Best Practice Experience Adaptation Options for Balkan Region- Lessons Learnt from Developing Countries Digitalization and Better Customer Management

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DHI

Albania, November 2023

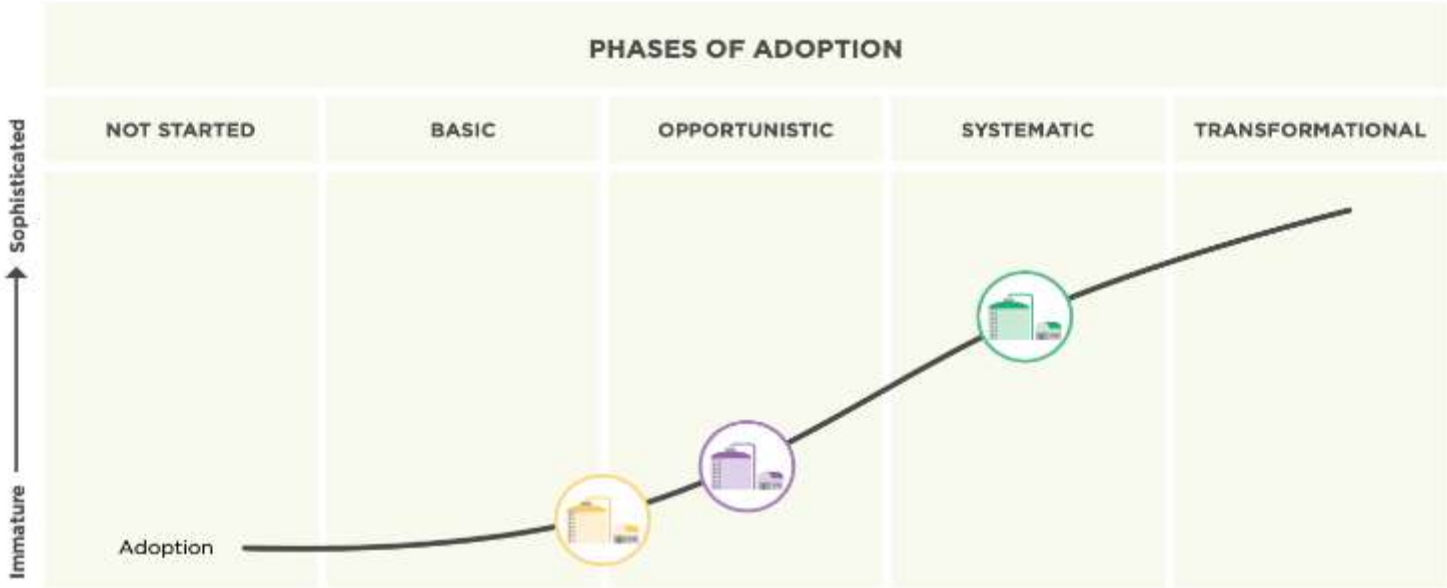
Outline

- *Digital Journey* is a complex and long process for water utilities
- It helps the Utility to transform into “Smart Utility”, modernize, move towards ”Digital Water”.
- The purpose is to improve efficiency, management, performance.
- GIS (Geographic Information Systems), CIS (Customer Information Systems), and SCADA (telemetry).

Various case stories and photographs will be presented to make this presentation more interesting.

Digital Journey for Water Utility

- Digitalization, from paper maps to GIS
- Telemetry, SCADA, smart metering
- Automation
- Customer relationship management - CRM and data analytics
- Internet of Things
- Digital Twins
- Artificial Intelligence



No data

Too much of data

EXAMPLE CHARACTERISTICS

NOT STARTED	BASIC	OPPORTUNISTIC	SYSTEMATIC	TRANSFORMATIONAL
• Traditional, legacy analog infrastructure • No digital strategies or technologies	• Begin incorporating digital technologies into operations • Develop online monitoring capabilities, i.e., IoT, SCADA	• Most operations have been redesigned with digital automation and control • Analytics tools utilized for process optimization	• Digital technologies are well established • Inter-process automation/control • Internal resources and platforms developed for working with digital infrastructure	• Digital technologies incorporated across business and operations processes • Advanced analytics, used for decision making

GIS, SCADA, Customer Information Systems CIS → Smart metering

Source: IWA (2019).

