Lessons learned

Advanced pressure management and asset management will boost Romanian water operators to reduce their real losses significantly

5th Water Loss Balkans Forum and Exhibition

31st August 2023, Constanța Exhibition Pavilion, Romania, 12.55-13.15

Cor Merks, Andreea Florea and Silviu Stoica

RAMBOLL Bright ideas. Sustainable change.

About one year ago…

Vitens proudly presents:

The water loss control program of Vitens in the Netherlands aiming to almost eliminate NRW in 2030 at the latest

Monday, June 20, 2022, Plenary Session, Panorama Hall, 11:30-11:50, Cor Merks, the Netherlands

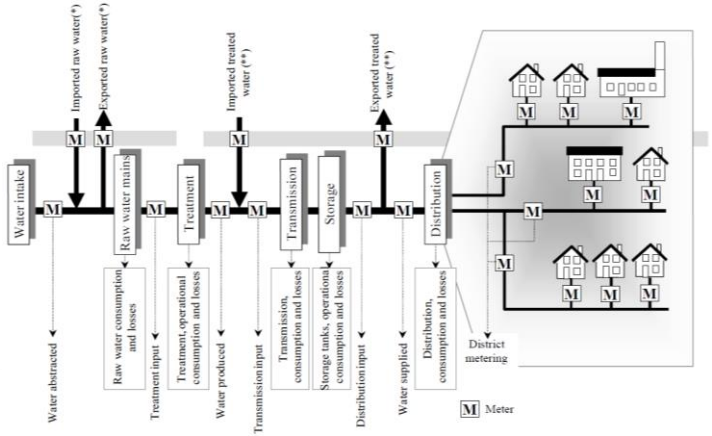
APAVITAL SA Iași proudly presents:

Preparation of an intelligent Asset Management Plan for better water management

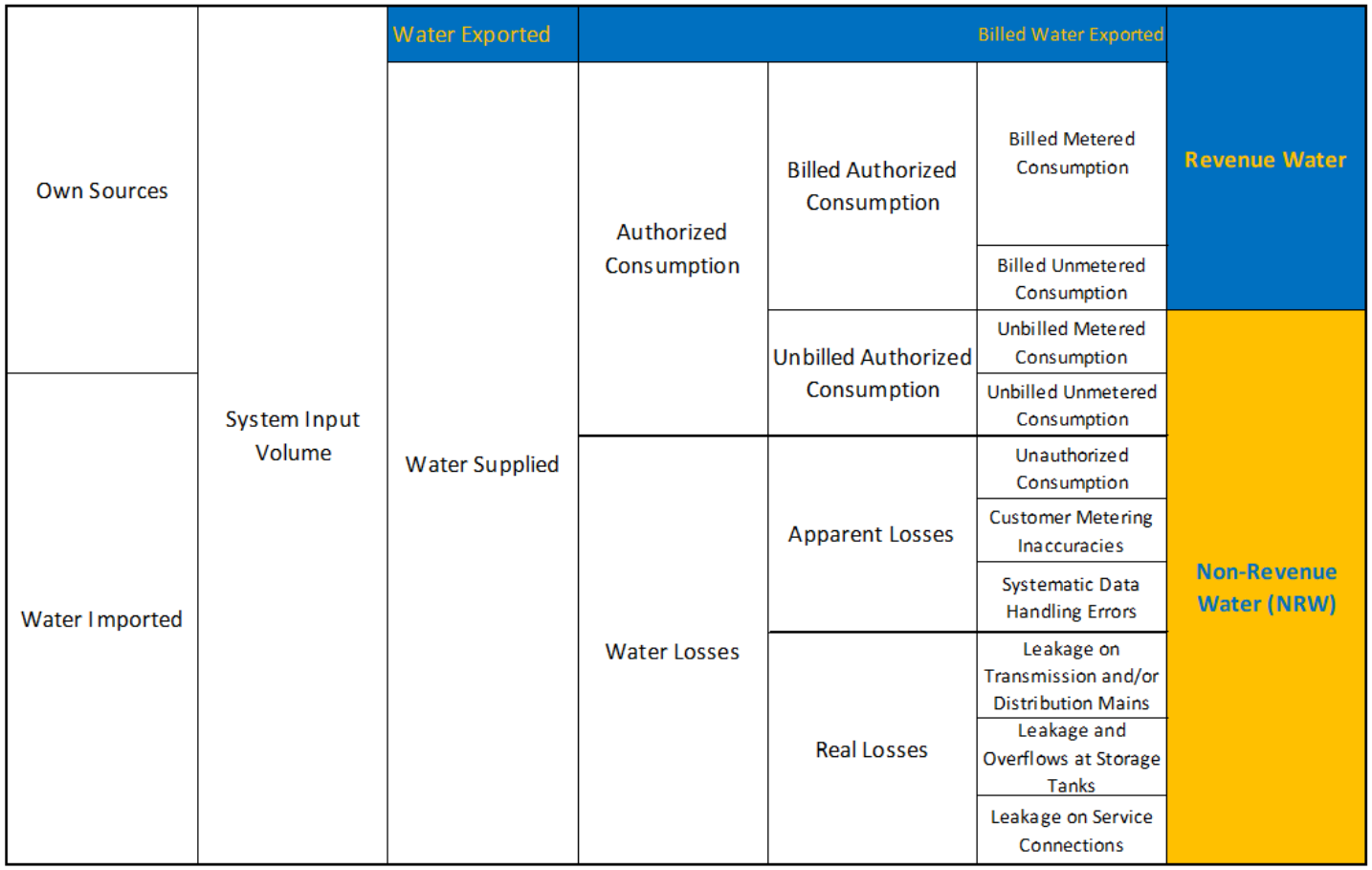
Wednesday, June 22, 2022, North Hall, 08:50-09:10, Cor Merks, the Netherlands

