IAM approach in the water services sector

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Presentation layout

- Playing with figures
- IAM: managing a long-term time window
- Typical key bottlenecks and shortcomings
- In Portugal: from incipient to leading-edge IAM planning
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Some figures

- Average pipe age?
  (R: 20 years)

- Most used materials?
  (R: High density polyethylene; 10% older pipes: asbestos cement)

- Average capital maintenance budget?
  (R: 500 k€ / 2.3% present accounting value)

- Utility estimate for the average useful life for those materials?
  (R: 50 years)
For the previous replies

- The network true value is approx. 60% of the replacement value
  - (i.e., still young; mature infrastructures should be approx. 50%).

- For the current rehabilitation rate to lead to sustainable networks, pipes would need to last on average 173 years instead of 50!

- If the current rate is kept constant, in 47 years the utility would provide NO SERVICE.
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Infrastructures have indefinite lives

We receive infrastructures from others

We use them and manage their value

Urban infrastructure

Time window

We pass them on to the next generation

2013

2050
Where to be in 2050? How to manage transition?

(ref. TRUST, www.TRUST-i.net)
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Key for our success!
Key for societies’ survival!
Key requirements for a successful implementation

- **Strategic views** are adopted

- **Users’ needs** and expectations are duly managed

- **Clear processes** and good **data**

- **Alignment** and **feedback** between **decision levels** are ensured (strategic/tactical/operational)

- **Alignment** between **management processes** are ensured
Playing with figures
IAM: managing a long-term time window
Typical key bottlenecks and shortcomings
In Portugal: from incipient to leading-edge IAM planning
Frequent shortcomings

- Water services taken for granted in modern societies
  - low political impact of capital maintenance efforts
  - low willingness to pay and willingness to invest in rehabilitation
  - lack of capital maintenance
Frequent shortcomings

- Emerging challenges and long-term objectives
  e.g., adaptation to climate change, efficient use of energy, use of new paradigms for the water systems
  often do not have an impact on operational management of the assets

- Capital maintenance actions tend to use a like-for-like replacement approach
  – often ignore long-term objectives and strategies

- Lack of effective alignment between strategic – tactical – operational level
Alignment through decisional levels

- Strategic Management
- Tactical management
- Operational management

alignment

feedback

people involvement empowerment
Frequent shortcomings

- Often, strategic planning is not long-term
  - e.g. implementation of BSC on a yearly perspective.
  - e.g. KPI adopted
Example: economic efficiency

Less than 5 years:
Promotes **cuts** in capital maintenance

> 15:
Sustainable capital maintenance becomes **crucial**
Frequent shortcomings

- Data are the foundation of IAM, but in general:
  - too little data **(NOT ENOUGH)**
  or
  - too little GOOD data **(NOT RELIABLE)**
  or
  - not the right data for decision-making **(NOT USEFUL)**
  or
  - too many (fragmented) data and information sources **(NOT EASY TO USE)**
Frequent shortcomings

Prevalent IAM - emphasis placed on:

- Asset condition
- Risks of failure
- (LOS not applicable to individual linear elements)

→ Priority on **what asset(s), when, where**

→ Not enough thought given to **what alternative solution**
Frequent shortcomings

The existing context differs from design assumptions

e.g.,

- Energy
- Sustainable use of materials
- DMAs’ implementation changes the hydraulics
- Fire-fighting design paradigm versus water quality

Capital maintenance interventions are opportunities for systems’ improvement!
Presentation layout

- Playing with figures
- Managing urban water infrastructures: what for?
- IAM: managing a long-term time window
- Typical key bottlenecks and shortcomings
- In Portugal: from incipient to leading-edge IAM planning
Portuguese context

- 3 decades of capital investment on new assets
  - Good service coverage
  - Ever-widening gap in deferred rehabilitation

- Prevailing low levels of rehabilitation: unsustainable urban water services
  - A time bomb largely invisible to society and policy-makers, placing an unreasonable burden on coming generations.

- A paradigm shift in infrastructure asset management (IAM) is urgently needed
How

1. AWARE-P: A new IAM methodology
   focused on strategic long-term planning

- IAM as an objective-driven, continuous improvement management process
- Service-oriented IAM planning for long-term sustainability
- Embedding key ISO 55000 requirements
- For the decision-makers: a transparent, defendable planning methodology to support the best choice of solutions, balancing performance, risk and cost
How

1. AWARE-P: A new IAM methodology across decisional levels...

alignment

people involvement

empowerment

feedback
How

2. New leading-edge methods

- **PLAN: Compare & decide**
  Where planning alternatives or competing projects are measured up and compared through selected performance, risk and cost metrics.