Customer management meter reading

Reverse flow detection

Leakage detection

In-person readings every 3 months, for example

Remote reading by a personnel or a vehicle

+ GIS (X, Y) for georeferencing

Smart water metering in the real-time

Illegal tampering detection

Alarming for high consumption

Cloud

Demand patterns

Manual → Remote → Automatic

Risk of privacy breach

Enough of necessary data → Too much of data

Customer management meter reading

Gnr Bnr Fnr Snr	Delnr	Avlest Dato	Avlest Målerstand (m3)	Sum Forbruk (m3)	Avlesning Metode	Type ID	Kunde Navn1	Eiendomsnavn	År	Måler Nummer	Montertdato
101.525.0.0	1	29.05.2018	3,199.00	339.00	Manuell	Sameie	Sameiet Kaiveien 13	Kaiveien 13	2018	24135610	06.09.2006
101.525.0.0	1	17.01.2019	112.00	112.00	Kort	Sameie	Sameiet Kaiveien 13	Kaiveien 13	2018	77327829	29.05.2018
101.525.0.0	1	17.01.2019	111.00	111.00	Kort	Sameie	Sameiet Kaiveien 13	Kaiveien 13	2018	77327830	29.05.2018
101.525.0.0	1	21.01.2020	624.00	512.00	Kort	Sameie	Sameiet Kaiveien 13	Kaiveien 13	2019	77327829	29.05.2018
101.525.0.0	1	21.01.2020	624.00	513.00	Kort	Sameie	Sameiet Kaiveien 13	Kaiveien 13	2019	77327830	29.05.2018
101.553.0.0	1	08.12.2016	390.00	75.00	Internett	Privat	Olsen Mary Synnøve	Lineveien 5	2016	11372638	15.12.2011
101.553.0.0	1	06.12.2017	503.00	113.00	Internett	Privat	Olsen Mary Synnøve	Lineveien 5	2017	11372638	15.12.2011
101.553.0.0	1	17.12.2018	534.00	31.00	Internett	Privat	Olsen Mary Synnøve	Lineveien 5	2018	11372638	15.12.2011
101.553.0.0	1	06.12.2019	570.00	36.00	Internett	Privat	Olsen Mary Synnøve	Lineveien 5	2019	11372638	15.12.2011
101.569.0.0	1	09.12.2016	5,568.00	467.00	Internett	Kommunal	Hommersåk Barnehage	Teineveien 2	2016	27803019	18.08.2007
101.569.0.0	1	05.01.2018	6,034.00	466.00	Kort	Kommunal	Hommersåk Barnehage	Teineveien 2	2017	27803019	18.08.2007
101.569.0.0	1	19.12.2018	6,434.00	400.00	Internett	Kommunal	Hommersåk Barnehage	Teineveien 2	2018	27803019	18.08.2007
101.569.0.0	1	18.12.2019	6,834.00	400.00	Internett	Kommunal	Hommersåk Barnehage	Teineveien 2	2019	27803019	18.08.2007
101.57.0.0	1	28.12.2016	1,287.00	128.00	Internett	Næring	Celeste As	Kaiveien 37	2016	28030800	26.09.2008
101.57.0.0	1	22.12.2017	1,392.00	105.00	Kort	Næring	Celeste As	Kaiveien 37	2017	28030800	26.09.2008
101.57.0.0	1	31.12.2018	1,497.00	105.00	Stipulert	Næring	Celeste As	Kaiveien 37	2018	28030800	26.09.2008
101.57.0.0	1	19.12.2019	1,499.00	2.00	Internett	Næring	Celeste As	Kaiveien 37	2019	28030800	26.09.2008
101.590.0.0	1	30.10.2016	1,817.00	136.00	Stipulert	Privat	Malmin Stian	Ileveien 8	2016	25001715	22.05.2006
101.590.0.0	1	31.12.2017	1,953.00	136.00	Stipulert	Privat	Malmin Stian	Ileveien 8	2017	25001715	22.05.2006
101.590.0.0	1	05.12.2018	2,001.00	48.00	Internett	Privat	Malmin Stian	Ileveien 8	2018	25001715	22.05.2006
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101.15.0.0	3	28.11.2016	46,269.00	1,521.00	Manuell	Kommunal	Sandnes Kommune	Nøtteskjellveien 9	2016	9512350	05.07.2004
101.15.0.0	4	27.01.2017	28,767.00	1,591.00	Manuell	Næring	Riskahallen	Merkant. Del Av Ha	2016	63164123	05.07.2004
101.15.0.0	5	30.10.2016	875.00	110.00	Stipulert	Næring	Grendahuset Riska BA	Riska Grendahus	2016	28030858	26.09.2008
101.15.0.0	5	02.01.2018	1,344.00	469.00	Internett	Næring	Grendahuset Riska BA	Riska Grendahus	2017	28030858	26.09.2008
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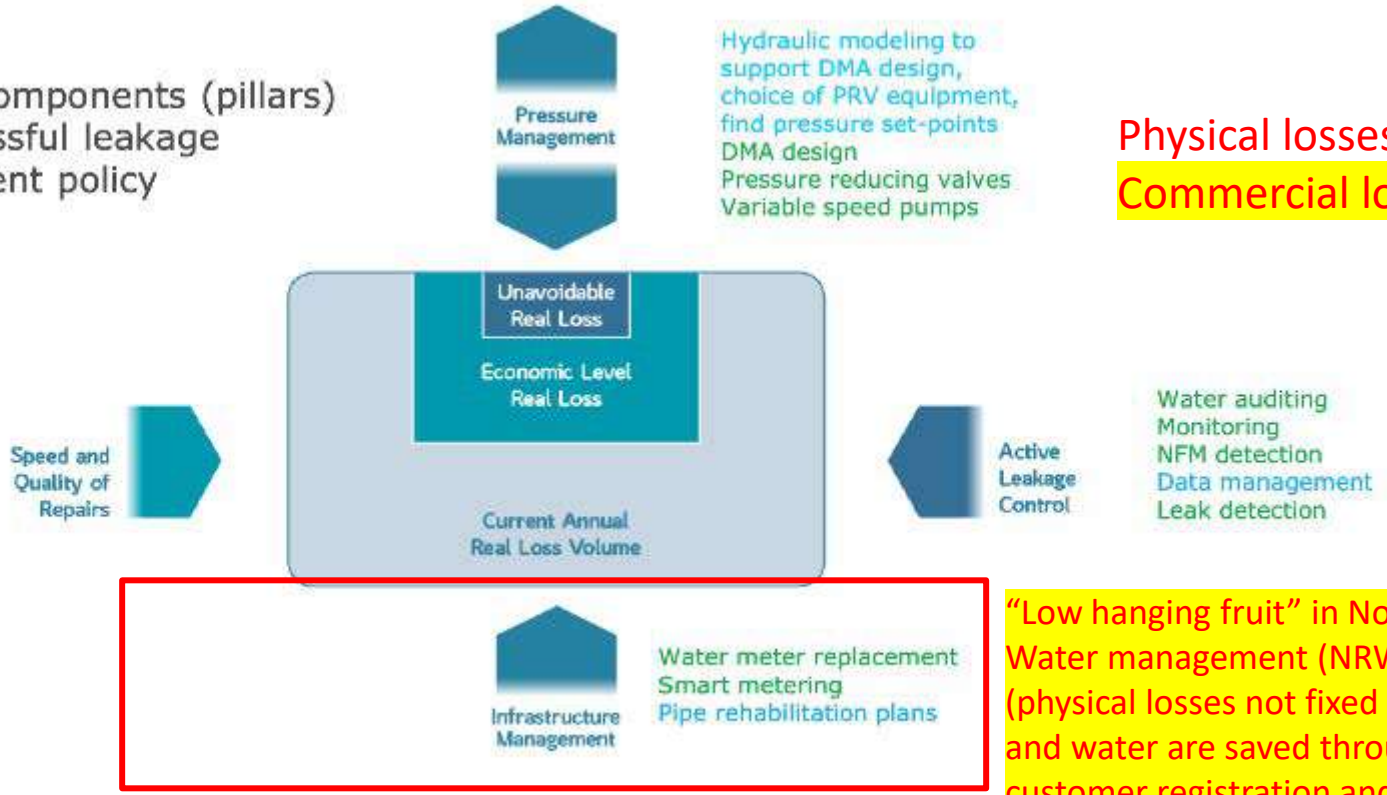
101.15.0.0	5	31.12.2019	1,514.00	85.00	Stipulert	Næring	Grendahuset Riska BA	Riska Grendahus	2019	28030858	26.09.2008

