: Electricity costs as percentage of total O&M costs

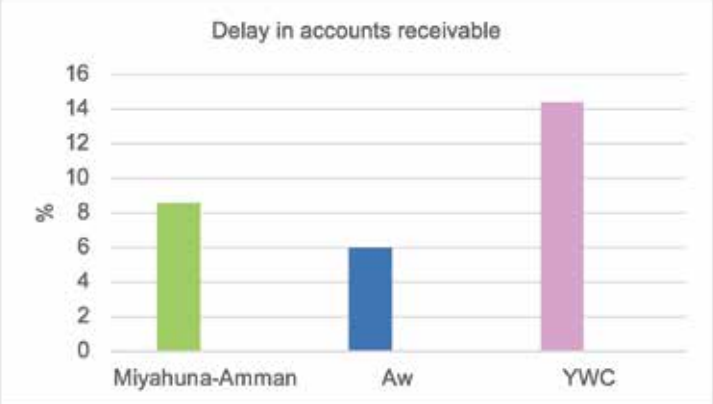


Figure 24: Delay in accounts receivable

5.5.2 Financial Sustainability

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
6.	Financial Sustainability	Operating cost coverage ratio (revenues)	%	94.4	124.8	56.3
7.		Operating cost coverage ratio (billing)	%	94.7	89.4	60.9
8.		Total cost coverage ratio	%	92.7	103.5	50

Table 18:Financial Sustainability EoY2019

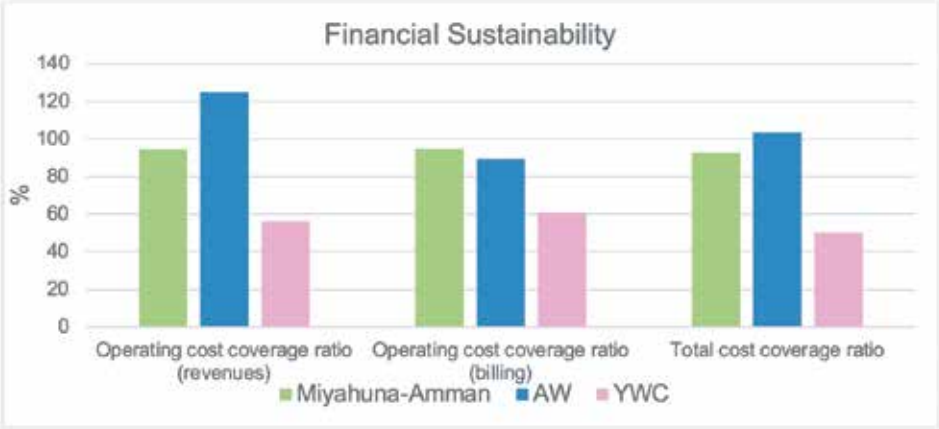


Figure 25: Financial Sustainability

Comments and/or recommendations:

• The chart above shows that revenues cover 124.8% of AW's O&M costs, while cost coverage for Miyahuna-Amman and YWC is less than 100%.

• YWC has the lowest cost coverage due to a combination of high non-revenue water and a dramatic increase of JD 4.4 million in O&M costs to JD 56 million in 2019, compared to JD 51.6 million in 2018 (according to audited financial statements).

• The three utilities need to work on improving water resources efficiency, reducing non-revenue water, and improving tap revenue potential (annual sewerage agreements & added areas /floors), in addition to controlling O&M costs, which will reflect positively on financial performance.

• YWC needs to improve its budgetary procedures to increase control over expenditures. In this respect, the internal audit department should be empowered to ensure adherence to approved expenditures.

• Several elements are making it more challenging for the water sector to cover the costs of operations & maintenance. These include increasing electricity tariffs, non-revenue water, low water tariffs, & fluctuating fuel prices.

• As the above table shows, bills generated by AW are able to cover generated O&M costs. Miyahuna-Amman is close to reaching a breakeven point, but YWC is far from covering its O&M costs.

• Since electricity is the main component of operating & maintenance costs (around 60% in Miyahuna-Amman and 55% in YWC), more efforts should be made to reduce this component by improving efficiency and searching for renewable sources of energy.

With regards to the total cost coverage ratio, YWC has the lowest expense coverage ratio due to not separating costs for water and wastewater, and to an increase in expenditures compared to the previous year. Miyahuna-Amman's revenue is almost enough to cover its expenses, while AW's revenue is enough to cover the total cost of water and wastewater

5.5.3 Profitability

Ser.	Cluster	PI Name	Unit	Miyahuna-Amman	AW	YWC
9.	Profitability	Unit total cost water services	JOD/m³	0.76	1.09	1.61
10		Average water charges for billed consumption	JOD/m³	0.677	0.630	0.663

Table 19: Profitability Eoy2019

Comments and/or recommendations:

YWC has the highest unit total cost of water services since it includes wastewater in its water cost. YWC should therefore segregate these figures.

The average total cost per cubic meter of water services differs between the three utilities due to operating conditions, NRW, capital expenditures, and the service area which each utility covers. Yarmouk should investigate the increase in their O&M costs and implement budgetary measures to control costs.

