Leakage management: key concepts and policy recommendations

EU Reference document Good Practices on Leakage Management WFD CIS WG PoM

Cor Merks, Allan Lambert and Stuart Trow
Key learnings

- Numerous water utilities throughout much of Europe already achieve sustained leakage reductions.
- Using the key concepts and recommendations provides a good understanding of the scope for change and the opportunities provided by investment.
- Allow for PESTLE considerations, taking account of all stakeholders.
- Pressure management and sectorization are the foundation of effective leakage management, and optimal sequence of activities is important.
Reasons for this presentation

- European Commission DG Environment “EU Reference document Good Practices on Leakage Management WFD CIS WG PoM”.
- Policy document with 25 evidence-based advisory recommendations from European and International experts based on 16 Case Studies and other referenced sources.
- Adopted by the Water Directors of the EU Member States, candidate and EFTA countries (November 2014).
EU, candidate and EFTA countries

- 28 EU Member States
  - Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK.

- 5 candidate countries
  - Albania, the former Yugoslav Republic of Macedonia, Montenegro, Serbia and Turkey.

- 4 EFTA countries
  - Iceland, Liechtenstein, Norway and Switzerland.
An approach for all of Europe

- Example of co-operation between EU Member States, the EU water industry and stakeholders.
- A fusion of good practices intended to guide policies that improve efficient use of water resources by utilities to achieve Water Framework Directive objectives.
- Recognition of the significant differences in maturity of countries, size and number of utilities, and systems of regulation for leakage management - no ‘one size fits all’ solution.
Key concepts: the four basic leakage control strategies

- Pressure influences burst frequencies of mains and services.
- Pressure influences leak flow rates of different types of leaks.
- Pressure influences the scale and optimal sequence of other cost-effective leakage management activities.

Original source: D. Pearson
Examples of available tools and methodologies

- Innovative pressure control technologies to modulate and stabilize pressures.
- Component analysis of background leakage, reported leaks and unreported leaks.
- District Metered Areas to identify and target leaks where and when they occur.
- Improved technology for leak detection.
- Improved on-site data collection and transfer (ease and speed improvements).
- Economic active leakage control intervention, with or without pressure management.
IWA Annual Water Balance (comparable AWWA Free Water Audit software)

Get started!
- Create water audit data collection and validation efforts.
- Use the leakage component analysis tool.
Key concepts: PESTLE considerations, taking account of all stakeholders

- **Political:** politicians, government agencies, the media.
- **Economic:** balancing the cost of Active Leakage Control and pressure management with the cost / value of water (Sustainable Economic Level of Leakage).
- **Social:** customer willingness to pay, willingness to be water efficient, PR, company reputation.
- **Technical:** the art of the possible with current technology.
- **Legislative (and regulatory):** usually pass / fail against a target.
- **Environmental:** the impact of leakage on water abstractions in the river basin or unconnected water resource level.
Recommendations for policy makers and regulators (1/2)

- Regulation should promote water conservation, including leakage management, in preference to water resource development.
- Consider leakage management in context of supply/demand balance, water policy objectives and other water efficiency measures.
- Intermittent supply is not an appropriate response to drought – Cyprus Case Study. Continuous supply with flexible pressure criteria is a better option in severe drought.
Examples of conservation in times of drought

Recommendations for policy makers and regulators (2/2)

- Process of regulation should be appropriate to the size of the utility, the number of utilities being regulated, and the objectives of the regulator.
- Performance measures and leakage targets should be fit for purpose and equitable.
- Regulate leakage at the river basin or unconnected water resource level and enforce implementation of leakage management at the level of the utility.
- Leakage should be managed taking account of all stakeholder views.
<table>
<thead>
<tr>
<th>England and Wales</th>
<th>Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 regional monopolies and 14 other companies; all privately owned</td>
<td>Single public utility</td>
</tr>
<tr>
<td>Comparative competition and performance</td>
<td>Market competition for retail services to non-households</td>
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<tr>
<td>Market competition in 2017</td>
<td></td>
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<tr>
<td>- Ofwat</td>
<td>- Water Industry Commission for Scotland</td>
</tr>
<tr>
<td>- Environmental Agency</td>
<td>- Scottish Environment Protection Agency</td>
</tr>
<tr>
<td>- Customer Council for Water (regional panels)</td>
<td>- Regulatory Leakage Reviewer – Stuart Trow</td>
</tr>
<tr>
<td>Leakage now at SELL but regulatory incentives to go below</td>
<td>Targets for each of 230 zones</td>
</tr>
<tr>
<td>- Formal annual targets based on Sustainable Economic Level of Leakage (SELL)</td>
<td>Leakage halved in 10 years</td>
</tr>
<tr>
<td>- Annual reports to regulators based on a water balance with additional DMA</td>
<td></td>
</tr>
<tr>
<td>leakage values</td>
<td></td>
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</table>
Dissemination actions by IWA WLSG experts