Customer management meter reading

Non-revenue Water

The four components (pillars) of a successful leakage management policy



Physical losses

Commercial losses

"Low hanging fruit" in Non-Revenue Water management (NRW) (physical losses not fixed but money and water are saved through customer registration and billing.

Source: EU Reference document Good Practices on Leakage Management

MAPPING OF CUSTOMERS USING COLLECTOR FOR ARGIS

BY JEAN PAUL KAYITARE,
GIS SPECIALIST (WASAC)

N°	Required Data	Data Type
1	Water Meter Manufacturer	**Text Pick List** (ITRON, ACTARIS , SENSUS ,SOCAM, SHLUMBERGER,ZENER, SAPPEL/ NA)
2	Meter Nominal Flow Rate	**Text Pick List** (1.5m³/h , 2.5m³/h , 3.5m³/h , 6 m³/h , 10 m³/h , 15m³/h , 40m³/h , 60m³/h , 100m³/h , 150m³/h
3	Year of Manufacturer	**Digits** (from 1980 to 2015)
4	Serial number	**Text**
5	Meter Type	**Text Pick List**
6	Metrological Class : B or C	**Text Pick List** (B, C)
7	Physical status of meter	**Text Pick List** (Normal, Damped, Tempered)
8	Meter sealing	**Text Pick List** (Yes or No)
9	Screen status	**Text Pick List** (Readable, Unreadable)
10	Index status :	**Text Pick List** (Normal, Blocked)
11	Current Index reading (in black only)	**Digits**
12	Inlet Pipe Connection Diameter	**Digits**
13	Connection Model	**Text Pick List** (Complete, Incomplete)
14	Presence of water Meter box	**Text Pick List** (Yes, No)
15	Presence of a Water Tank	**Text Pick List** (Yes, No).
16	If Yes, Tank Capacity in Liters	**Digits**

Kigali, Rwanda

Digitization was supplemented by massive information surveys and data mining.

Kigali, Rwanda

BY JEAN PAUL KAYITARE,
GIS SPECIALIST (WASAC)

MAPPING OF CUSTOMERS USING COLLECTOR FOR ARGIS

Kigali, Rwanda

These are fields specified by DHI

This is a part of the drinking water network as digitized during the process

DHI and ESRI Rwanda partnership

Pipes

Location: 30.185093 -2.102187 Decimal Degrees

Field	Value
OBJECTID	3754
Shape	Polyline
ID code	JURKABSP9
From Node	JURKABJU1
To Node	JURKABJU27
From name To name	Kabukuba
Branch Name	Rugeseca
Diameter	63 (2 ")
Connected to	<null>
Pipeline Material	PVC
Pipeline Category	Secondary Pipes
Nominal Pressure	16
Depth	<null>
Roughness	<null>
Thickness mm	<null>
Action on pipeline	Done
Year of Laying	2007
Company that layed the pipe	SOGEA
Street Number	Not available
Provide comment if necessary	<null>
Length in meters	1115.289606
Shape_Length	0.010029