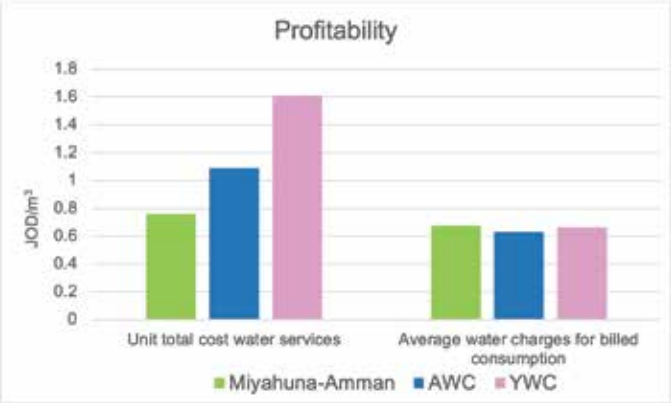


Figure 26: Profitability

6.Thematic/strategic deep dives

This chapter gives an analysis and outlook that goes beyond individual indicators on two topics that the UPMU sees as strategically relevant to the sector.

6.1 The magnitude and the unknowns of NRW

The topics of unaccounted for water and subsequent non-revenue water (NRW) have been on MWI's priority list for some decades. NRW has posed, still poses, and will continue to pose a serious threat to financial sustainability, increasing dependency on government subsidies and subsequently stressing the national budget.

It is also a waste of an already scarce natural resource, especially in view of increasing demand through population growth, economic development, and mass regional migrations.

Furthermore, it is critical that even as reliability of supply is decreasing due to climate change, water is being wasted while many customers throughout the year are frustrated that their demands are not being met.

In view of the above the water utilities, the UPMU and the whole sector must ensure that NRW remains at the top of their priorities. Although the three utilities are all engaged at different levels in combatting the sources of NRW through focusing on water network rehabilitation & management and introducing innovative water meter technologies and computer aided commercial & customer service systems, NRW is still high at 38.7% for Miyahuna-Amman, 36.2% for AW and 46.1% for YWC, which raises legitimate questions about the viability and sustainability of these measures.

In this respect, and as pre-requisites, the three utilities have conducted comprehensive customer surveys to update their customer registers. Miyahuna-Amman is at present conducting a survey to update its customer information and digitalize its customer's paper files to streamline commercial processes and identify untapped revenue potentials.

On the network rehabilitation side, a hydraulic analysis study was conducted for parts of Amman, the ≤ 200mm tertiary water network was rehabilitated with GI & steel pipes replaced by a total of 300 km of PE and 3km ductile pipes, and 10,400 house connections in four district zones were replaced. On the water meter side, 200,000 mechanical water meters were replaced by smart meters and rigorous systems for active leak detection and proactively identifying illegal cases were implemented. Moreover, calibration of water sources and zone meters is a standard procedure and 80% of Miyahuna-Amman distribution zone water pressures are monitored and controlled.

For AW, a comprehensive customer survey was conducted in 2017 to update the customer register and link it to GIS. Meanwhile, all water and wastewater customer files have been digitalized and archived. On the customer information system side, a modern Field Force Automation system (FFA) is being implemented to interactively link field operations with billing and revenue collection activities.

Moreover, 7,250 mechanical water meters have been replaced by smart meters and a further 28,800 will be installed during 2020-2021. For bulk metering, although AW has all its import and export points metered, only 58% of operational water wells and reservoirs are currently metered, and this needs to be improved. AW also needs to study and address the need for network rehabilitation, water supply zoning, and pressure management.

For YWC, a customer survey was conducted and completed in 2005 through the GIZ-OMS Project whereby NGWA (YWC's predecessor) migrated data into the billing system. Since then, updating this information has been influenced by the degree of computerization of commercial and customer service processes. About two years ago, YWC changed its billing system without conducting a comprehensive customer field survey and is at present aiming to standardize those processes across its 10 regional operating units.

Regarding bulk metering and water network & operations, YWC needs to address its non-operational well and reservoir meters (67%) and reduce the number of net system inputs that it estimates by metering all its import and export points, of which only 83% are currently metered. YWC has replaced about 13% of its customer meters with mechanical meters. However, YWC has not rehabilitated any service connections.

The 3 utilities are addressing NRW reduction within their available resources and capacities. However, NRW percentages are still high which raises questions about the sustainability of NRW reduction counter measures.

It is important to note that the classical way of reactively repairing leakages and burst pipes needs to be changed.

International and practical experience shows that proper system zoning and isolation, controlled pressure monitoring, and the implementation of intelligent pressure management systems are pre-requisites for proactive leak detection, illegal case identification, meter monitoring, proper maintenance, etc. to reduce losses in the long term.

Jordanian water utilities have, for the most part, analyzed NRW from a top down perspective and need to pay more attention to bottom-up approaches to develop a better understanding of the origins and sources of NRW.

In addition, with support from MWI, the utilities must streamline and improve their management, organizational and human resources procedures if they are to achieve their desired long-term results. Jordan's water utilities have engaged with these activities to varying degrees and must maintain their momentum. Meanwhile, MWI is actively working on enhancing its role in monitoring the utilities' performance.

The UPMU has already started internal and external discussions with the three utilities to submit an NRW reduction strategy and work plan which will list the individual measures described above and will be followed-up on a quarterly basis.

