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WHITE PAPER: 'CARBON EFFICIENCY' A NEW RATING METHOD FOR NRW PROJECT DELIVERY

INTRODUCTION

Historically, volumetric water loss reduction or improved revenue recovery have been the two main drivers for NRW projects. It is widely recognised that the impacts of NRW programmes incur activity with a carbon intensity which need to be properly considered and appraised at the project creation stage. These maybe directly embedded carbon intensities, or the externalities caused by the operations of the utility, such as the source of water production or closing roads for mains renewal which in turn causes traffic congestion.

Physical loss reduction is critical for manging the supply demand balance and to do these various activities, such as leak repair, pressure management, pipe replacement, and meter replacement, significantly reduce water loss. However, there are many factors across thew global community meaning the carbon intensity of each approach can vary widely based on local contexts.

Understanding the carbon emissions associated with each activity is essential for driving towards carbon-efficient operations that maximize water loss reduction and for stimulating innovation in technology and operational practices or even alternative nature based, lower carbon intensity materials.

At present Carbon Assessment is mainly used at the scheme planning stage with very little decision support tools aimed at targeting carbon as the third driver for NRW reduction strategies.

The aim of this white paper is to provide a first emissions and typical water loss reduction activities, suggest methods for quantifying their associated carbon emissions, and propose a rating system for evaluating the carbon efficiency of water loss reduction projects that can be used in decision support by operators.

By adopting this approach, utilities can make informed decisions relevant to their locality that balance direct carbon intensity with long-term water and carbon savings, thus promoting sustainable practices.

The Carbon intensity method is not intended to discount proper asset management methods, rather compliment them and help inform the decision made around short-, medium and long-term asset management and should take into consideration other factors and synergies of utility operations.

The method also recognises the requirement to assess the scope 1,2 and 3 emissions of manufacturing as well as utility operations, this will be incorporated in the assessment in due course.

EXAMPLES OF A TYPICAL WATER LOSS STRATEGIES DIRECT-CARBON INTENSITY

LEAK REPAIR

Description: Leak repair involves detecting and fixing leaks in the water distribution system. This process is critical for reducing water loss and maintaining system integrity. Processes can be performed using various methods from excavation to internal repairs using smart technology.

Carbon Emissions: The Direct-carbon intensity of leak repairs is typically low due to minimal excavation and material use. Most emissions arise from the transportation of repair crews and equipment, as well as the materials used for the repairs. External disruption costs might be significant depending on the context.

Examples of typical Emissions Estimate:

- Internal repairs no excavation - 5-10 kg CO2 eq. per repair
- Manual excavation - 10-20 kg CO2 eq. per repair
- Machine excavation - 100-200 kg CO2 eq. per meter per repair

PRESSURE MANAGEMENT

Description: Pressure management entails regulating water pressure within the distribution system to minimize leak occurrences and reduce the frequency of pipe bursts. This can be achieved through the installation and adjustment of pressure reducing valves (PRVs) and advanced pressure management systems.

Carbon Emissions: Pressure management activities have very low carbon emissions since they generally involve minor adjustments to existing infrastructure rather than extensive physical work.

Example of typical Emissions Estimate: 5-10 kg CO2 eq. per km of pipe managed.

PIPE REPLACEMENT

Description: Pipe replacement involves replacing old or damaged pipes with new ones. This process can be performed using various methods, including open cut (trenching) and insertion lining (trenchless technology).

Carbon Emissions: The carbon intensity of pipe replacement is relatively high, especially for open cut replacement, due to extensive excavation, transportation of materials, and the energy-intensive nature of the work.

Examples of typical Emissions Estimate:

- Open Cut: 400-600 kg CO2 eq. per meter.
- Insertion Lining: 100-200 kg CO2 eq. per meter.

METER REPLACEMENT

Description: Meter replacement involves upgrading old water meters to more accurate, often smart, meters. Accurate metering is essential for detecting leaks and managing water usage more effectively.

Carbon Emissions: Meter replacement has a moderate carbon footprint, primarily due to the production and installation of new meters. The use of smart meters can provide long-term benefits by enabling better water management and leak detection.

Example of typical Emissions Estimate: ~50-100 kg CO2 eq. per meter replaced.