Storages

Location: 30.182625 -2.101235 Decimal Degrees

Field	Value
Shape	Point
ID code	JURKABRE2
Location Name	Kabukuba
Branch Name	Bugesera
Capacity m3	50
Diameter	7
Material	Stones
Reservoir Form	Cylinder
Base Elevation	0
Height m	3
Type of the inlet pipe	Bottom
Elevation of the inlet pipe in meter	2.5
Minimum Volume	2.5
Minimum Level	0.3
Maximum Level	2.8
Minimum Volume	6
Presence of float valve Regulator	Yes
Diameter of inlet pipe for the float valve	90 (3 ")
Reservoir Position	Semi-ground
Reservoir Function	Storage
Street Number	Not available
Provide comment if necessary	<null>
Province	<null>
District	<null>
Sector	<null>
Cell	<null>
Village	<null>

Pumps

Location: 30.293328 -2.079128 Decimal Degrees

Field	Value
Created Date	<null>
Location Name	FERI SP3
Branch Name	Rwamagana
Nature	Multi cellular
Electrical Starting Method	Soft starter
Head m	180
Current Head m	150
Flow rate m3 h	120
Current Flow rate m3 h	150
Year of Construction	2015
Year of installation	2017
Installation	Horizontal
Type Number	1 (Design Head & Design Flow-Default P
Motor Mark	KSB
Motor Type	1CV2282A
Voltage Frequency	50
Power Consumption KW	1 (Design Head & Design Flow-Default P
Power KW	90
Constant Operating	<null>
Time Controlled	<null>
Time Start	<null>
Time Stop	<null>
Level Controlled	<null>
Start Level	<null>
Stop Level	<null>
Controlled Junction Tank ID	<null>
Characteristic Curve	90
ID Code	KARNYAPU3
From Node	KARNYAJU136
To Node	KARNYAJU133

Customers

Field	Value
Year of Manufacture	2011
Inlet Pipe Connection Diameter	3/4 "
Is the plot accessible	Yes
Type of customer	Domestic Use
Is it a particular customer or institution	Particular custome
Particular customer Family name	Musengimana
Particular customer First name	Ziripa
Name of institution	<null>
Nationality	Rwanda
ID Type	National ID
ID Number	<null>
Phone number	<null>
Email Address	Not available
Who Is the person on bill	Plot Owner
How many water users	<null>
Is there WASAC water	Yes
Is there REGI water	No
Is water meter available	Yes
If No Provide Connection Legality	Legal
Presence of water meter box	No
Physical Status of Meter	Normal
Meter sealing	Yes
Screen Status	Readable
Index Status	Normal
Current Index Reading	181
Connection Model	Complete
Connection Legality	Legal
CFO Name	<null>
Presence of Water Tank	No
Tank capacity in liters	<null>
Tank Material	<null>
Tank Position	<null>
Other Water Storage Capacity in Liters	60
Presence of swimming Pool	No

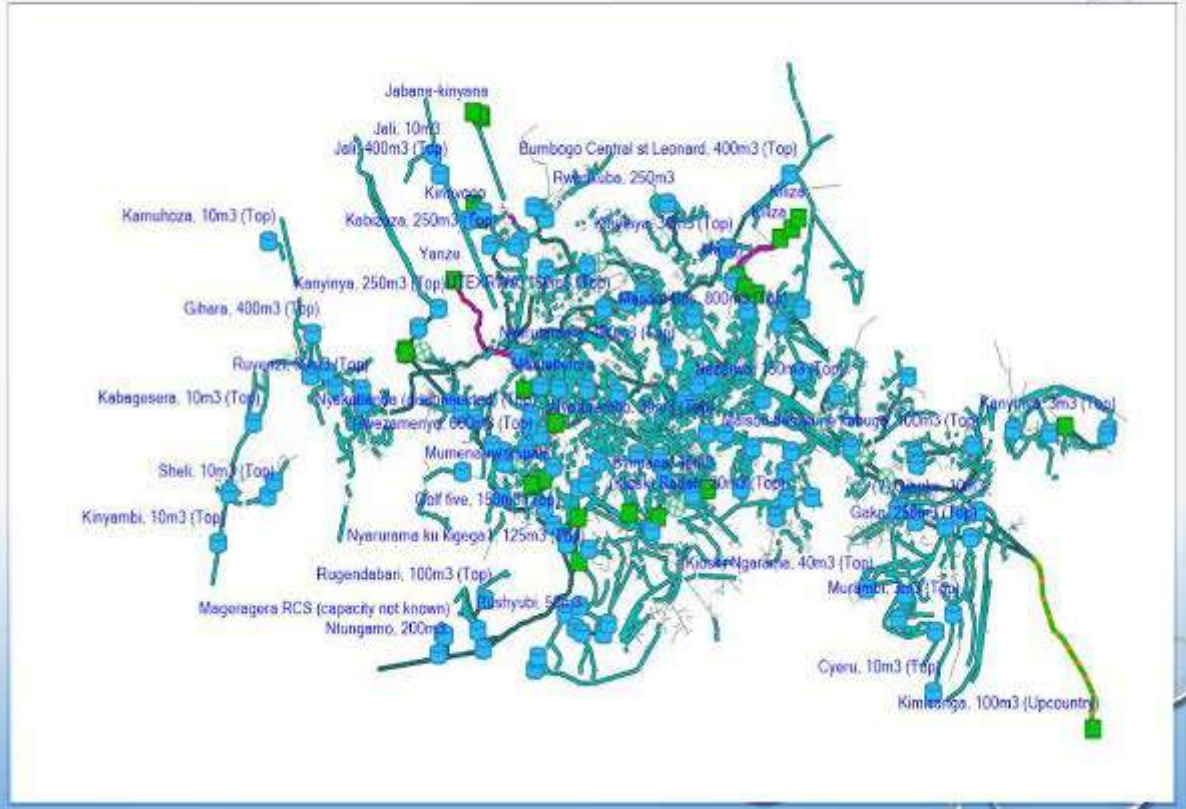
Kigali, Rwanda

Upcountry Network Overview (14 Branches, 15 Hydraulic Models)