State-of-the-art Non-Revenue Water management has been developed over the last three decades

- In the past, water loss reduction activities were done in an un-coordinated way
- Interrelations were not properly understood
- Privatization of the UK water industry in 1989 marked the tipping point – the need to become more efficient
- Significant research was done in the UK
- This work forms the basis for most state-of-the-art NRW management concepts and tools
- The International Water Association started in 1997 with international standardization of terminology and standard performance indicators – an important article was published in October 2000



Standard IWA Annual Water Balance



- Revenue Water
  - Water Exported (billed)
  - Billed Metered Authorised Consumption
  - Billed Unmetered Authorised Consumption
- Non-Revenue Water (NRW)
  - Unbilled Authorised Consumption (Metered and Unmetered)
  - Apparent Losses
    - Unauthorised Consumption
    - Customer Metering Inaccuracies
    - Systematic Data Handling Errors
  - Real Losses
    - Leakage on Transmission and/or Distribution Mains
    - Leakage and Overflows at Storage Tanks
    - Leakage on Service Connections

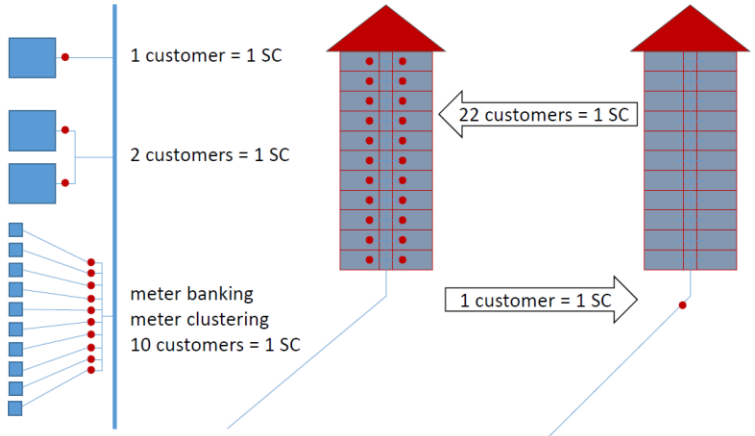
The importance of calculating the Standard Water Balance

- Framework for assessing a water operator’s water loss situation
- It:
  - Reveals availability and/or reliability of data and level of understanding
  - Creates awareness of problems and issues
  - Directs necessary improvement and investment measures
- It is the NRW management tool that generates the Key Performance Indicators to be used for benchmarking, performance improvement, and comparison among water operators
- Understanding the Water Balance and system-specific factors is necessary for decision making on investment measures and strategies
  - Here is the crucial link with asset management

What data needs to be available?