<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="3">Authorized Consumption</td><td rowspan="2">Billed Authorized Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorized consumption</td><td>Unbilled Metered Consumption</td><td rowspan="6">Non-Revenue water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="5">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorized Consumption</td></tr>
<tr><td>Metering Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission and/or Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Utility's Strong Tank</td></tr>
<tr><td>Leakage on Service Connections up to point of Customer Metering</td></tr>
</table>

Figure 27: IWA Non-Revenue Water

The UPMU also plans to facilitate a twice-yearly round table discussion where, for instance, technical and commercial managers from all utilities and local NRW experts can meet and exchange their experiences. This could be hosted by a different utility each time and could be a combination of meeting room discussions and field visits.

6.2 The financial status of utilities

The water utilities face the key challenge of improving their financial performance and cash management to cover O&M expenditures in the short term, reduce long-term dependency on governmental subsidies, and finance their capital costs.

6.2.1 Financial challenges

The financial challenges that the water utilities are facing include:

1. High electricity cost / tariff.
2. Inability to cover Operational & Maintenance costs due to low water tariffs.
3. High levels of non-revenue water.
4. Collection efficiency.

1. High electricity cost / tariff:
The high cost of electricity and increasing electricity tariffs, along with increases in other costs, is having a negative impact on the water utilities' financial performance as it has increased O&M costs, as shown in the table below.

Description	Miyahuna-Amman			AW			YWC		
	Amount JOD '000								
Year	2017	2018	2019	2017	2018	2019	2017	2018	2019
Electricity Expenses	63,692	80,518	85,329	3,134	3,915	4,345	30,625	39,649	42,624
O&M Expenses	129,365	134,922	144,514	14,993	17,392	17,685	62,918	71,553	76,899
%of Electricity from O&M	49%	60%	59%	21%	23%	25%	49%	55%	55%

Table 20:Utilities O&M and Electricity Expenses 2017-2019

Recommendations:

Water utilities are strongly advised to:

- Conduct energy efficiency measures to reduce electricity consumption.
- Search for alternative sources of renewable energy that are more economic and efficient, such as solar and wind. They should also look for appropriate funding opportunities to support such projects.
- Water sector management should open communication channels with the EMRC (Energy and Mineral Resources Commission) to discuss having more favourable tariffs for electricity consumption, as the current tariff places a high financial burden on operating expenses.

2. Low water tariff:
The current low water tariffs make it impossible for the water utilities to cover Operations and Maintenance costs. In 2019 the average total cost per m³ of water was JOD 1.276, while the water utilities' average revenue per m³ was only JOD 0.906. This deficit per cubic meter of JOD 0.37 represents an overall deficit of JOD 82 million, and the water utilities are not permitted to increase their tariffs to cover this shortfall.

Recommendations:
- Gradually increase water tariffs to recover O&M costs and reduce dependency on government subsidies.
- The utilities should monitor and control operational and maintenance expenditures.
- Management should implement proper budget and financial planning, since these are key tools for controlling expenditures and forecasting the utilities' future financial performance.

3. High levels of Non-Revenue Water:
Water utilities should work to reduce NRW as this will lead to decreasing production costs and increasing revenues generated from billing. Please refer to the NRW sub chapter.

4. Collection Efficiency:
Improving collection efficiency would greatly improve the water utilities' liquidity. This can be achieved through:

- Putting practical incentive plans in place to motivate members of the collection teams to meet set target levels.
- Increasing the implementation of the Public Funds law (Amiri Law), which will have a positive impact on collecting aged accumulated receivable balances.
- Outsourcing the collection of aged outstanding receivable balances through PSP (Private Sector Participation), which has proven to be successful as a commercial management measure. For example, YWC's latest PBC contract has successfully collected outstanding revenues in sewerage customer management.

6.2.2 Financial Statement Analysis - Accounts Receivables

Account Receivables JOD	Year 2018	Year 2019	Increase
Miyahuna-Amman	40,741,494	41,576,186	834,692
AW	7,451,265	8,423,350	972,085
YWC	42,865,113	49,166,254	6,301,141

Table 21: Account Receivable for three Utilities

The increase in accounts receivables for all three utilities indicate their deteriorating liquidity status. It is therefore recommended that each utility takes the following actions:

- Reduce outstanding receivable balance by improving the collection process.
- Obtain quarterly reports on the status of receivables, highlighting the 20 largest outstanding customer balances and stipulating the actions being taken to obtain settlement.

6.2.3 – Miyahuna-Amman Other Receivables:

The Jordan Post office collects payments from Miyahuna-Amman's customers, but is not transferring received payments regularly as stipulated in the established contract, leading to an outstanding receivables balance of JOD 538,000. UPMU recommends emphasizing the implementation of the collection agreement with Jordan Post Office to improve collection efficiency and boost Miyahuna-Amman's liquidity.

Ageing of Receivables:
The current billing system is not matching payments made by customers with issued invoices. Payments made are just reducing the outstanding receivable balances, which makes it difficult to obtain accurate data regarding ageing of receivables and unsettled outstanding bills/invoices. The billing system should be made more transparent to show which invoices are being cleared when payments are made, and which remain outstanding.