- 200,000 pipes,
- 960 storage ta
  reservoirs,
- 190 pumps.
- 8,500 km lengt
  pipelines
- 130, 500 demc
  (Customers)
- 600 l/s total ne
  demand

Kigali Network Overview (6 Branches, 1 Hydraulic Model)

- 190,000 pipes,
- 185 storage tanks or reservoirs,
- 81 pumps.
- 4,900 km length pipelines
- 105,000 demands
- 500 l/s total network demand

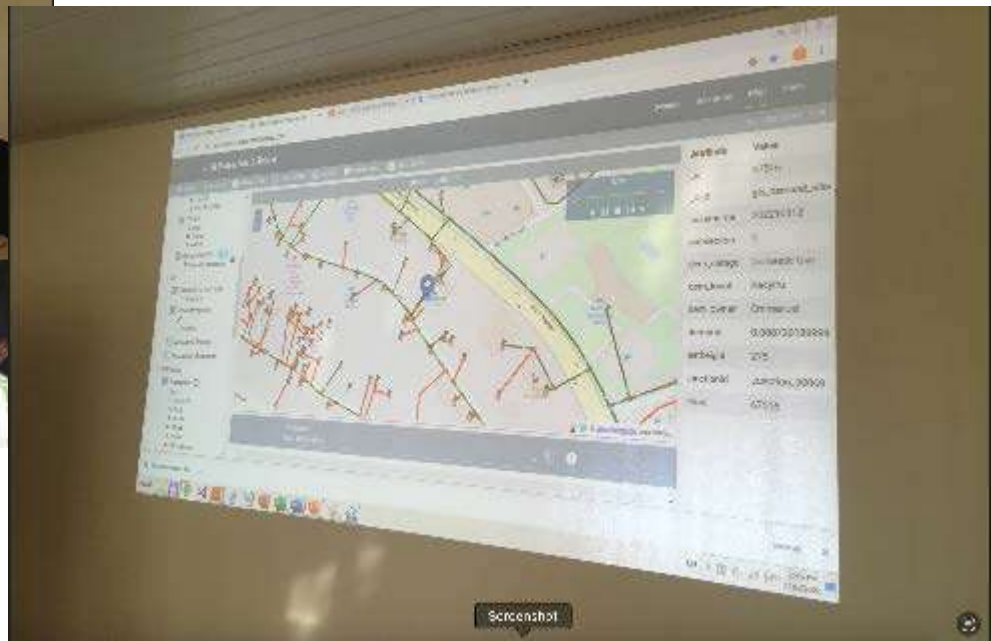


… and these are hydraulic model of water distribution network in all Rwanda

Kigali, Rwanda

DHI workshop with ESRI Rwanda for WASAC
(water utility personnel)

MIKE WaterNet Advisor
Hydraulic modeling software for WASAC



Gangtok, India

Intermittent water supply, 1x or 2x per day, no or scares metering, high water losses.

Private house tanks

Gangtok, India

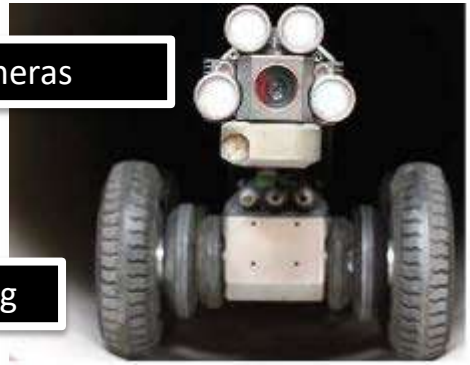
Fourth Industrial Revolution - Moving South Africa towards 'Digital Water'

Increased transparency

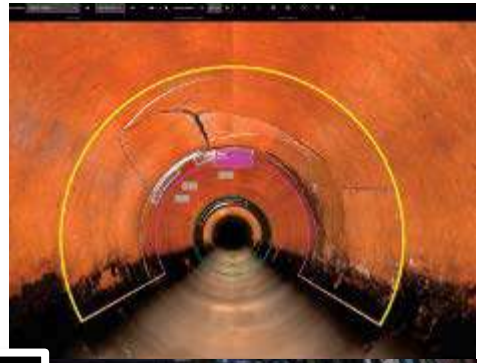
…igeons and horse-drawn carts faded into obscurity with the invention of the …ised cars, the new age of digital "thinking machines" is set to revolutionise the management of one of the world's most critical resources. Article by Tony Co…

Automated processes for filtration plants, backwashing cycles, and chemical dosing.

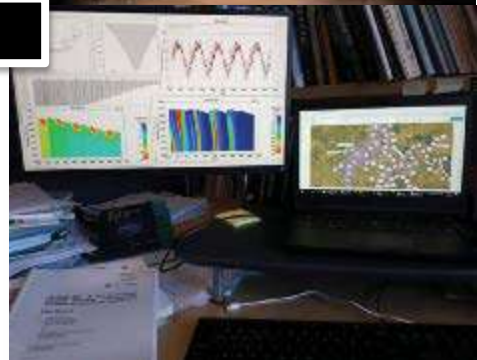
Robotic cameras



Drones for sampling



SCADA



UMGENI WATER

Establishment of MIKE WaterNet Advisor On-Line Model

Hydraulic on-line model of the bulk water supply system for Umgeni Water.