- Water Balance main components:
  - Volume from Own Sources
  - Water Imported
  - Water Exported (billed)
  - Billed Metered Authorised Consumption
  - Billed Unmetered Authorised Consumption
  - Unbilled Metered Authorised Consumption
  - Unbilled Unmetered Authorised Consumption
  - Unauthorised Consumption
  - Systematic Data Handling Errors
  - Customer Metering Inaccuracies

- Important water supply system data:
  - Length of mains
  - Number of service connections
    - *Customers versus service connections*
  - Average length of (private) customer service line
  - Average supply time (24/7?)
  - Average Operating Pressure



- Cost data:
  - Customer Retail Unit Charge
  - Variable Production Cost
- Uncertainty and inaccuracy of:
  - Large volume (large diameter) flow meters – production metering
  - Customer meters
  - Estimated components of water use

The importance of the Infrastructure Leakage Index (ILI)

OBJECTIVE	GOOD PRACTICE PERFORMANCE INDICATOR FOR LEAKAGE, FIT FOR PURPOSE						
	Volume per year	litres/ service connection	m^3/km mains	litres/ billed property	% of System Input Volume	% of Water Supplied	Infrastructure Leakage Index, with Pressure
SET TARGETS AND TRACK PERFORMANCE, FOR AN INDIVIDUAL SYSTEM	YES, for large systems	YES*	YES*	YES (UK)	NO	NO	Only if all justifiable pressure management completed
TECHNICAL PERFORMANCE COMPARISONS OF DIFFERENT SYSTEMS	NO	NO	NO	NO	NO	NO	YES
DRAW GENERAL CONCLUSIONS FROM SINGLE OR MULTIPLE SYSTEMS	NO	NO	NO	NO	NO	NO	YES, together with other context factors
* Choose services connection density > 20/km; if not, choose mains; or base choice on country custom and practice							

Furthermore, the ILI is an important technical screening criterion for water supply in the EU Taxonomy and is the prescribed rating method for assessment of water leakage levels in Directive (EU) 2020/2184

UARL EQUATION ALLOWS FOR KEY SYSTEM-SPECIFIC FACTORS

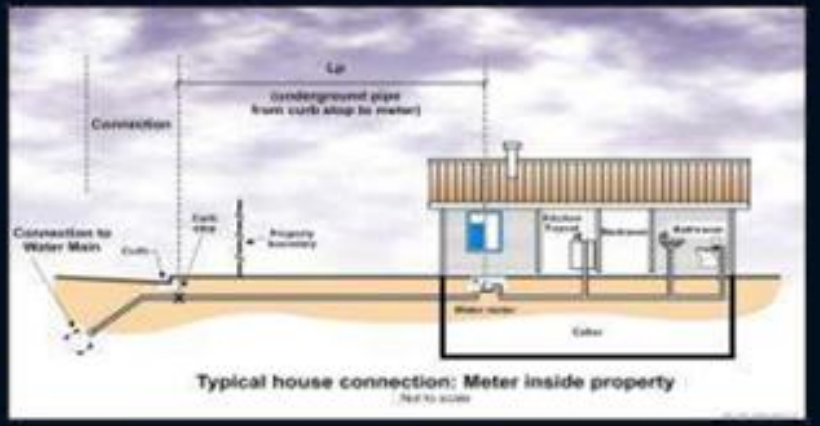
Unavoidable Annual Real Losses 'per day' equation (1999)

$$UARL\ (m^3/day) = (18 \times Lm + 0.8 \times Ns + 25 \times Lp) \times AZP/1000$$

Main length (Lm) in km

Number of conns (Ns) main to property line

Length of underground private pipes (Lp), Property line to meter in km



Average Zone Pressure in m

The four basic Real Losses control strategies

- Pressure management, as pressure affects:
  - Energy consumption (pumping)
  - Water consumption
  - Frequency of leaks and bursts
  - Flow rates of leaks and bursts
- Active leakage control, as leak detection affects:
  - Frequency of repairs
  - Run time of leaks
- Speed and quality of repairs, as it affects:
  - Reoccurrence of leaks
  - Run time of leaks
- Asset management, as it affects:
  - Water distribution system quality

As each control strategy receives less or more attention, the Real Losses will increase or decrease

Pressure management is the foundation of effective leakage management

Leakage is a function of the number of leaks in the network, their flow rate, and the time for which they run