- Presentations at IWA Conferences Bologna, Italy (2014), Cincinnati, USA (2015), Bucharest, Romania (2015) and Bangalore, India (2016).
- Free European Water Balance and KPI software (EurWB&PICalcs) to quantify utility leakage and performance indicators.
- Workshops and training courses on fit for purpose leakage performance indicators and on pressure management, and information sharing.
www.leakssuite.com/eu-good-practice-on-leakage-management/

- Total page views from January 2015 to October 9th, 2016: 3,678
- Total unique page views (UPV) from January 2015 to October 9th, 2016: 1,954

<table>
<thead>
<tr>
<th>Region</th>
<th>UPV</th>
<th>Top-5 UPV from European countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>1,474</td>
<td>UK (730), Romania (160), Italy (108), Poland (49) and Croatia (39)</td>
</tr>
<tr>
<td>Asia</td>
<td>209</td>
<td></td>
</tr>
<tr>
<td>Americas</td>
<td>176</td>
<td></td>
</tr>
<tr>
<td>Oceania</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>45</td>
<td></td>
</tr>
</tbody>
</table>
Reach of the EU Reference document at EU level

- Leakage management is one aspect of the whole EU policy on quantitative management of water; an aspect on which, at this time, there’s no need for a specific intervention at EU level as there are clear drivers to push for reducing water loss even without a “policy” intervention.
- Part of the global policy on addressing water scarcity and droughts.
- Playing an important role in the correct implementation of Article 9 of the WFD.
Reach of the EU Reference document on water loss regulation

(1/2)

- The document did not directly lead to policy developments at EU level.
- Policy developments and effects on regulatory practices take a longer timescale (normally minimum 5 to 10 years) than the 21 months since it was published, and:
  - Some European countries have proper regulation and water loss evaluation methodologies in place already and will gradually, at a given moment, incorporate the recommendations.
  - Recognition of the dangers of intermittent supply.
  - Some European countries make better choices in leakage performance indicators already.
Reach of the EU Reference document on water loss regulation (2/2)

- England and Wales: taken into account by the regulators in setting out their requirements for the next five-year business plan (PR19) and the next WRMP.

- Flanders Environment Agency (VMM) WaterRegulator:
  - Relatively ‘young’ regulator (operational since 2010); first data collection in 2010.
  - Non-Revenue Water identified as one of the first processes for the obliged process benchmark (in 2015). Best practices (i.e. the ILI as one of the KPI’s and EurWB&PICalcs for the calculations) are accepted/selected in close cooperation with AquaFlanders.
  - Recently adopted legislation covering tariff regulation (June 10th, 2016) includes the ILI, CARL and UARL as indicators for ‘Quality of the network’ in the tariff plan template.
Reach of the EU Reference document on stakeholders (1/2)

- Provided a structured set of concepts and priorities which summarize the progress achieved in a variety of individual European countries already.
- Publication gave clear support to water loss management initiatives that were initiated earlier on basis of economical, social, technical and environmental drivers.
- Water Boards and water utilities did take their responsibilities “voluntarily”.
- WssTP included water loss in their Key Impact Parameter ‘Reducing the impact of Europe’s society on our natural water resources’ (Water Vision 2030).
The Bulgarian Water Association developed the Bulgarian Water Loss Guideline in 2014/2015 and refers in several sections to the EU Reference document.

Water operators and water service providers are more aware of the true condition of the water network and the measures to improve performance.