Umgeni Water, a state-owned entity, is one of Africa's most successful organizations involved in water management and is the largest supplier of bulk potable water in the Province of KwaZulu-Natal, South Africa. Development of an on-line hydraulic model of Umgeni Water service area consisting of 120 storage tanks and reservoirs, 105 pumps, control valves, 888 km (550 miles) of pipelines with a diameter up to 1700 mm (68 inches) and about 150 main turnouts. The hydraulic model is connected with a SCADA system in about 270 points and it is automatically and periodically synchronized and computed.

The activities performed during the model development:

- Review of Inland, North Coast, and South Coast models
- Sensor mapping between the hydraulic model and the SCADA system
- Set-up of the real-time model and forecasting model
- Development of tailored dashboards
- Training and knowledge transfer

SUMMARY

CLIENT
Umgeni Water, South Africa

PROJECT PERIOD
08/2020—08/2022

SOFTWARE
MIKE+, MIKE WaterNet Advisor On-Line

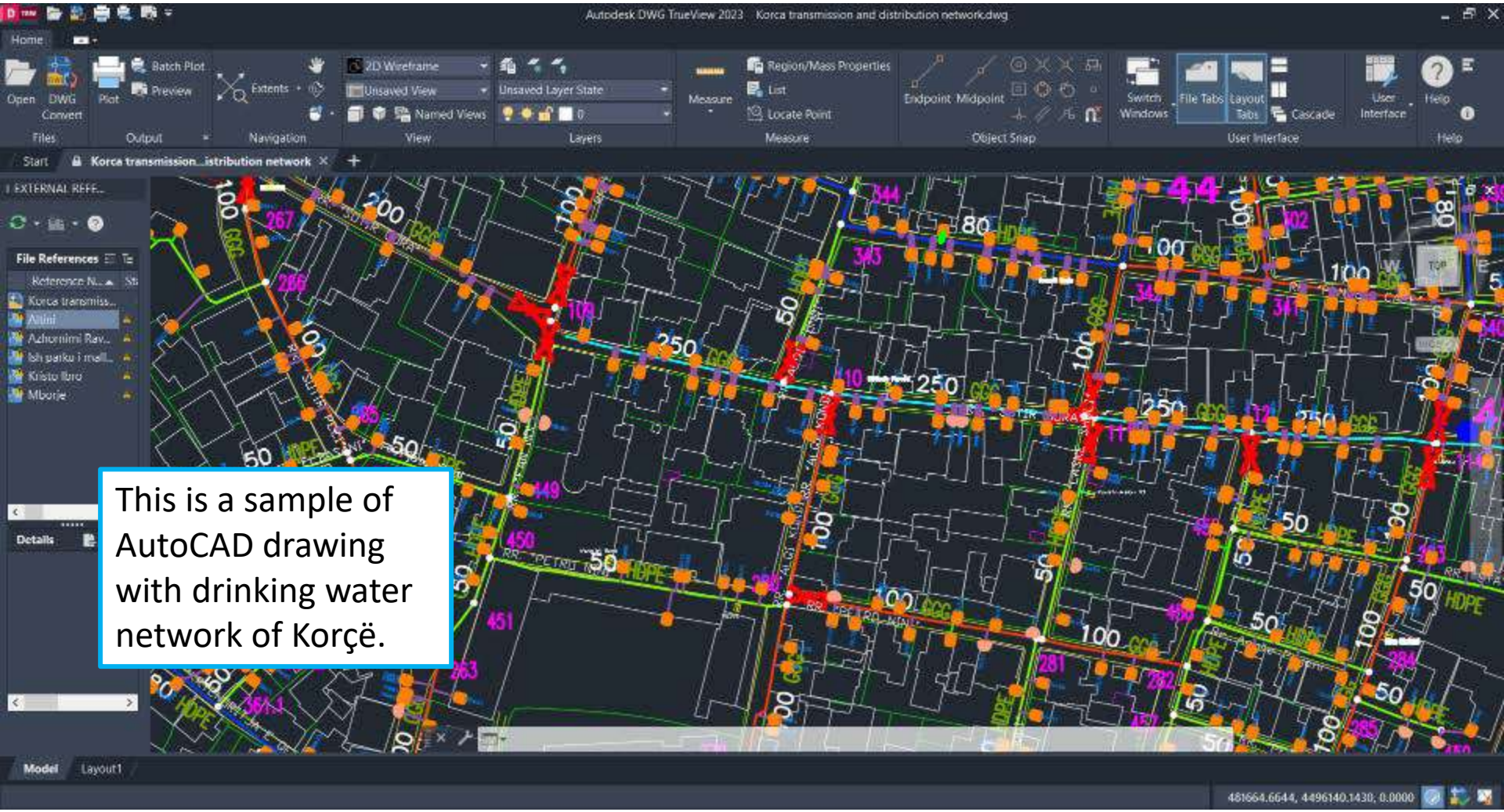
LOCATION /COUNTRY
Pietermaritzburg, South Africa