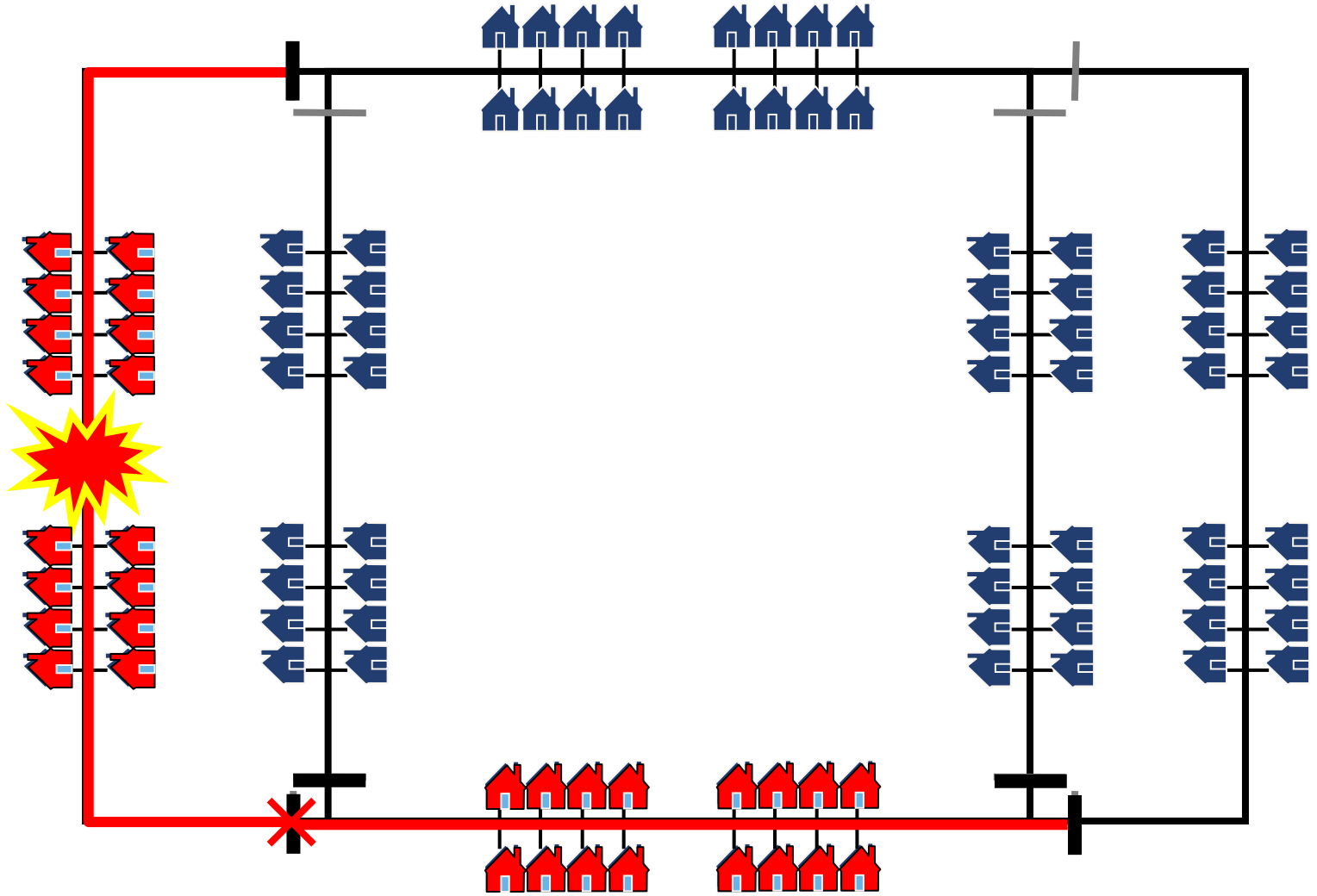
- Pressure affects frequency of leaks and bursts ("likelihood of failure")
- Pressure affects flow rates of leaks and bursts ("consequence of failure")

➢ Water utilities worldwide are implementing pressure management in as large as possible zones within their supply area

Source: courtesy of Kenneth J. Brothers, Commissioner of Public Works, Niagara Region, Canada & Allan Lambert, ILMSS, UK

The importance of functioning valves

- Effect of failing valve depends on network structure
- Probability of failing valve depends on location of valve (access) and type (aging)
- Maintenance of valves affects network performance, e.g., average interruption minutes and maximum time of interruption