- Local context, contractual issues, etc. sometimes poses limitations. Specific policies/regulations could help in changing the paradigm to move towards an approach more focused on water conservation and resource preservation.
Recommended role of policy makers and regulators

- Importance of leakage management can be very different from one country to another or even within the same country.
- ‘Fit for purpose’ leakage performance indicators do not include % of SIV, which is a problematic Zero Sum indicator for targeting, tracking and comparing leakage.
- Promote the management of excess pressure, to decrease leakage and extend asset lifespan.
- Uptake of the recommendations for policy makers and regulators is in your hands.
Thanks

- Thank you for your interest and attention
- Thanks to all who contributed their time voluntarily to the development of the EU Reference document

www.leakssuite.com
All 25 evidence-based advisory recommendations

- Recommendations A. to J. for all stakeholders.
- Recommendations K. to Q. for policy makers and regulators.
- Recommendations R. to Y. for water utilities.
Recommendations: leakage targets

A. Include environmental externalities and willingness to pay.

B. Set targets using a volumetric parameter.

C. Use the ‘squeezing the box’ approach for smaller systems (< 30,000 service connections) until no further economic actions can be identified.

D. Larger systems are an aggregation of smaller systems. Aggregate strategic annual zonal targets to the utility as a whole.
Recommendations: performance indicators

E. Leakage expressed as a % of System Input Volume (SIV) to target and track water loss is misleading as it is a Zero Sum indicator.

F. Use ‘m$^3$/km of main/day’, or ‘liters/service connection/day’ or (for UK) ‘liters/ billed property/day’ for tracking progress in individual systems and sub-systems.

G. Use UARL and ILI (with some measure of pressure) for making technical comparisons between systems and sub-systems.
‘Fit for purpose’ leakage Performance Indicators

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>GOOD PRACTICE PERFORMANCE INDICATOR FOR LEAKAGE, FIT FOR PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume per year</td>
<td>litres/service connection</td>
</tr>
<tr>
<td>SET TARGETS AND TRACK PERFORMANCE, FOR AN INDIVIDUAL SYSTEM</td>
<td>YES, for large systems</td>
</tr>
<tr>
<td>TECHNICAL PERFORMANCE COMPARISONS OF DIFFERENT SYSTEMS</td>
<td>NO</td>
</tr>
<tr>
<td>DRAW GENERAL CONCLUSIONS FROM SINGLE OR MULTIPLE SYSTEMS</td>
<td>NO</td>
</tr>
</tbody>
</table>

* Choose services connection density > 20/km; if not, choose mains; or base choice on country custom and practice
Recommendations: calculating leakage & water conservation

H. Use the IWA Water Balance or equivalent; show Water Imported and Exported, calculate confidence limits for leakage volume.

I. Also use night flow measurements to target leakage operations and to check average level of leakage in systems with wider confidence limits due to partial or ineffective metering and/or high apparent losses (e.g. systems with roof tanks).

J. Always consider leakage reduction in parallel with reduction of excess or inappropriate consumption, based on demand side options.
Recommendations: supply/demand balance & drought management

K. Regulation should promote water conservation, including leakage management, in preference to water resource development.

L. Consider leakage management in context of supply/demand balance, water policy objectives and other water efficiency measures.

M. Intermittent supply is not an appropriate response to drought – Cyprus Case Study. Continuous supply with flexible pressure criteria is a better option in severe drought.
Recommendations: regulation & stakeholder involvement

N. Process of regulation should be appropriate to the size of the utility, the number of utilities being regulated, and the objective of the regulator.

O. Performance measures and leakage targets should be appropriate for purpose and equitable.

P. Regulate leakage at the river basin or unconnected water resource level and enforce implementation of leakage management at the level of the utility.

Q. Leakage should be managed taking account of all stakeholder views.
Recommendations: pressure management

R. Measure and monitor pressure; manage and reduce excess pressure and pressure transients – every meter counts.

S. The optimum sequence of pressure management, active leakage control, leak repairs and pipe replacements is very important.

T. The value (€/m³) of leakage and energy used are two additional fundamental parameters in developing a sustainable leakage management strategy.
Recommendations: service connections & asset renewal

U. Management of leakage from service connections should receive equal or, in some cases, greater attention than management of leaks from mains.

V. Allow for selectively replacing mains and/or service pipes to reduce leakage and the cost of ALC, when further pressure management and more frequent ALC are not sustainable solutions.

W. New distribution systems and extensions should be based on sectorized designs to operate at relatively low pressures with future leakage management and rapid leak location in mind.
Recommendations: long-term view

X. Leakage management is an essential long-term and ongoing activity with a continuous cycle of planning, action and review.

Y. Consider available/innovative tools and methodologies such as reducing excavation damage, uniform system of pipe failures, benchmarking of water utilities, Performance-Based Contracting for improved leakage management.