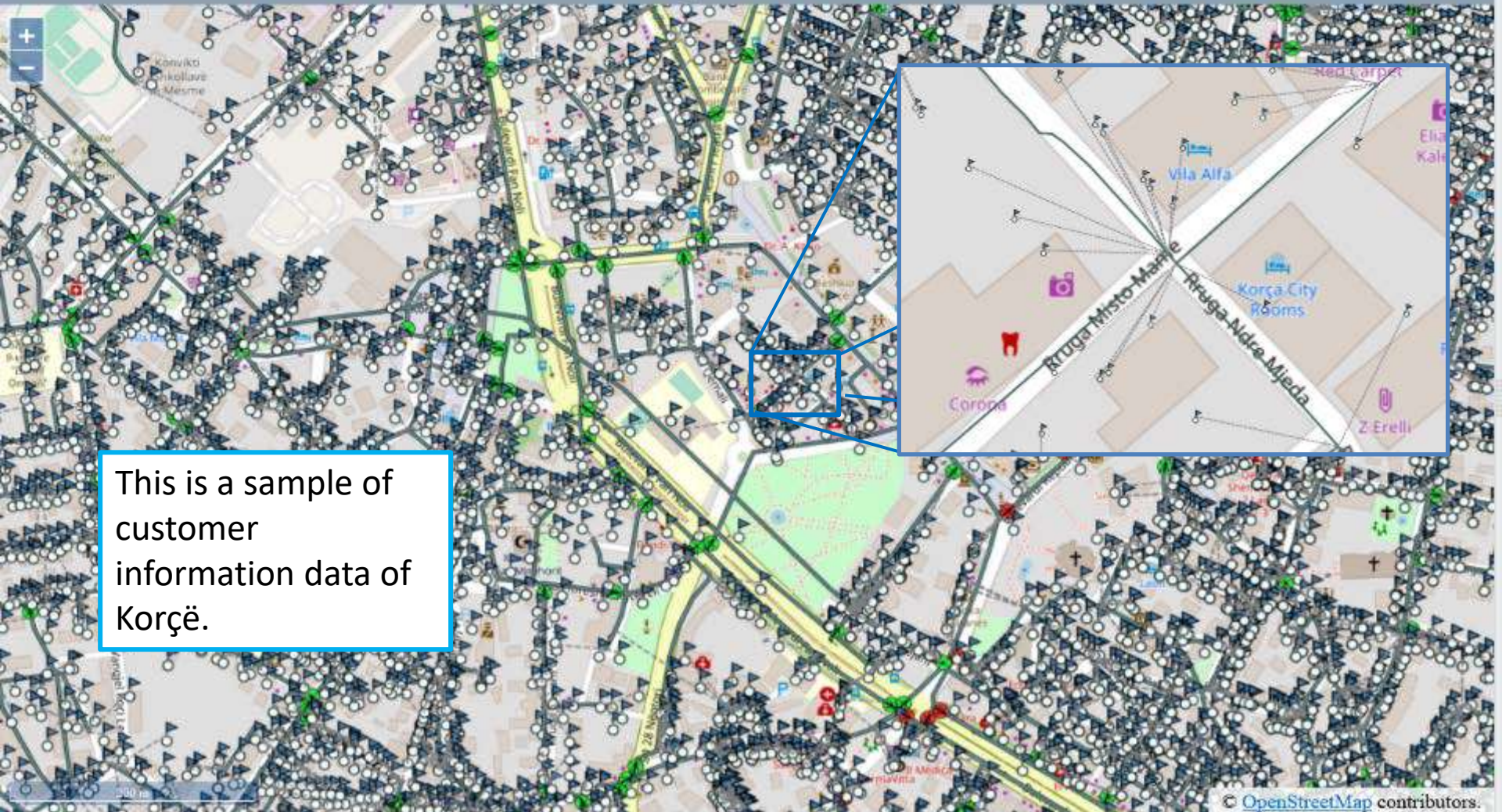
DHI Hydraulic modeling software

AutoCAD

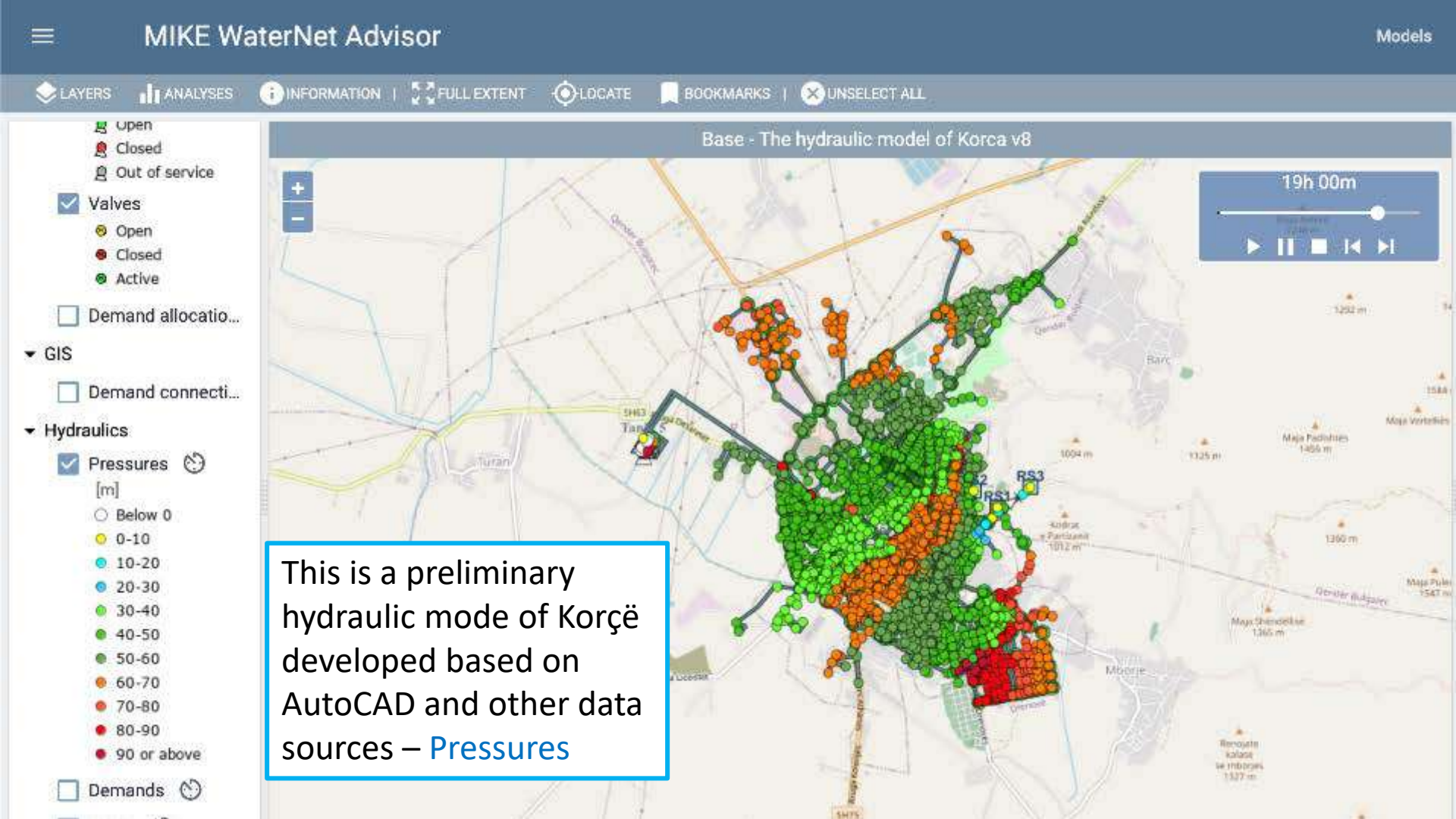
- If there is no GIS, then there is AutoCAD ☺
- Even though it is not designed for GIS but for technical drawings, it can still serve as data source for hydraulic modeling and other analytics.

This is a sample of AutoCAD drawing with drinking water network of Korçë.


Autodesk DWG TrueView 2023 Korca transmission and distribution network.dwg
Home
Open
DWG Convert
Plot
Batch Plot
Preview
Files
Output
Extents
Navigation
2D Wireframe
Unsaved View
Named Views
View
Unsaved Layer State
Layers
Measure
Region/Mass Properties
List
Locate Point
Measure
Endpoint
Midpoint
Object Snap
Switch Windows
File Tabs
Layout Tabs
Cascade
User Interface
Help
Start
Korca transmission...istribution network
EXTERNAL REFE...
File References
Reference N...
Korca transmiss...
Altini
Achornini Rav...
Ish parku i mall...
Kristo Ilaro
Mborje
Details
This is a sample of AutoCAD drawing with drinking water network of Korçë.
Model
Layout1
481664.6644, 4496140.1430, 0.0000



This is a sample of customer information data of Korçë.


MIKE WaterNet Advisor
Models
LAYERS
ANALYSES
INFORMATION
FULL EXTENT
LOCATE
BOOKMARKS
UNSELECT ALL
Open
Closed
Out of service
Valves
Open
Closed
Active
Demand allocatio...
GIS
Demand connecti...
Hydraulics
Pressures
[m]
Below 0
0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90 or above
Demands
Base - The hydraulic model of Korca v8
19h 00m
RS3
RS1