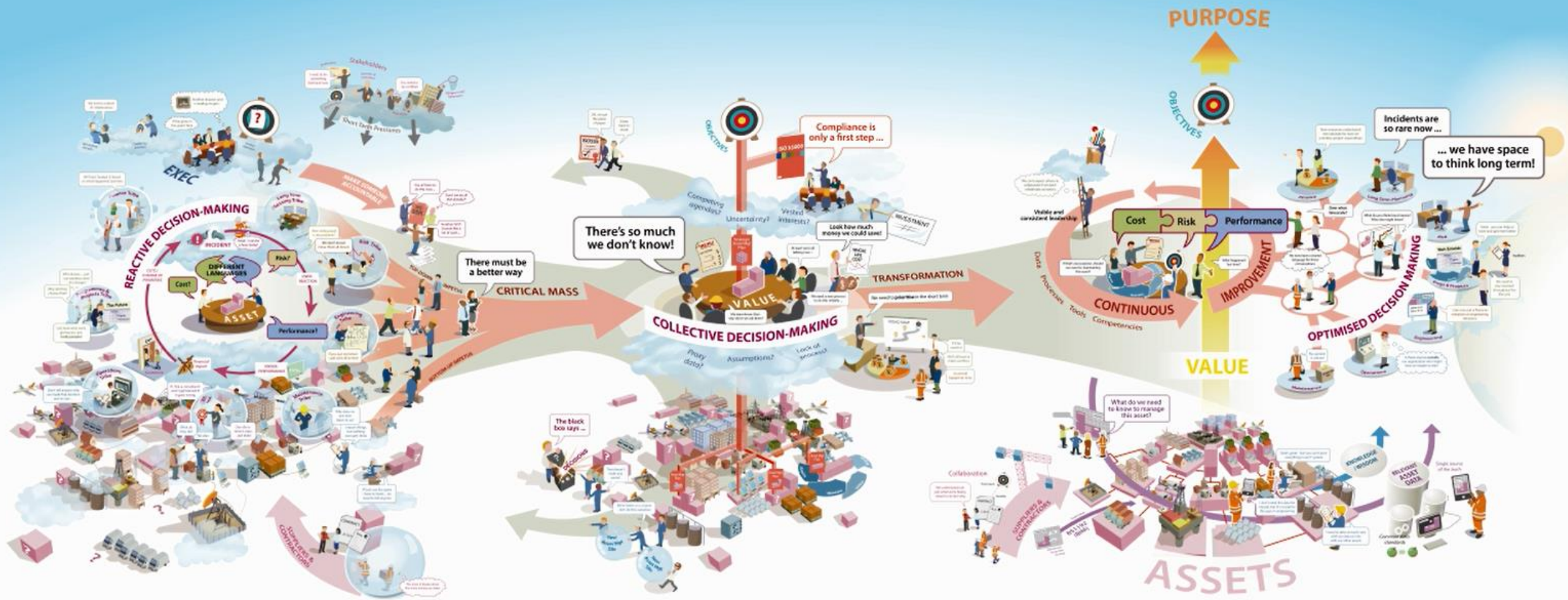
Global drinking water distribution network challenges

- The history and the specific operating environment of individual utilities within each country and/or region is unique
- The drinking water distribution network challenges are universal
  - How to maintain high standards?
  - How to balance cost, risk and performance?
  - How to work in a busy urban subsoil?
- Worldwide response:
  - NRW reduction management
  - Asset Management

The Asset Management Journey

Creating value through good Asset Management

Source: The Institute of Asset Management (IAM)