6.2.4 Financial Statement Analysis – YWC

Other Credit Balances:

Social Security	Year 2018	Year 2019
Credit Balance	305,714	1,168,889

Table 22: Social Security - YWC

This increase in the Social Security balance is an indication that fines, and penalties will be imposed by Social Security department. This balance should be settled in full to avoid further charges. YWC Management is in communication with the Social Security Department to settle the outstanding balance.

6.2.5 Financial Statement Analysis – General Recommendations

Based on the challenges mentioned above, the water utilities need to implement proper budgetary procedures to ensure the control of expenditures (e.g. Electricity, Operations, Admin), which will in turn enhance their cash positions. The UPMU will support the utilities in implementing such procedures.

Water utilities should also search for alternative sources of renewable energy that are more economic and efficient and identify appropriate funding to support such projects.

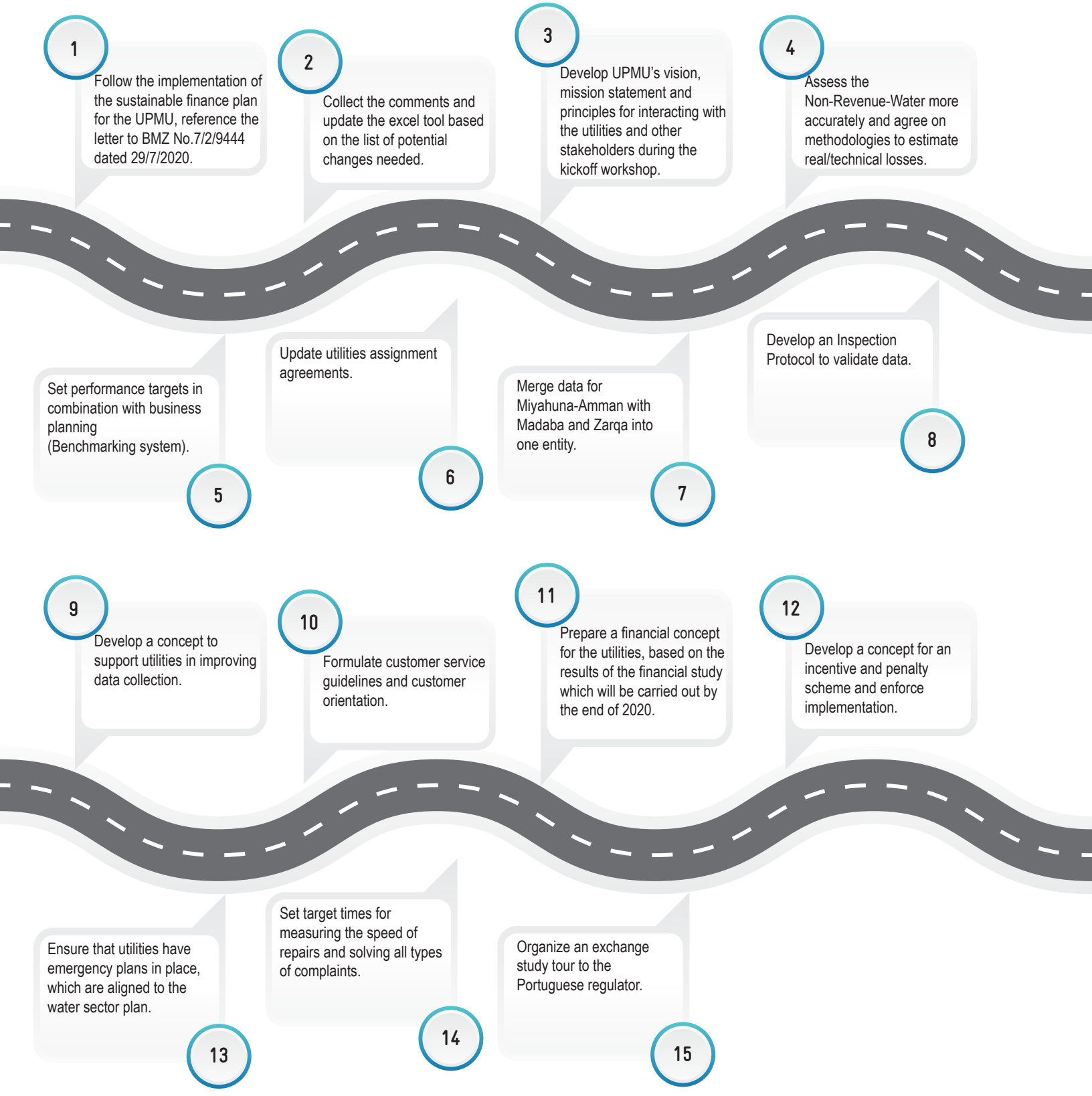
The main issue facing the Water Utilities in general is ownership of their accounting functions. The UPMU will arrange a series of meetings to define these accounting functions and identify the sections responsible for each function.

UPMU will enhance knowledge transfer and sharing between utilities, which is a vital step to create a culture for continuous development and improvement.

