

Science for Environment Policy

Recycling wastewater would bring economic benefits to Tel Aviv Metropolitan Area

The economic viability of wastewater reuse projects could be better determined using methodology from a new study. The authors developed a five-step cost-benefit analysis framework to assess a planned wastewater reuse project within the catchment of the Yarqon River, in Tel Aviv Metropolitan Area, Israel. It was found that the scheme could have a net present value of \$4.83 (€4.34) million per year. The authors highlight the relevance of identifying external as well as internal economic, social and environmental costs of such projects.

Water scarcity is a major challenge for countries with arid or semi-arid environments. The problem is exacerbated by factors such as intensive urban and industrial development, irrigation due to agriculture, climate change and increasing population concentrations in cities. Together with reducing water consumption, water reuse is an effective solution to help alleviate the pressure on [water resources](#). However, the recycling of [wastewater](#) requires many different considerations and variables — the degree to which the water should be treated, the impact of heightened nutrient levels on crop growth, and potential public health implications — which make the development of rigorous and accurate cost-benefit analyses a daunting task.

This research, which was supported by funding from the European Marie Curie Actions programme¹, included a literature review of the socio-economic and environmental implications of three different approaches to wastewater reuse: Direct, where wastewater is treated and supplied mainly for urban uses and agricultural irrigation; Natural water body augmentation, which returns water of a suitable quality back into natural systems to sustain ecological needs; and Indirect, which reclaims wastewater after it has been filtered by natural groundwater or surface water systems and additionally aims at ecological restoration of the water body.

The authors then determined a five step cost-benefit analysis to be applied to wastewater management projects: Step 1 — Select and evaluate the water re-use plan; Step 2 — Estimate the internal costs; Step 3 — Estimate the externalised costs; Step 4 — Implement the cost-benefit analysis; Step 5 – Implement an economic sensitivity analysis.

These steps were used to assess the case of the Yarqon Recycling Project, which plans to implement an indirect water reuse plan on the Yarqon River starting in 2016. In the past, increased usage demand combined with an influx of poorly treated sewage greatly damaged the river's flow rate and quality. In recent decades, the Yarqon River Authority has implemented several actions to improve the ecological state of the river by reusing wastewater for flow augmentation of the Yarqon. In the near future, the Yarqon Recycling Project would provide a downstream treatment facility to reduce direct water extraction from the river for farmland irrigation, and provide a sustainable resource for irrigation of the Yarqon Park, which has approximately 3.7 million visitors per year.

It was found that the water reuse plan would have a range of positive economic impacts. For agricultural uses, the market value for reclaimed wastewater is set between \$0.24 (€0.22) and \$0.31 (€0.28)/m³, while the estimated operation and maintenance cost for producing high-quality recycled water from the Yarqon Recycling Project is \$0.16 (€0.14)/m³. The high-quality reclaimed wastewater will reduce nutrient concentration which may detriment agricultural crops fertilization, although the negative economic impact figures vary from different studies — between \$-0.07/m³ (€0.06/m³) (pessimistic) and \$0.01/m³ (€0.01/m³) (optimistic).

It would also remove the current necessity to use desalinated water in Yarqon Park, which generates costs between \$0.99/m³ and \$1.26/m³ (€0.89-€1.13/m³).

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1. <http://ec.europa.eu/research/mariecurieaction/>

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The authors noted a survey which showed that 95.7% of the public support water reuse in the park, but also draw attention to the possible negative economic impacts of the assumed 4.3% who disapprove.

Overall, the study estimates that on average expectations, the economic benefits of the Yarqon Recycling Project could amount to \$4.83 (€4.34) million per year. However, due to the requirement to include all relevant environmental externalities, and the large discrepancies between these possible scenarios, the economic sensitivity analysis showed a positive but modest likelihood of obtaining a positive economic result, of just 64%. This indicates the potential economic risks of such a project.

The authors say the importance of public perception should not be underestimated, as the 'unpleasantness factor' can be a significant hindrance to successful implementation. If these externalities are left out of the equation, the cost-benefit analysis is much more optimistic, but this would not account for the possible effects on all relevant stakeholders, especially those with non-material interests.