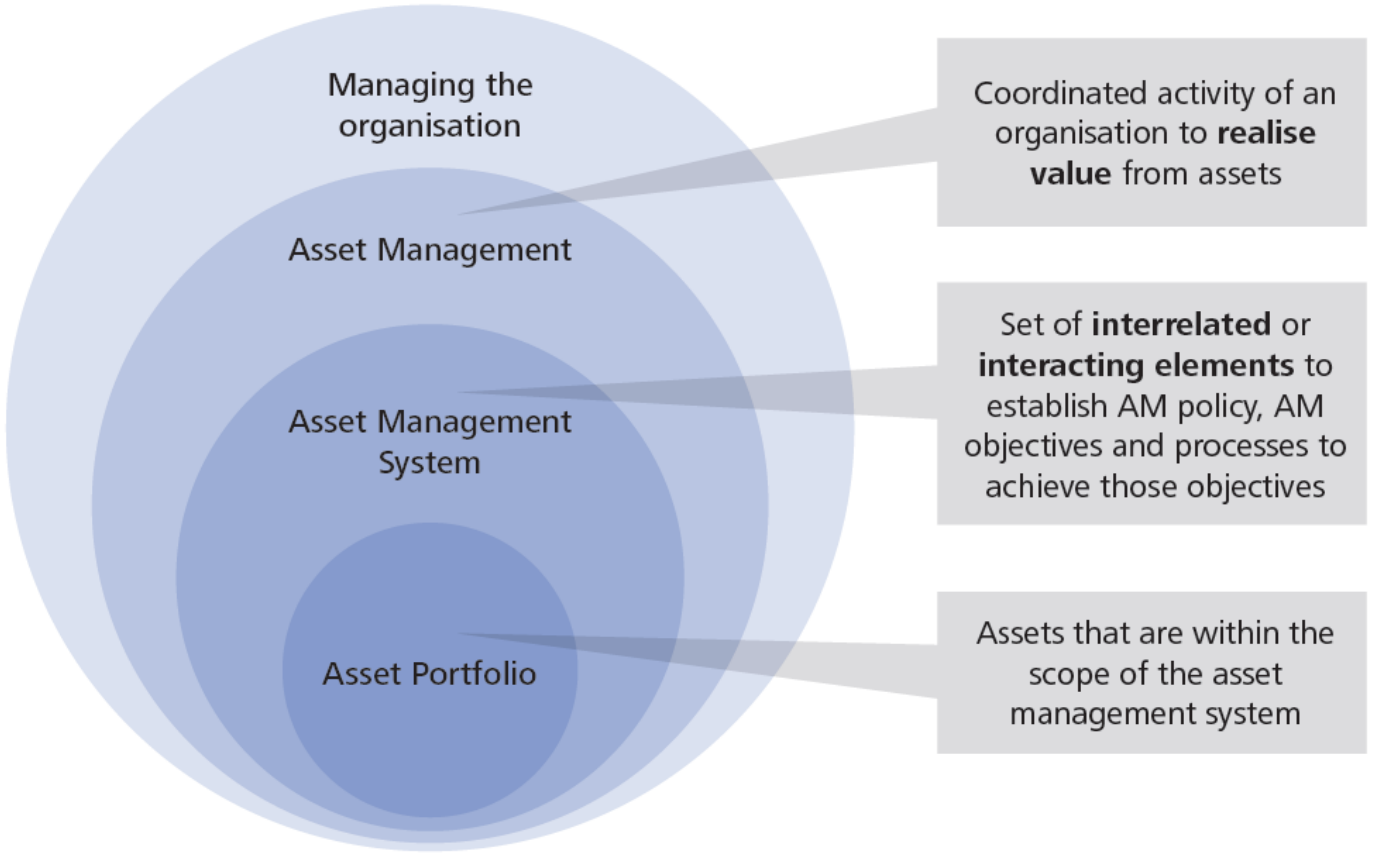


Why should Romanian water operators start the Asset Management Journey?

- A water operator has **thousands of distributed assets**, both new and very old
- Asset management will enable to optimise how you operate, **make risk-based decisions** and choose the **right interventions**, at the right time whether they be capital or operational/maintenance
- Ensuring that investment is supported by a **strong rationale** – enabling funding to be agreed with stakeholders incl. regulators
- Prolonging asset life through understanding the right intervention at the right time, i.e., **rehabilitate, repair or replace**
- Improving **security and safety** of assets and response to emergencies
- Developing people and individual capabilities to match the needs of the business, and promoting improved working across it – **breaking down silo's**

- Assets are anything with actual or potential value to an organisation
- Asset Management is an organisation's activity to realise value from its assets