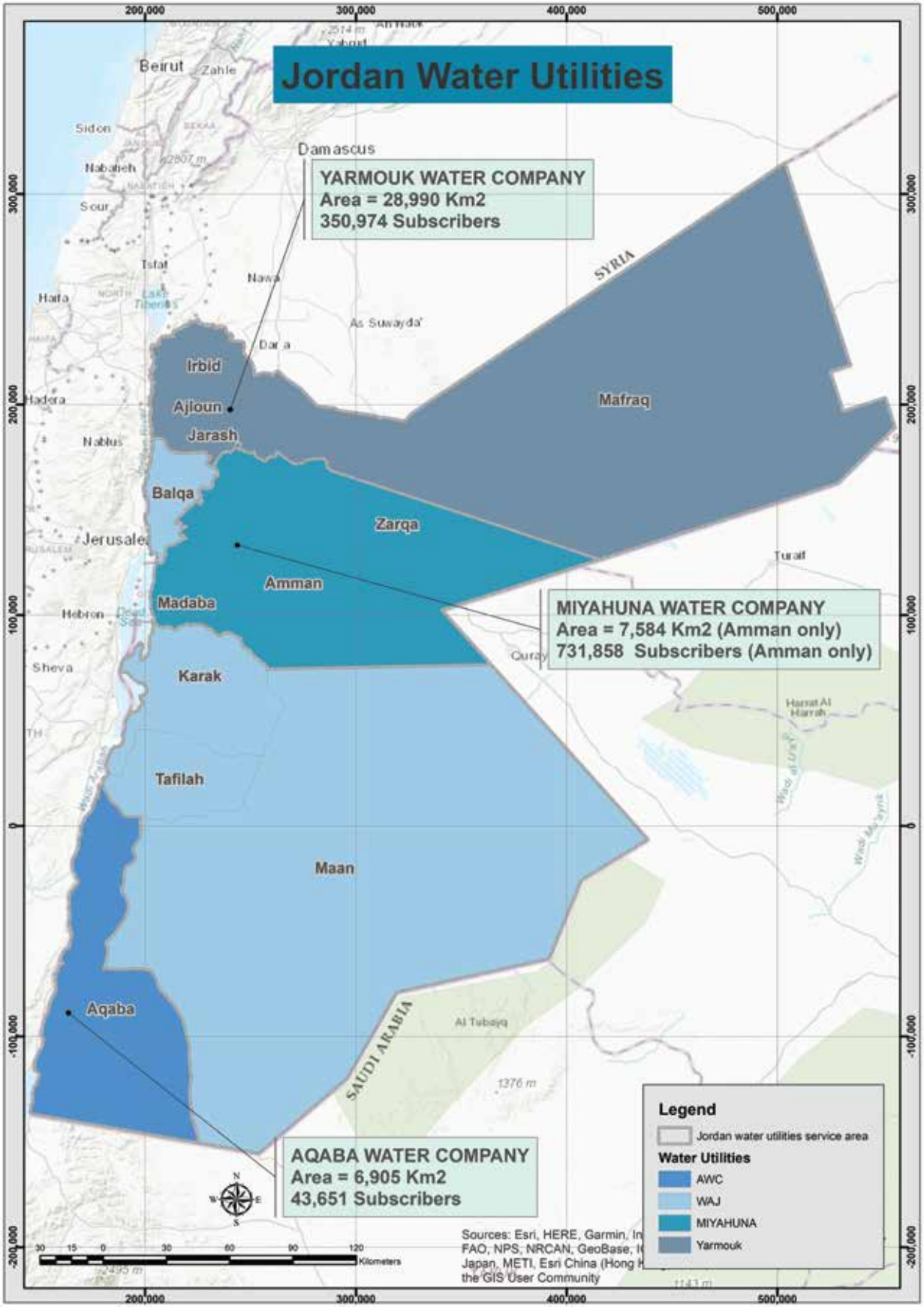
Based on the UPMU's recommendations, the utilities' management should each present the UPMU with a board-approved plan with quarterly milestones detailing how they are going to increase collection ratios and reduce receivables over the next 12 months.

