

IWA Global Water Loss KPI Initiative

Quantifying the Global NRW Problem

OBJECTIVES OF THE INITIATIVE

- 1) Assess **Current Practices** in the Use of Water Loss KPIs,
 - Which indicators are being used, and for which purposes
 - Questionnaire /survey carried out
- 2) Compile a Global Set of **NRW Data** to:
 - Prepare estimates of TOTAL NRW by country, by Region and for the World
 - Identify important challenges and areas of uncertainty
 - Assess the importance of NRW in the context of Water Stress, Energy Intensity and Carbon Emissions
 - Support solid evidence-based assessment and performance improvement
- 3) Prepare **Guidance Notes** on Best Practices and Challenges in the Use of Water Loss KPIs

KEY PERSONNEL

- Joerg Koelbl, Austria – Questionnaire, Guidance Notes, Data Compilation
 - Dave Pearson, UK – Chair, Data Compilation, Guidance Notes
 - Stuart Trow, UK – Guidance Notes Leader
 - Alan Wyatt, USA – Data Compilation Leader, Guidance Notes
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- Steering Committee – Members from 22 Countries
 - Volunteers – More than 100 from ~80 countries
 - Members of five IWA Specialist Groups

IWA Global Water Loss KPI Initiative

Report on Global NRW Data Compilation



OUTLINE – GLOBAL NRW

1. Technical Scope
2. Data Sources
3. Data Compilation
4. Challenges and Uncertainty
5. Results - with Uncertainty
6. Perspectives: NRW in Context



TECHNICAL SCOPE

- Focus on total NRW – NRW components next time
- 2024 data, to the extent possible
- Not including bulk suppliers
- Not including losses from raw water transmission mains and / or treatment plants
- Focus on piped distribution systems (respecting boundaries and water balance)
- No adjustments for supply continuity (wsp) to tabulate actual NRW

MANY DATA SOURCES

1. Regulators and Government Ministries
2. National Strategy / Planning Documents
3. National Statistics Offices
4. Professional Associations
5. Benchmarking Organizations / Programmes
6. International Development Agencies
7. Utility Annual Reports
8. Project Preparation Documents – World Bank, ADB, IDB, AfDB, EBRD
9. VOLUNTEERS to find, assemble, analyze and refine data



DATA COMPILATION METHODOLOGY

Where data is only available on a sample of utilities or data is very limited:

Country population served with piped water * NRW (Liters/Capita/Day):

- Country population served with piped water from WHO / JMP database
- Population served with piped water includes people served with direct connections and people served from standposts in distribution systems (urban and rural).
- NRW in Liters/Capita/Day, can be found from sample total NRW and sample population served, or even estimated water billed in Liters/Capita/Day and % NRW
- $\text{Total NRW} = \text{Country Population served with piped water} \times \text{sample NRW Liters/Capita/Day}$

Same method used in previous IWA publication from 2018

CHALLENGES AND UNCERTAINTY

1. Problematic Data Collection

- Data not collected or rarely collected
- Inaccurate or incomplete instrumentation
- Data scattered in many locations within a utility
- Data restricted for confidentiality

2. Confusion and Inconsistency of Terminology and Analysis

- NRW, Losses and Leakage not defined and used interchangeably
- Lack of understanding of water balance components
- Connections, customers, accounts, properties, clients not defined or used interchangeably
- Lack of data on connections in many many countries