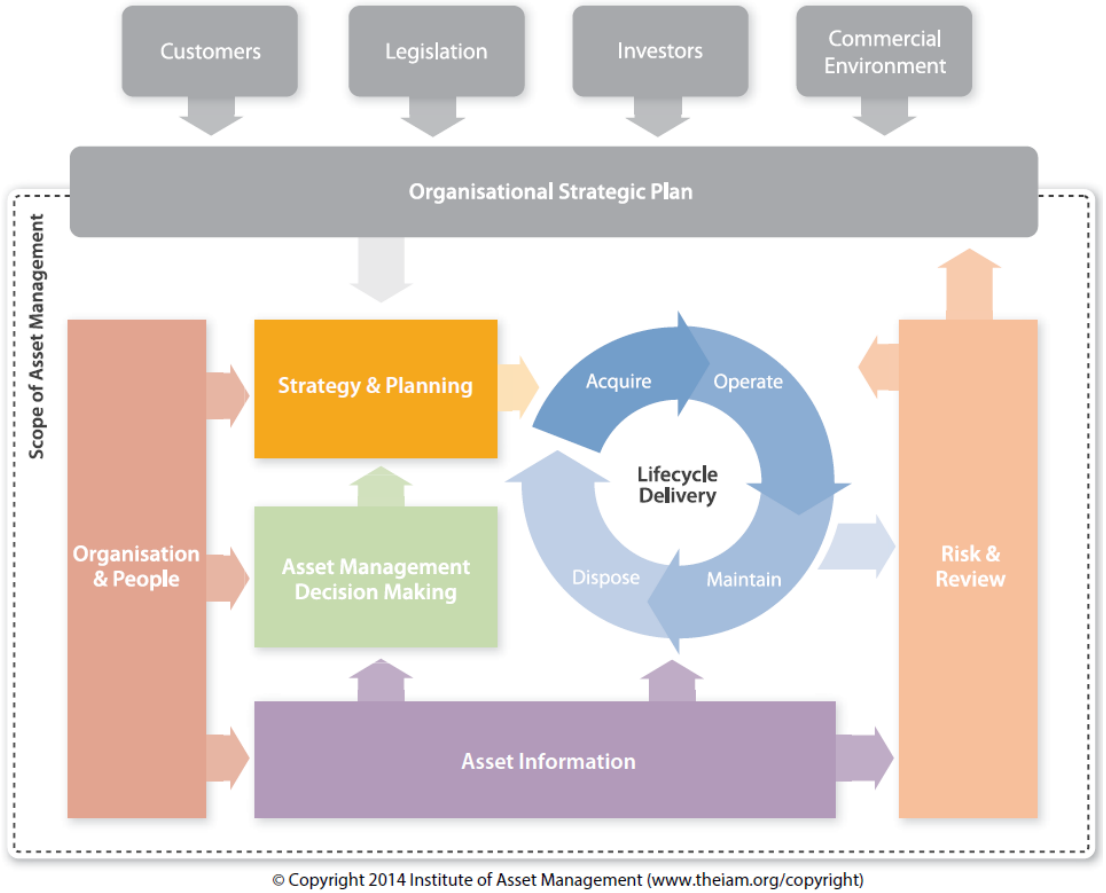
Asset Management System and the discipline of Asset Management of an organisation (Source: IAM)



An asset management organisation:

- Manages the organisation according to the standard ISO 9001 Quality management systems, and possibly other standards such as ISO 14001 Environmental management systems
- Fully understands their whole asset portfolio
- Has a documented Asset Management System (AMS)
- Fully understands that it is about the overall asset management capabilities and performance of their employees

IAM Conceptual model as generic overview to the asset management activity (Source: IAM)



- ISO 55001 sets out requirements which describe **what** is be done to be competent in asset management, however, doesn't offer advice on **how** it should be done
- The IAM subject specific guidance documents (SSGs) provide the **next level of detail** for 39 subject areas

Group 1
1. Asset Management Policy
2. Asset Management Strategy & Objectives
3. Demand Analysis
4. Strategic Planning
5. Asset Management Planning

Group 2
6. Capital Investment Decision-Making
7. Operations & Maintenance Decision-Making
8. Life cycle Value Realisation
9. Resourcing Strategy
10. Shutdowns & Outage Strategy

