Extended Abstract
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Paper/Poster Title	Paper/Poster Title

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Abstract	***200 words max***

Catchment-based management approaches to improving water quality have become a popular alternative in recent years to costly drinking water treatment which deals with the consequences of water quality issues rather than tackling them at source. These schemes have the potential to deliver multiple benefits including improved drinking water quality, reduced carbon emissions, enhanced biodiversity, greater amenity value and reduced flood risk. However, more evidence is needed to demonstrate their cost-effectiveness.
This paper reports on a cost-benefit analysis of a catchment management scheme called the Land Incentive Scheme (LIS) undertaken in the Derg catchment on the Ireland/Northern Ireland border. The 'Avoided Cost' approach is used which provides a lower bound on the economic value of the water quality improvements secured by the scheme. Projected over a 30 year period, estimates of the benefits and costs of the LIS show that for every £1 invested there will be £3.36 worth of benefits. The majority of cost savings are achieved because regulatory breaches trigger substantial capital and operational spend that could be avoided with effective catchment management. This study shows that 'Avoided Cost' is a credible valuation method which can provide compelling evidence for water companies and policymakers to support investment in catchment-based approaches.

Keywords	Agri-environment schemes; environmental valuation; avoided cost method
JEL Code	Q50 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	***100 – 250 words***

Catchment-based management approaches are attractive because they deal with water quality issues at source and have the potential to deliver multiple additional benefits including carbon benefits, enhanced biodiversity, greater amenity value, reduced flood risk and benefits to the local economy. However, there is a need for more evidence to demonstrate the cost-effectiveness of these approaches.

One way of valuing water quality improvements is to use cost-based methods. These include avoided cost and replacement cost and can provide useful lower bound estimates of value based on the assumption that the value of the ecosystem service is worth at least the additional cost that must be incurred to maintain it at the required standard.

The avoided cost method is used in this study to assess the water quality benefits from a catchment management scheme called the Land Incentive Scheme (LIS) undertaken as part of

the €4.9M Interreg Source to Tap project. The LIS awarded €1.2 million in grants to farmers to adopt sustainable practices for the protection of water quality in the Derg catchment. The scheme focused on pollutants with the highest risks to drinking water quality which were identified as the pesticide MCPA, colour and turbidity and the measures offered in the LIS reflected these priorities, i.e., watercourse fencing, weed-wiping with glyphosate as an alternative to MCPA, pesticide storage cabinets, etc.
Benefit estimates are then combined with LIS costs to derive a cost-benefit ratio of the LIS which provides a useful decision criterion by which to assess the scheme.

Methodology

100 – 250 words

- The costs of treating the raw water in Derg WTWs with and without the LIS are examined using two scenarios: the business as usual (BAU) scenario representing the costs of treating the raw water *without* the LIS while the intervention scenario representing the costs of treating the water *with* the LIS. The difference is a lower bound estimate of the economic value of the water quality benefits of the LIS.

- Treatments costs include capital and operational costs related to MCPA, colour and turbidity levels (granular activated carbon (GAC) filters, chemicals and sludge disposal) and costs related to relevant parameter exceedances, (e.g., reports and trials).
- Data on estimated future capital spend (Powdered Activated Carbon (PAC) facility and clarifier) and associated operational spend related to parameter exceedances under the BAU were also gathered from the water company.

- Operational costs were tracked against historical monitoring data to estimate the impact of lower colour and turbidity levels on water treatment costs while expert judgment informed assumptions about GAC filter regeneration and replacement rates.

- A timeframe of 30 years was chosen to accommodate all long-term benefits of the LIS measures, e.g., galvanised steel fencing and tree planting.

- Source to Tap water monitoring data was used to estimate future steams of benefits from lower parameter concentrations under the intervention scenario.

- Assumptions underlying the model were informed by a Process Evaluation of the LIS which examined the circumstances required to enable the LIS to compete with capital-intensive solutions through individual interviews with key actors and secondary research.

Results

100 – 250 words

The water treatment cost savings were aggregated over a 30 year time frame and discounted at 3.5% to convert future benefit streams to their present value.

- Capital cost savings are £3.7M and include the avoided capital costs associated with construction of a new capital facility to deal with MCPA and GAC filter savings through less frequent replacement and regeneration of filters.
- Operational cost savings are £7.4M and include cost savings in chemicals and sludge disposal, and the avoided operational costs associated with the PAC facility. When MCPA levels are kept below regulatory levels savings, other additional cost savings accrue, for example, treatability and feasibility studies and trials, amounting to an additional £1.1M in cost savings.
- The combined cost saving provides total discounted benefits from the LIS of £12.2M. The present value of the costs for the past LIS and future investment were estimated to be £3.5M.

Over a 30 year period from 2019 to 2048, comparing the benefits and costs of the LIS including future LIS investment costs gives a Net Present Value of £8.7M and a Benefit Cost Ratio of 3.36. That means that for every £1 invested there will be £3.36 worth of benefits from lower concentrations of MCPA, colour and turbidity, but this excludes other water quality benefits, e.g., lower concentrations of ammonia and coliforms and several other non-market benefits including recreational benefits to anglers, biodiversity benefits and erosion control.

Discussion and Conclusion

100 – 250 words

The Avoided Cost Method was used to provide a lower-bound estimate on the benefits of a catchment management scheme by calculating the water treatment savings costs including capital, operational and other costs. The results demonstrate that catchment approaches have significant potential to address water quality problems in a cost-effective manner where regulatory breaches would otherwise trigger significant capital and operational spend. The Avoided Cost Method is a credible market-based valuation method which can provide persuasive evidence for water companies and policymakers to support investment in catchment-based approaches. However, deriving accurate estimates depends on correct assumptions which can be improved by carrying out a Process Evaluation of the scheme to help validate the assumptions used in the valuation.

A successful scheme requires high uptake by the farming community. It can take years to build up trust with farmers to secure their engagement in catchment-led schemes but they typically suffer from restrictive short-term funding schedules. This hampers their effectiveness so that they are unable to compete with costly capital-based solutions. To avoid this, engagement and investment must be sustained and built upon to ensure long term success which will deliver substantial water treatment cost savings for water companies and multiple additional benefits for society as a whole.