- **Failure analysis**
  Use your component failure records to predict future pipe or sewer behaviours.

- **Performance Indicators**
  Assess the efficiency or effectiveness of your system through state-of-the-art, standardised PI libraries.

- **Performance Indices**
  Simulation-based, detailed technical performance assessment of capacity, water quality and energy behaviour.

- **Inspection analysis**
  Use your inspection records to predict sewer behaviour.

- **Component Importance**
  Simulate the failure of each individual pipe in a network to measure its impact on nodal consumption.

- **Unmet demand**
  Calculate a service interruption risk metric expressed as the expected reduced service, the volume of unmet demand over a given period.

- **Infrastructure Value Index**
  Ageing degree of the infrastructure as a ratio between current value and replacement value of its components.

- **Financial project**
  Assess the net present value (NPV) and the investment return rate (IRR) of any financial project from a long-term/asset lifecycle perspective.
How

3. Next generation integrated software
   Supporting every aspect of the planning methodology
How

3. Next generation integrated software
Made for networked systems

- Open-sourced
- Web-based
- Collaborative
- Multi-platform
- Multi-user
- GIS: ESRI, Google, Bing, MapBox,…
- Records, work-orders, models…
- Advanced 3D visualisations
From R&D to the industry

Selection of IAM as a strategic R&D priority at LNEC

IWA LESAM 2007 at LNEC

LNEC’s IAM R&D program was launched

Start of AWARE-P: Methodology, guides, software, business cases

Start of AWARE-P application in 2 utilities in Spain

Start of roll-out stage: iGPI, PGPI initiatives

Start of AWARE-P application in USA and Australia

30 utilities in Portugal finalise their strategic and tactical IAM plans according to AWARE-P

2nd editions of iGPI and PGPI will start

Urban Water Commons is launched

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A few statistics
(Jan 2009 - Nov. 2013)

- 34,000 NETWORK KMs COVERED BY IAM PLANS
- 100+ UTILITY TECH STAFF DIRECTLY INVOLVED
- 30 UTILITIES
- €1.8M TOTAL FUNDING
- 49,918 LINES OF SOURCE CODE DEVELOPED
- 22 MEMBERS OF THE PROJECT’S R&D TEAM
- 500+ WATER PROFESSIONALS TRAINED
- 43 SCIENTIFIC & TECHNICAL PAPERS
- 51 KEYNOTES & SEMINARS WORLDWIDE
# Uptake in Portugal

- **# Households served**
  - Águas de Coimbra: 75,327
  - Águas da Região de Aveiro: 131,694
  - Águas do Pinhal: 30,718
  - CN Sousel: 11,942
  - ENMR Vila Real: 24,612
  - IDP Tejo: 177,376
  - Infranquist: 1,387
  - Inframoura: 12,074
  - Infralobo: 1,872
  - INOVA-Cantanhede: 8,158
  - SM Abrantes: 94,968
  - SMAS Almada: 33,679
  - SM Castelo Branco: 153,764
  - SM Leiria: 179,378
  - SM MSB Vila do Castelo: 37,128
  - Águas do Oeste: 69,086
  - ESE: 16,488
  - AESE: 133,136
  - Águas da Amoreira: 22,500
  - Águas de Ateiro: 33,600
  - Águas de Barcelos: 113,800
  - Águas de Carnaxide: 28,000
  - Águas de Dafundo: 40,000
  - Águas da Figueira: 84,000
  - Águas do Mardo: 63,000
  - Águas da Serra: 28,000
  - Águas do Pego de Freire: 26,500
  - Olhão: 118,400

- **Water supply**

- **Wastewater**

- **Storm water**

- **Other public services**

- **Bulk**

- **Retail**

- **Municipal service**

- **Municipal company**

- **Multi-municipal company**

- **Private Concession**
30 Strategic IAM Plans
30 Tactical IAM Plans
Global Software Usage (Nov 2013)

1047 registered users in 143 countries
Main IAM achievements in the recent past:

1. Recognition of the importance of the theme
2. Agreement on key principles and best practice
   a) ISO 55000 / 55001 / 55002
   b) Projects, manuals, legislation (e.g. DL 194/2009, IAM manuals)
3. Relevant technological evolution, e.g. inspection, information systems
4. Countries highlighted: Australia and Portugal

Way forward – need for improvements in:

- Stakeholder-driven IAM
- Communication (internal and external)
- System perspective instead of asset-by-asset IAM
- Alignment between decision levels
- Further technological developments
World Water Congress

Lisbon

21 – 26 September 2014

Introduction to the Congress

www.iwa2014lisbon.org
• A great congress
• An amazing town
• A MUST NOT MISS EVENT!
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