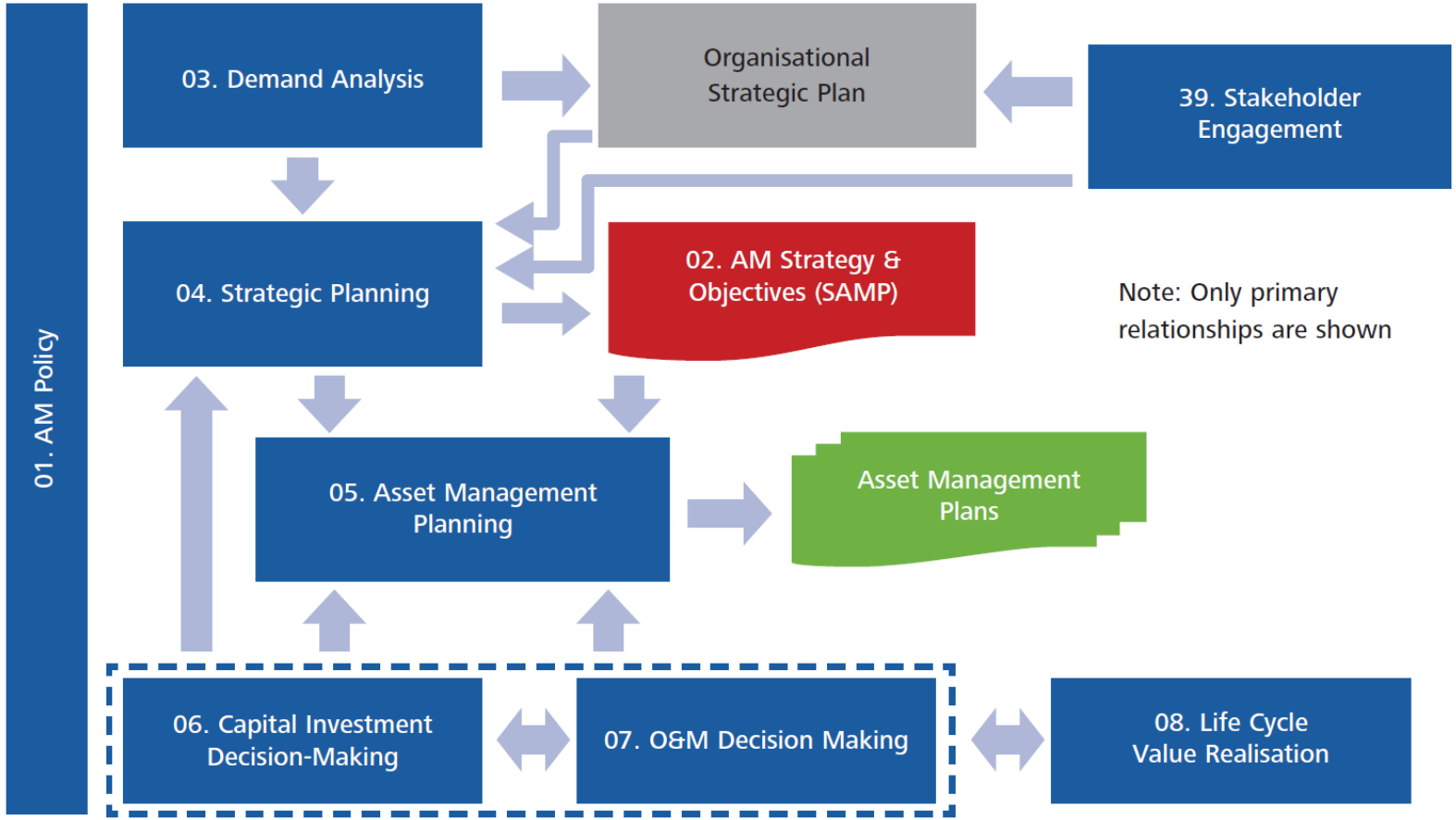
Group 3
11. Technical Standards & Legislation
12. Asset Creation & Acquisition
13. Systems Engineering
14. Configuration Management
15. Maintenance Delivery
16. Reliability Engineering
17. Asset Operations
18. Resource Management
19. Shutdown & Outage Management
20. Fault & Incident Response
21. Asset Decommissioning & Disposal

Group 4
22. **Asset Information Strategy**
23. **Asset Information Standards**
24. **Asset Information Systems**
25. **Data & Information Management**

Group 5
26. Procurement & Supply Chain Management
27. Asset Management Leadership
28. Organizational Structure
29. Organizational Culture
30. Competence Management

Group 6
31. Risk Assessment & Management
32. Contingency Planning & Resilience Analysis
33. Sustainable Development
34. Management of Change
35. Assets Performance & Health Management
36. Asset Management System Monitoring
37. Management Review, Audit & Assurance
38. Asset Costing & Valuation
39. Stakeholder Engagement

Focus on Group 1: Strategy & Planning (Source: IAM)



- Organisational Strategic Plan is about managing the organisation
- Asset Management Plans (AMPs)
  - To be developed from the Group 1 Documents
  - Describe in detail the activities which are to be carried out on the assets
  - Usually include one-two years of work, and are normally agreed and funded as part of the business planning and budgeting process

Conclusions and recommendations

- Water loss control helps to turning Non-Revenue Water into Revenue Water
  - Pressure management is the foundation of effective water loss control
    - Reduces both the likelihood of failure and the consequence of failure
    - Short payback time (i.e., energy savings)
  - A well-managed water loss control program should always include an allowance for selectively replacing mains and/or service pipes specifically to reduce leakage and an allowance to rehabilitate and replace critical valves
- The Asset Management Journey is really a journey for the whole organisation
  - Take 5 years to grow with time from reactive decision-making to collective decision-making
  - Take another 5 years to grow with time from collective decision-making to optimised decision-making to balancing cost, risk and performance and to realise value from the assets
    - Having an implemented Quality Management System reduces the amount of documentation for the Asset Management System significantly
    - Recognise that it’s predominantly about the organisation’s overall asset management capabilities and performance
  - Focus on development of the Strategy & Planning documentation and on ensuring Asset Information
- Let employees take ownership for the water loss control program and asset management system documents

Bright ideas. Sustainable change.

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