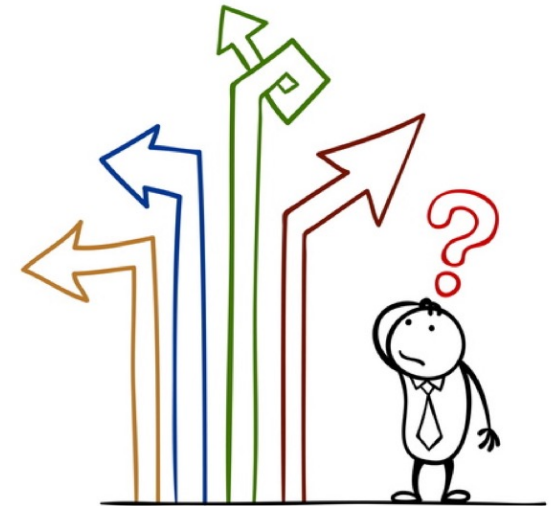
CHALLENGES AND UNCERTAINTY

3. Weak Data Compilation Systems:

- Only data for one or two large cities in a country
- Only indicators and not base variables (important for context)
- Different states or provinces have different systems
- Multiple data systems within a country for different concerns (economics or water resources)
- Data reliability or accuracy rarely considered, reported or verified

4. Uncertainty Assessment Required

- SO..... We prepared confidence intervals for data on population served with piped water, and for NRW to arrive at uncertainty of total NRW by country
- Country uncertainties “rolled-up” to Regional and Global uncertainty



UNCERTAINTY ANALYSIS

1. Percent uncertainty intervals prepared for population served with piped water: WHO/JMP data compared to country sources or other data.
2. Percent uncertainty intervals prepared for NRW (Liters/Capita/Day), based on sample size, general data quality, and comparison to other sources.
3. Percent uncertainty of Total NRW by country determined using RSS method (Square root of sum of squares of percent uncertainties).
4. Three levels of Total NRW by country: Low, Medium, High.
5. Global or Regional NRW uncertainty determined using RSS method (Square root of sum of squares of country volumetric uncertainties).
6. RSS method assumes the uncertainties across countries are independent of each other.



DATA CHALLENGES IN LARGE COUNTRIES

1. **AFRICA:** Angola, Cameroon, Chad, Mozambique, Madagascar, Nigeria, Sudan
2. **CENTRAL ASIA:** Azerbaijan, Kazakhstan, Tajikistan, Uzbekistan
3. **EAST ASIA:** Myanmar, North Korea, Viet Nam
4. **SOUTH ASIA:** Afghanistan, Bangladesh, Nepal, Pakistan, Sri Lanka
5. **EUROPE:** Belarus, Moldova
6. **LATIN AMERICA:** Cuba, Guatemala, México, Venezuela
7. **MENA:** Egypt, Iraq, Iran, Israel, Morocco, Saudi Arabia, Syria, UAE, Yemen



But all countries are important !!!

Still Need Help!!!

PRELIMINARY RESULTS WITH UNCERTAINTY

- Estimated Global NRW Volume – with uncertainty range
- Estimated Regional NRW Volume – with uncertainty range
- Estimated Country NRW Volume – with uncertainty range

- Comparison to 2015 - IWA Journal publication (2018)
 - Growth in Population Served
 - Change in Total NRW
 - Change in NRW (Liters/Capita/Day)



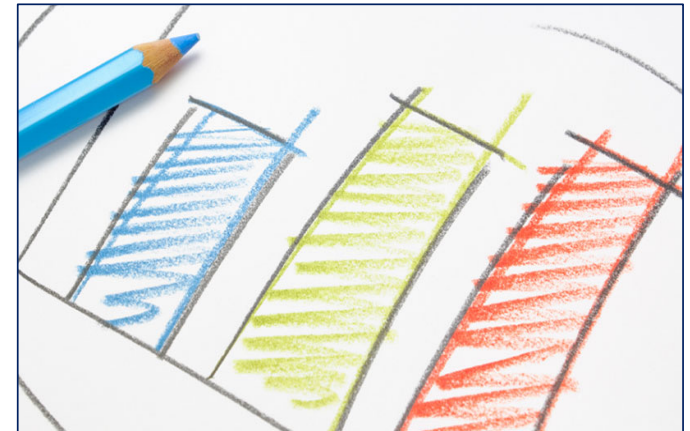
GLOBAL NRW WITH UNCERTAINTY – 2024

- Estimated Population Served with Piped Water: 5.76 Billion (71% of World Population)
- Uncertainty of Population Served (using RSS): 0.33 Billion (+/- 5.7%)