This is a preliminary hydraulic mode of Korçë developed based on AutoCAD and other data sources – Pressures

Myths

- We have no data, this is not for us.
- Not true, there is always some data. Paper maps to be digitized, as built drawings, spreadsheets, invoices, list of complaints, etc. Just get started with digitization.

Myths

- We have GIS so all is 100%.
- Unfortunately not true, “100%” for asset management does not mean ”100%” for analytics, or anything else. But GIS is probably the best place to start.

Myths

- We are a small Utility, this is not for us, it is too expensive.
- Not true, on the contrary, “small is nice”, results are achieved more rapidly, easy to maintain, less demanding in all aspects.

The future of the matter

- Ready or not, digital tools are here.
- We must avoid disruptive effects (such as Uber or Airbnb ventures, for example) (*).
- The Water sector must learn from other sectors (*).

(*) A Strategic Digital Transformation for the Water Industry, IWA, 2022.

References

- The Digital Journey of Water and Sanitation Utilities in Latin America and The Caribbean: What is at Stake and How to Begin, IDB, IDB-DP-00972, 2022.
- A Strategic Digital Transformation for the Water Industry, IWA, 2022.
- The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries - How the Private Sector Can Help: A Look at Performance-Based Service Contracting, Water Supply and Sanitation Board Discussion Papers, Paper No. 8, The World Bank Group, 2016.

Thank you and Questions