7. Next steps/Road Map for UPMU

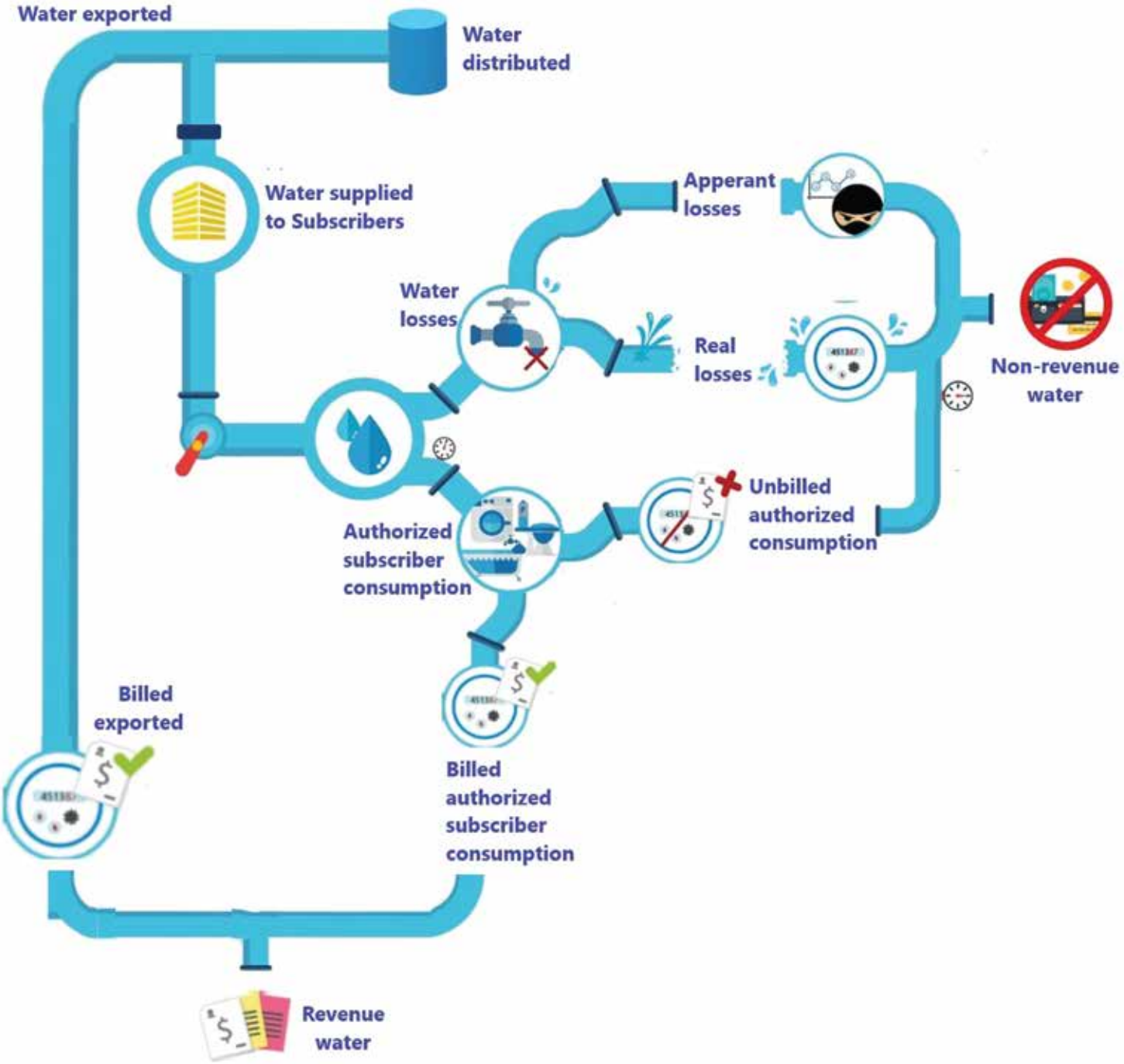
The UPMU's core activities and responsibilities are now specified and can be finalized during the UPMU's kick-off workshop. The following activities are listed in the UPMU road map for the year 2020 -2021:



Annex I Map of Jordan showing the utilities' service areas



Annex II Water Balance Diagram



Annex III List of Indicators used in this report

Service quality						
Cluster	**PI Name**	**PI Level**	**Unit**	**Miyahuna-Amman**	**AW**	**YWC**
Quality Assurance & Control	Microbiological water quality compliance	KPI	%	99.9	100	100
	Water quality tests performed	PI	% of req. tests	100	100	100
	Physical-chemical water quality compliance	PI	%	99.8	100	100
	Effluent quality compliance	NSPI	%	99.4	100	91.1
Supply Mode & Efficiency	Continuity of supply	KPI	% of time	21.3	100	5.4
	Water consumption per capita (residential subscribers)	KPI	lcd	64.8	79.5	56.7
	Subscribers receiving continuous supply	PI	%	0.9	96.6	0.0
Commercial & Customer Processes	New connection efficiency	KPI	% of requests	87.5	100	85.4
	Percentage of inactive subscribers	PI	%	9.4	3.4	12.7
	Metering ratio	PI	%	91.5	97.5	87.7
	Subscriber meter replacement ratio	PI	%	5.8	3.7	12.7
	Meter reading ratio	PI	%	99.5	93.8	102.1
Customer Relationship & Complaints	"No Water" complaints per 1000 subscribers	KPI	No./1000 active subs.	211.3	70.8	243.2
	Billing complaints	PI	No./1000 subs.	16.8	33.3	25.2
Operational Efficiency						
Cluster	**PI Name**	**PI Level**	**Unit**	**Miyahuna-Amman**	**AW**	**YWC**
Staff Utilization & Efficiency	Employees per 1000 subscribers W&WW	KPI	No/1000 subscribers	1.2	4.5	2.9
	Employees per 1000 subscribers W	PI	No/1000 subscribers	2.16	8.26	4.15
	Training per employee	KPI	Hr/employee	11.9	26.7	1.8
	Percentage of staff trained	PI	%	43.1	110.0	14.2
Energy Efficiency	Average unit energy consumption	PI	KWh/m^3	3.4	1.0	3.3
	Renewable energy utilization	NSPI	%	0.0	0.0	0.2
	Speed of repair of failures	PI	% of bursts	96.6	100.0	100.0

