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A dynamic decision-support approach for the performance assessment of water utilities in Portugal

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Introduction

- Organizational performance increasingly depends on the ability to adapt to changing environments and priorities. Since 2004, the Water and Waste Services Regulation Authority (ERSAR) implemented a sunshine regulatory model based on service quality assessment. However, the evaluation model applied does not disclose global performance, not allowing for a comparison of the overall performance across service providers.
- Indicators are widely used to monitor and compare service quality. However, traditional static evaluation models do not capture the evolution of performance over time.
- Multi-criteria decision aid (MCDA) methods, especially dynamic ones, support complex decision-making involving multiple indicators and time periods, and promote continuous improvement and strategic alignment.

Objectives

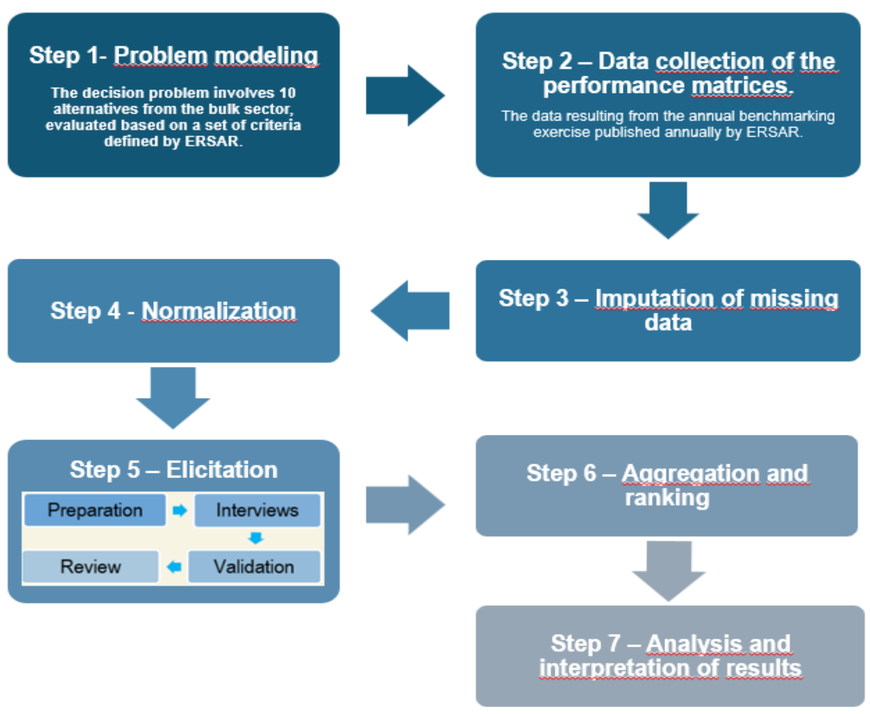
To develop a multi-period MCDA model (MP MAVT) to assess the performance of water supply in Portugal, in the bulk sector, from 2018 to 2021.

To incorporate the elicitation of preferences from experts to determine the relative importance of criteria over time.

To assess overall performance trends and identify persistent weaknesses in service providers.

To provide a tool to support regulation and policy formulation that promotes continuous improvement in the water sector.

Methodology and data



Preference elicitation was conducted through structured interviews, based on a script, in collaboration with ERSAR, which appointed three experts from different areas regulatory areas within the sector.

Main results

Overall performance - indicator by indicator

- The criteria “Safe water”, “Coverage of total costs”, “Mains failures”, and “Adequacy of human resources” stand out positively. On the other hand, the criteria “Connection to the service”, “Non-revenue water”, and “Mains rehabilitation” perform poorly.

Criterios	2018	2019	2020	2021	Overall performance (scale coefficients resulting from elecitation)
(v_1) Physical accessibility of the service	▲ 0.976	▲ 0.978	▲ 0.978	▲ 0.979	▲ 0.9780
(v_2) Affordability of the service	▲ 0.469	▲ 0.458	▲ 0.458	● 0.526	▲ 0.4832
(v_3) Service interruptions	▲ 0.589	▲ 0.800	▲ 0.700	▲ 0.844	▲ 0.7498
(v_4) Safe water	● 0.997	● 0.997	● 0.997	● 0.997	● 0.9972
(v_5) Reply to written suggestions and complaints	▲ 0.993	◆ 0.947	▲ 0.995	◆ 0.940	▲ 0.9656
(v_6) Coverage of total costs	● 0.967	● 0.969	● 0.908	● 0.937	● 0.9422
(v_7) Connection to the service	◆ 0.960	◆ 0.959	◆ 0.964	▲ 0.980	◆ 0.9678
(v_8) Non-revenue water	◆ 0.845	◆ 0.849	◆ 0.842	◆ 0.841	◆ 0.8437
(v_9) Mains rehabilitation	◆ 0.173	◆ 0.177	◆ 0.375	◆ 0.375	◆ 0.2950
(v_{10}) Mains failures	● 0.641	▲ 0.613	● 0.775	● 0.852	● 0.7421
(v_{11}) Adequacy of human resources	● 0.497	● 0.485	● 0.459	● 0.562	● 0.5070
(v_{12}) Real water losses	◆ 0.760	▲ 0.779	▲ 0.801	▲ 0.795	▲ 0.7865
(v_{13}) Standardised energy consumption	▲ 0.341	▲ 0.336	▲ 0.370	▲ 0.388	▲ 0.3635

● Good service quality ▲ Acceptable service quality ◆ Unsatisfactory service quality

Overall performance of the water sector

- The MP MAVT results show that most providers are rated “acceptable service quality”. Only one is rated “unsatisfactory service quality” and none were rated as having “good service quality”.
- Overall performance tends to be worse when using elicitation-based scaling coefficients rather than equal ones. Only two service providers perform better when equal scale coefficients are applied.
- By analysing the ranking position, we see that only a_7 maintains its position and stands out as the water utility with the best overall performance.

Alternative	Overall performance (scale coefficients resulting from elecitation)	Ranking position	Overall performance (equal scale coefficients)	Ranking position
a_1	▲ 0.737	6	▲ 0.776	2
a_2	▲ 0.761	2	▲ 0.774	3
a_3	▲ 0.706	8	▲ 0.721	10
a_4	▲ 0.707	7	▲ 0.772	4
a_5	▲ 0.739	5	▲ 0.728	9
a_6	▲ 0.760	3	▲ 0.758	5
a_7	▲ 0.772	1	▲ 0.786	1
a_8	▲ 0.747	4	▲ 0.753	6
a_9	◆ 0.609	10	▲ 0.733	8
a_{10}	▲ 0.703	9	▲ 0.733	7

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Conclusions

Dynamic performance evaluation reveals that the average performance of water utilities has remained stagnant over the years. Most service providers offer only “acceptable service quality”.

Indicators such as “Non-revenue water” and “Main rehabilitation” continue to show unsatisfactory results, highlighting persistent weaknesses in the sector.

The MP MAVT enables the assessment of overall utility performance and supports more robust public policies, complementing the current regulatory approach.

We recommend complementing the current regulatory approach by assessing overall performance (beyond isolated indicators), integrating historical performance data, adopting models with dynamic weighting based on sectoral priorities, and disclosing aggregate results to enhance transparency and drive effective action.