Estimated Global NRW 2024:

- LOW: 141 Billion m³/year
- MEDIUM: 149 Billion m³/year
- HIGH: 156 Billion m³/year

- UNCERTAINTY: 7.4 Billion m³/year
(+/- 5.0 %)



GLOBAL NRW: COMPARISON OF 2015 TO 2024

- Population served with piped water: 4.50 to 5.75 Billion people 
- Total NRW Volume: 126 to 149 Billion m³/year 
- NRW in Liters/Capita/Day: 77 to 71 Liters/Capita/Day 

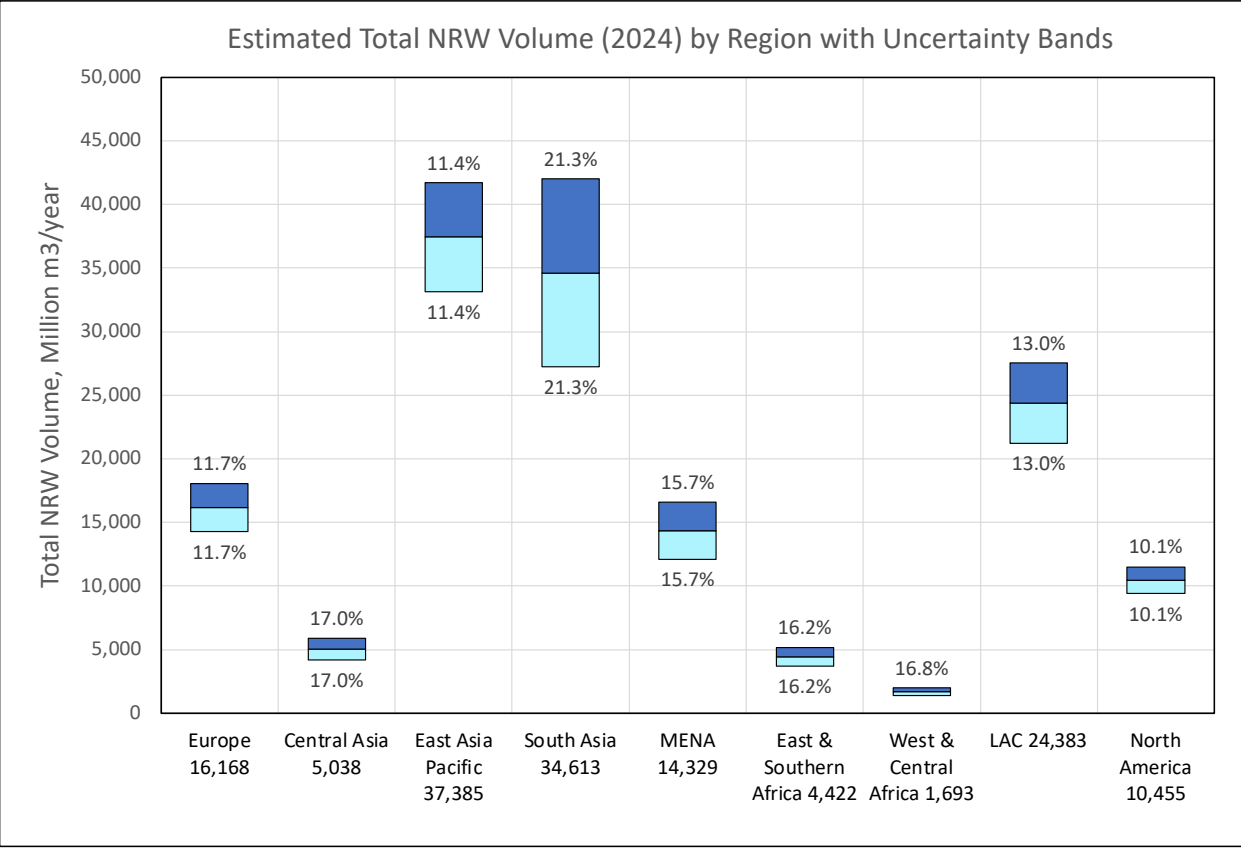
BUT WHAT IS 150 BILLION M³ PER YEAR?