Annex III List of Indicators used in this report

Response Time & Repair Efficiency	Preventive maintenance of pumps	NSPI	%	100.0	2.8	0.0
	Corrective maintenance of pumps	NSPI	%	60.9	NA	225.0
	Sizing of pumps	NSPI	%	87.9	0.0	50.0
Bulk metering	Operational well and reservoir meters	NSPI	%	100.0	57.6	32.9
	Calibration of well and reservoir meters	NSPI	%	0.0	0.0	0.0
	Metering of import and export points	NSPI	%	100.0	100.0	83.3
Water Resources Efficiency						
Cluster	**PI Name**	**PI Level**	**Unit**	**Miyahuna-Amman**	**AW**	**YWC**
Water Losses	Non-Revenue Water	KPI	% of system input	38.7	36.2	46.1
	Water loss per subscriber	PI	Liters/subscriber /day	0.355	0.616	0.360
	Water losses per mains length	PI	m^3/km/day	25.5	25.5	11.6
	Water losses per connection per day	PI	Liters/connection/day	1.25	0.62	0.58
Network Efficiency	Inefficiency of use of water resources	PI	%	12.5	18.1	20.9
	Water resources use per capita/day	PI	lcd	142.8	404.2	112.9
Financial Performance						
Cluster	**PI Name**	**PI Level**	**Unit**	**Miyahuna-Amman**	**AW**	**YWC**
Financial Efficiency	Collection Efficiency (Customers)	KPI	%	99.3	96.6	75.7
	Collection ratio	PI	%	95.5	70.7	73.7
	Electricity costs as percentage of total O&M costs	PI	%	60.1	23.9	54.9
	Delay in accounts receivable	PI	month	8.6	4.5	14.4
	Operating cost coverage ratio (collection)	PI	%	90.5	84.7	44.9
Financial Sustainability	Operating cost coverage ratio (revenues)	KPI	%	94.4	124.8	56.3
	Operating cost coverage ratio (billing)	PI	%	94.7	119.8	60.9
	Total cost coverage ratio	PI	%	92.7	103.5	50
Profitability	Unit total cost water services	PI	JOD/m^3	0.76	1.09	1.61
	Average water charges for billed consumption	PI	JOD/m^3	0.677	0.630	0.663

Annex VI Calculation of indicators used in this report

Indicator Name	Definition	Formula
"No water" complaints per 1,000 subscribers	Number of "no water" complaints per 1000 active subscribers during reporting period	=Complaints of "No Water Supply" / (Active subscribers*1,000)
Average unit energy consumption	Electricity consumption per m³ supplied	=Electricity consumption / (Water produced + Imported treated water - Exported treated water)
Average water charges for billed consumption	Water sales revenue from residential and non-residential subscribers (exported water excluded) per m³ of authorized consumption	= (Residential water sales (amount) + Non-residential water sales (amount)) / (Residential billed volume + Non-residential billed volume)
Billing complaints	Average number of billing complaints and queries per 1,000 water subscribers during reporting period	=Billing complaints / Total water subscribers
Calibration of well and reservoir meters	Percentage of calibrated well and reservoir meters	=Number of reservoir meters calibrated / Number of reservoir meters that require calibration
Collection Efficiency (Customers)	Percentage of revenues collected from residential and non-residential customers during period	= (Collected amount from bills of residential & non-residential customers + collected amounts of sewerage charges from private tankers sales + collected amounts from annual sewerage. agreement) / (Amount Billed in Period - billed amount for exported water - Other Billing) *100
Collection ratio	Percentage of revenues collected from billed amounts during reporting period including exported water and other billing	= (Total collection / Amount billed in period) * 100
Continuity of supply	Percentage of hours when the (intermittent supply) system is pressurized	= (Number of hours per week that the system is pressurized / (7*24)) * 100
Corrective maintenance of pumps	Percentage of pumps fixed by corrective maintenance	= (Production and distribution pumps corrective maintenance / Production and distribution pumps) * 100
Delay in accounts receivable	Accounts receivable at reporting date compared to revenues during reporting period	=Total accounts receivable / (Amount billed in period / 12)
Effluent quality compliance	Percentage compliance of effluent quality test results with standards	= (Compliant effluent quality tests / Wastewater effluent tests conducted) * 100
Electricity costs as percentage of total O&M costs	Electricity costs as percentage of total Operation and Maintenance	= (Total electricity costs / Total operation and maintenance costs water and wastewater services) * 100
Employees per 1,000 subscribers	Number of full-time equivalent employees per 1,000 water subscribers and wastewater subscribers	=Total number of employees / ((Total water subscribers + Total sewer subscribers) /1,000))
Employees per 1,000 subscribers W	Number of full-time equivalent employees per 1,000 water subscribers	=Total number of water employees / ((Total water subscribers /1,000)
Inefficiency of use of water resources	Real losses during the assessment period / System input volume during the assessment period *100	= (Water produced + Imported treated water - Exported treated water - Billed consumption) / (Water produced + Imported treated water - Exported treated water) * 100) * (Real water losses/100)
Meter reading ratio	Percentage of active customers whose meter has been read during reporting period	= (Customer meters read / Active subscribers) * 100
Metering of import and export points	Percentage of metered import and export points	= (Number of metered import points + Number of metered export points) / (Number of import points + Number of export points) * 100
Metering ratio	Percentage of subscriber connections that are metered	= (Subscriber meters / Total water subscribers) * 100
Microbiological water quality compliance	Percentage of the total number of microbiological tests of treated water performed that comply with the applicable standards.	= (Compliant microbiological tests/Microbiological water quality tests performed) * 100
New connection efficiency	Percentage of connections installed within the specified target time	= (New water connections type 1 and type 2 within a target time / New water connection type 1 and type 2 requested) * 100