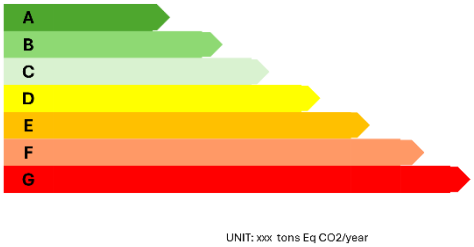
CARBON EFFICIENCY RATING SCALE

To assess the carbon efficiency of water loss reduction projects, we propose a rating system on a scale from A "very high carbon-efficient" to G "extremely poor carbon-efficient ". The carbon footprint of each activity will be used to calculate the overall project rating based on the proposed rating.

Example Grading Scale

- **A**: < 20 kg CO2 eq. per activity
- **B**: 20-50 kg CO2 eq. per activity
- **C**: 50-100 kg CO2 eq. per activity
- **D**: 100-200 kg CO2 eq. per activity
- **E**: 200-400 kg CO2 eq. per activity
- **F**: 400-600 kg CO2 eq. per activity
- **G**: > 600 kg CO2 eq. per activity

The IWA WLSG Carbon Efficiency Scale



PROJECT SCORING MECHANISM

To ensure utilities focus on carbon-efficient methods for non-revenue water (NRW) reduction, projects will be able to be scored based on their overall carbon intensity over variable planning horizons to inform correct decision making. For example, a project relying heavily on pipe replacement might score G over a short planning window, whereas one focusing on leak repair and pressure management might score B. A project scoring C or above might be considered carbon efficient in this assessment.

Balancing Carbon Intensity and Water Savings

While it is important to minimize carbon emissions, we must also consider the long-term water savings each activity provides. An activity with a higher initial carbon footprint might save significant amounts of water over time, leading to net carbon savings. Therefore, it is crucial to look at the net effect of each activity.

Externalities

There is a requirement to factor in the external carbon intensity caused by the utility. In a Major city this can be substantial where traffic disruption and physical complexity of operations result in a higher carbon

Intensity index, whereas repairs in less complex environments may have a lower externality impact. It is necessary to consider this in the project planning stage.

Example Considerations

- **Service Pipe Repair**: Despite being carbon-intensive, replacing a beyond asset life leaking service pipe might save more water and thus reduce overall carbon emissions in the long term.
- **Pressure Management**: This low-carbon activity can significantly reduce water loss without major infrastructure changes, making it an attractive option for immediate impact.

CONCLUSION

By implementing a carbon efficiency rating system for water loss reduction activities, utilities can make informed decisions that balance immediate carbon impacts with long-term water and carbon savings. This approach encourages the adoption of more sustainable practices and provides the necessary due diligence within the planning process to properly appraise the carbon impacts of large-scale pipe replacement schemes in favour of more efficient methods like pressure management and leak detection and repair.

FUTURE STEPS

FINANCIAL IMPLICATIONS

International Financial Institutions (IFIs) require due consideration of carbon intensity of a project to use as a guideline for determining if the project could be bankable, using climate change as an indicator. by developing a carbon intensity decision support tool that quantifies project level, regionally derived assessments as a ratio of tonnes of carbon saved from the project to the tonnes of carbon spent to achieve the savings. Projects that can express a robust Carbon assessment with a favourable ratio, indicating significant long-term carbon savings, will be considered more favourable than alternative solutions and are more likely to receive funding and support from IFIs.

DEVELOPMENT OF DETAILED PROCEDURES

This IWA Water Loss Specialist Group Initiative aims to define and certify the procedures for each activity to ensure consistency and reliability in carbon footprint calculations. This involves establishing standardized methods for measuring and reporting carbon emissions associated with each type of activity and establishing a universally applicable carbon-efficient rating system.

IMPLEMENTATION OF THE RATING SYSTEM

Roll out the rating system for use in project planning and evaluation. This includes training utility staff on how to apply the rating system and integrating it into existing project management frameworks.
Development of a decision support tool may be a further outcome of the project.

CONTINUOUS IMPROVEMENT

Regularly review and update the carbon efficiency ratings based on new data and technological advancements and identify where innovations targeted through this assessment might be developed.
This ensures that the rating system remains relevant and accurate as new methods and technologies emerge.
By focusing on carbon-efficient water loss reduction activities, we can achieve significant environmental benefits while maintaining effective water management practices. The proposed carbon efficiency rating system will guide utilities in selecting the most sustainable approaches, ultimately leading to a more resilient water distribution system.