- It's about 5,000 m³/second – that is 2 Olympic swimming pools every second
- 70 times the average flow of the River Thames
- Almost twice the average flow of the Rhine
- Equal to the average flow over Victoria Falls
- 75% of the average flow of the Danube
- 25% of the average flow of the Rio Paraná/Plate



If the total NRW were cut by one third, the water saved would be sufficient to supply 125 liters/day to about 770 Million people

REGIONS: NRW UNCERTAINTY



Range of Total NRW by World Region, Billion m3/Year					
World Region	Low Estimate	Best Estimate	High Estimate	Range	% Range
Europe	14.6	16.9	19.2	2.3	12%
Central Asia	4.2	5.0	5.9	0.9	17%
East Asia Pacific	33.1	37.4	41.7	4.3	11%
South Asia	27.2	34.6	42.0	7.4	21%
MENA	12.1	14.3	16.6	2.3	16%
East & Southern Africa	3.7	4.4	5.1	0.7	16%
West & Central Africa	1.4	1.7	2.0	0.3	17%
LAC	21.2	24.4	27.6	3.2	13%
North America	9.4	10.5	11.5	1.1	10%
Total	127.0	149.2	171.4	22.2	15%

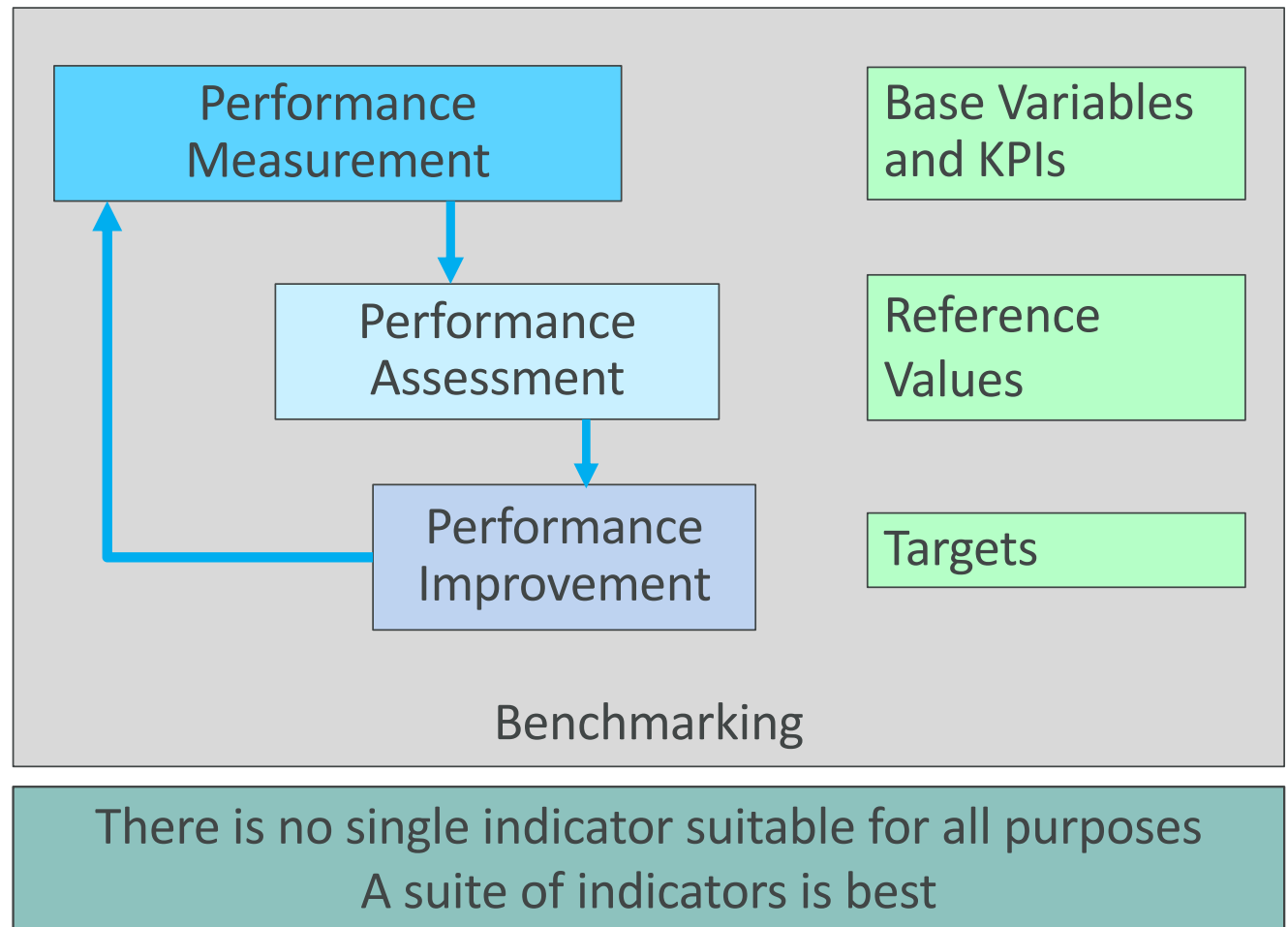
There's still a lot we don't know!!