Annex VI Calculation of indicators used in this report

Non-Revenue Water	Percentage of system input volume not being billed	= (Water distributed - Billed authorized consumption) / (Water distributed) * 100
Operating cost coverage ratio (billing)	Total billing compared to total operation and maintenance costs	= (Amount billed in period / Total operation and maintenance costs water and wastewater services) * 100
Operating cost coverage ratio (collection)	Total collection compared to total operation and maintenance costs	= (Total collection / Total operation and maintenance costs water and wastewater services) * 100
Operating cost coverage ratio (revenues)	Total revenues compared to total operation and maintenance costs	= (Total revenues / Total operation and maintenance costs water and wastewater services) * 100
Operational well and reservoir meters	Percentage of wells and reservoirs with operational meters	=Number of operational reservoir meters / Number of metered reservoirs
Percentage of inactive subscribers	Percentage of subscribers inactive at the time of reporting	= ((Total water subscribers - Active subscribers) / Total water subscribers) * 100
Percentage of staff trained	Percentage of staff trained during reporting period	= (Total number of staff that participated in internal or external training / Total number of employees (full-time equivalent)) * 100
Physical-chemical water quality compliance	Percentage of the total number of physical-chemical tests of treated water performed that comply with the applicable standards.	= (Compliant physical-chemical tests / Physical-chemical water quality tests performed) * 100
Preventive maintenance of pumps	Percentage of pumps covered by preventive maintenance	= (Production and distribution pumps preventive maintenance / Production and distribution pumps) * 100
Renewable energy utilization	Percentage of renewable energy used	= ((Photovoltaic energy produced + Hydro power produced + Wind energy produced + Biogas energy produced) / Electricity consumption) * 100
Sizing of pumps	Percentage of pumps running at the right sizing	= (Production and distribution pumps sizing / Production and distribution pumps) * 100
Speed of repair of failures	Percentage of network and water service connection failures repaired within target time	= ((Network failures repaired in target time + Service connection failures repaired in target time) / (Network failures + Water service connection failures)) * 100
Subscriber meter replacement ratio	Percentage of subscriber meters replaced during reporting period	= (Subscriber meters replaced during reporting period / Subscriber meters) * 100
Subscribers receiving continuous supply	Percentage of subscribers receiving 24 hours supply 7 days per week except for interruptions due to major maintenance or repair interventions	= (Subscribers receiving continuous supply / Total water subscribers) * 100
Total cost coverage ratio	Total collection vs. total costs of service provision	=Total collection water and wastewater services / Total costs of water and wastewater services
Training per employee	Number of training hours per employee during reporting period	=Total number of training hours in reporting period / Total number of employees
Unit total cost water services	(Operation and maintenance costs + capital costs) / authorized consumption (including exported water)	=Total costs water services / (Authorized consumption + Exported treated water)
Water consumption per capita (residential subscribers)	Average daily water consumption per capita	quarterly = Residential billed volume*1,000/90/Population supplied (water) annually = Residential billed volume*1,000/365/Population supplied (water)
Water loss per subscriber	Total (apparent and real) losses, expressed in terms of annual volume of supplied water lost per subscriber per day	= (Water supplied -(Authorized Consumption-Exported water) / Total water subscribers) * 1,000 / 365
Water losses per connection per day	Total real losses, expressed in terms of annual volume of supplied water lost per connection per day	= ((Water supplied -(Authorized Consumption-Exported water))) *Real losses / Total connections * 1,000 / 365
Water losses per mains length	Total (apparent and real) losses, expressed in terms of annual volume of distributed water lost per mains length.	= (Water distributed -Authorized consumption) / Length of water network / 365
Water quality tests performed	Percentage of treated water tests required by applicable standards that are carried out.	= (Water quality tests performed / Water quality tests required) * 100
Water resources use per capita/day	Average daily volume of water supplied per capita	= (Water produced + Imported treated water - Exported treated water) / (Resident population) * 1,000 / 365

Annex V UPMU Team

Utilities Performance Monitoring Unit (UPMU) Team

1. Dr. Ahmad Abdellatif Al-Azzam/ Utilities Performance Monitoring Unit Director.
2. Eng. Jamal Issa Al-Naouri/ Utilities Operations Expert.
3. Eng. Mohammad Omar Kurdi/ Customer Services & Relations Expert.
4. Mr. Hussein Mohamad Al-Sorkhy/ Accounting &Financial Monitoring Expert.
5. Mr. Jamal Mohammad Dajani/ Financial/ Economic Analyst.
6. Mrs. Doa'a Mohammad Al-Musa/ Data Officer/ IT Expert.

German-Jordanian Water Portfolio/ Management of Water Resources II

1. Mr. Nayef Khalil Hammad/ Component Manager - Regulation and Private Sector Participation.
2. Eng. Zeyad Abdelrahman Shawagfeh/ National Expert - Water Sector Performance and Regulation.