IWA Global Water Loss KPI Initiative

Best Practices and Challenges
in the use of
Water Loss Key Performance Indicators (KPIs)



BACKGROUND: THE RIGHT TOOLS FOR THE JOB

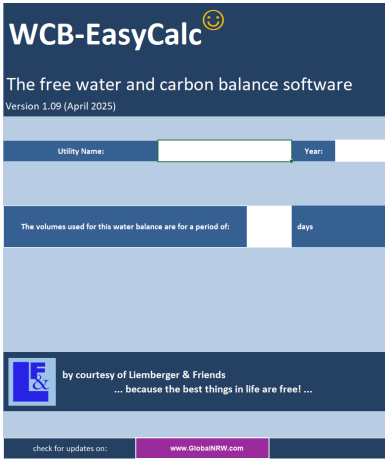
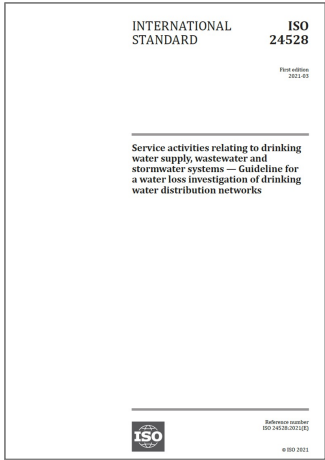
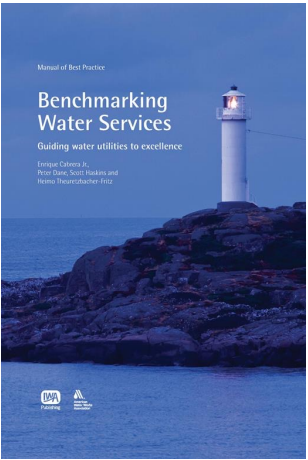
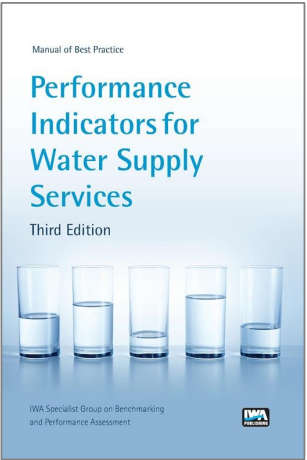
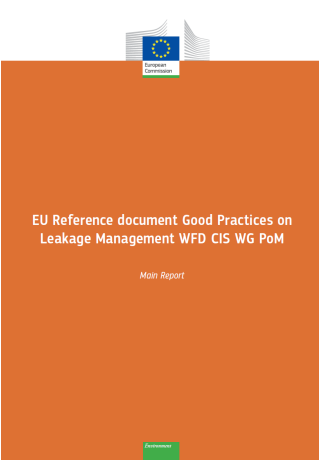
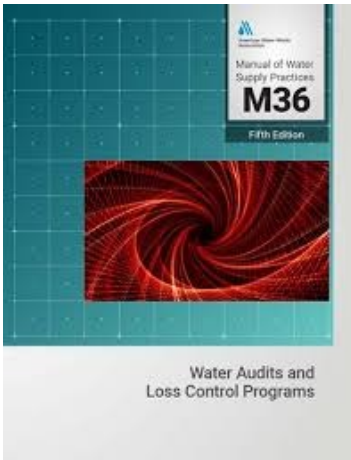
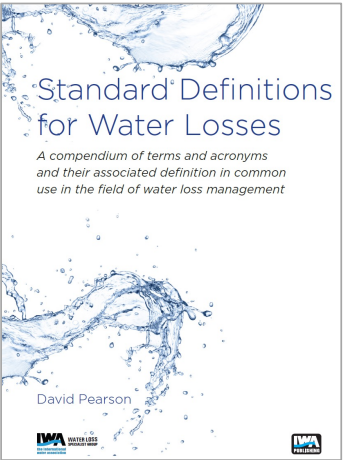
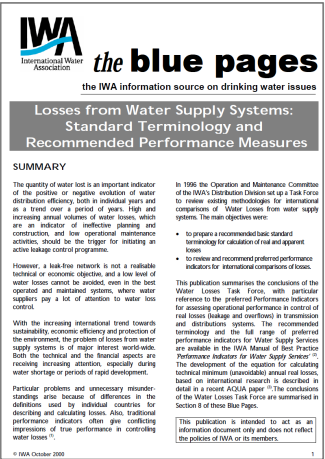


KPI GUIDANCE NOTES – PURPOSE

- These guidance notes explain some of the difficulties involved in calculating and applying performance measures to water loss.
- Their aim is:
 - To improve the understanding of water utility staff, consultants and regulators
 - To make recommendations on the use of the most appropriate KPIs for different purposes



X. KPI GUIDANCE NOTES – REFERENCES



and others

KPI GUIDANCE NOTES – WHAT WE HAVE SO FAR

- **A great and motivated team of authors**
 - Steering group for the IWA Global Water Loss KPI Initiative
 - Contributions from several members of the Water Loss Specialist Group
 - Colleagues from other specialist groups
- **Shared preparation of individual chapters** – Draft for review complete
- **Ongoing discussion** about certain issues, e.g. classification schemes, suitability of certain KPIs, etc.



KPI GUIDANCE NOTES – OUTLINE OF THE CONTENT

- Introduction – purpose, background
- The Level of Non-Revenue Water and Water Losses (Boundaries, Water Balance)
- KPIs for Non-Revenue Water
- KPIs for Real Losses (Scaling denominators, Explanatory factors)
- KPIs for Apparent Losses
- Performance Assessment and Improvement
- Supplementary Pls and Context Information
- Reliability, Uncertainty and Sensitivity Analysis of KPIs
- Challenges in the interpretation of KPIs under different context condition (Intermittent Water Supply, low- and high-pressure systems)
- Summary on the use of Water Loss KPIs
- Case Studies

KPI GUIDANCE NOTES – NEXT STEPS

- Review by Core Team and Wider Group → August 2026
- Review by a wider group → September 2026
- Presentation at World Water Congress → October 2026
- Final revisions → October to December 2026
- Publication (downloadable version) → December 2026