THINKING BEYOND THE ASSET – A COST EFFECTIVE SOLUTION TO THE WINEP CHALLENGE?

The Water Industry National Environment Programme (WINEP) presents a unique challenge to water companies, with unprecedented levels of investment required in AMP7 to address a range of environmental drivers.

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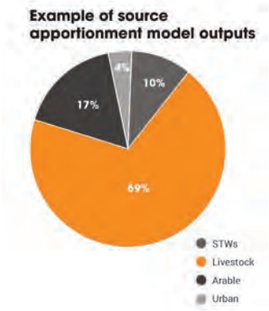


The largest area for investment, almost £3 Billion, is to upgrade wastewater treatment works (WwTW) to meet far more stringent consent levels for phosphorus, largely driven by the need to meet Water Framework Directive targets at the waterbody scale. This phosphorus removal programme in isolation presents several challenges for water companies, such as scale and technological requirements. By its nature the WFD is environmental outcome focussed and seeks to promote sustainable approaches where possible; however, current plans for delivery of the WINEP appear in many cases to not fully consider the sustainability of the solutions proposed, as the widespread requirement for secondary and tertiary treatment technology, including at smaller rural works, necessitates an increase in energy requirements in operation, production of treatment chemicals and disposal of waste products.

In considering the WINEP challenge we also need to recognise how Ofwat has shifted the emphasis for water companies. The regulator wants to see bills reduce whilst strengthening the customer's role in decision making; improving levels of service; securing resilience for our environment and; increasing innovation. This includes engaging with the community to support solutions that are efficient and affordable.

Water company assets form part of a wider environmental system, and outcomes, such as reduced nutrient loading at catchment scale, can often be cost-effectively achieved through an appropriate combination of environmental (referred to as catchment-based) and asset focussed measures, which realise wider benefits and lead to enhanced ecosystem services and natural and social capital (a key policy in the UK government's 25 year Environment Plan and meeting Ofwat's requirements mentioned above) compared to a purely asset centric engineered solution. Such solutions can also significantly reduce carbon cost and be deemed to deliver a longer-term sustainable outcome to catchment scale nutrient management. Wider co-benefits can include reduced sediment loading and natural flood management.

Robust system characterisation is necessary to identify an optimal integrated solution

The design of such integrated solutions, which can include measures to reduce diffuse inputs from agriculture and the urban environments through 'catchment nutrient balancing' (CNB), together with point source reductions from sewer overflows and WwTW discharges for example, which may also include 'green infrastructure' such as constructed wetlands, necessitates a need to characterise the system within which they occur. This includes the environmental system, such as hydrological processes occurring at both local and catchment scale, but also the anthropological system, such as stakeholder relationships, dependencies and their interaction with the natural environment.

In order to determine the potential for catchment-based solutions to help deliver the WINEP requirements, the system within which the asset is located needs to be characterised at the scale of the required environmental outcome (e.g. WFD waterbody). Catchment characterisation can be undertaken in a staged approach, with an initial screening exercise performed to assess the relative proportion of nutrient loading derived from the WwTW compared to other catchment sources, and whether this would preclude wider catchment interventions having a meaningful effect on loading reductions. Standard industry approaches can include interrogation and validation of source apportionment model outputs.

Subsequently, a more detailed assessment of the potential for catchment based nutrient loading reductions is usually performed based on a more detailed understanding of the environmental system, notably around hydrological processes, land use and landscape-river connectivity. Modelling, using tools such as FARMSCOPER and SCIMAP, can be used to aid characterisation, refine estimates of achievable loading reductions from non-asset sources and allow uncertainty around these to be quantified.

From this, a comparison can be made with the reductions possible from the asset via engineering-based options, and the identification of a potential 'optimal' sustainable combined solution that minimises risk and cost (measured in £/kg removed), while maximising wider environmental benefits and enhancing ecosystem services. A key point here is that the catchment solution screening and assessment should be considered as part of, and integrated with, the wider WINEP delivery programme to ensure collaboration between engineers and environmental scientists that provides greatest value to the client.

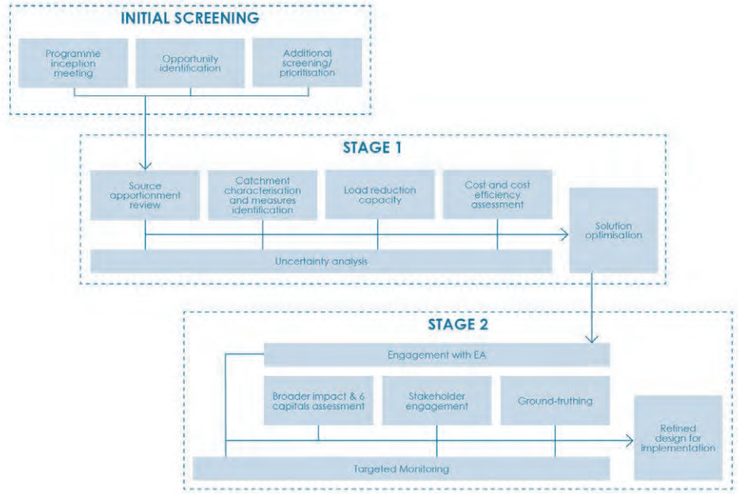
Stakeholder collaboration is critical to successful catchment-based solutions

Stakeholders form the second critical part of the system, and the development and implementation of catchment-based solutions require the co-operation and collaboration of a variety of organisations and groupings, including but not limited to, the water company, regulator, agricultural industry, other industry, the general public and established catchment partnerships. An understanding of the established interactions and inter-dependencies can be developed through application of stakeholder network maps at the waterbody or multiple waterbody scale, which can in turn help to facilitate effective engagement and communication during project design and implementation. An example would be the use of existing third-party mechanisms/relationships to engage with key farms through catchment partnerships or stewardship schemes, or identification and integration of existing environmental schemes in the assessment of catchment-based solutions, such as river restoration and natural flood management projects.

Principles of adaptive management should be adopted

Through this process key knowledge gaps and residual uncertainties should be identified and, if possible, addressed through further investigative work or mitigated in programme design. Indeed, effective programme design needs to adopt adaptive management principles to address such uncertainties and recognise the inherent complexity of the system, to allow a defined solution to be adapted to reflect data collected during its implementation. This reduces the risk of failure and provides opportunity of realising benefits not identified during planning and potentially the ability to outperform programme targets. This requires a structured evaluation plan and defined time-based metrics, against which to assess progress in achieving the targeted outcome.

Stantec's phased approach to the screening and scoping of catchment solutions to manage nutrient loading



Flexibility and pragmatism are key to delivering wider benefits

While incorporation of integrated catchment solutions into the WINEP offers a real opportunity to develop a progressive, collaborative and sustainable means of delivering long-term nutrient management, significant challenges remain in realising the benefits offered, primarily associated with regulatory constraints or uncertainty. For example, the restriction of the 'trialling' of CNB or catchment flexible permitting to water companies with a 'Good' Environmental Performance Assessment rating for three consecutive years prevents widespread consideration of such approaches, potentially in areas where they'd have significant positive outcomes. Success, or compliance, criteria of such integrated programmes also remains subjective, and the current Environment Agency requirement is that success is achieved three years following the implementation date (thus 2027 for sites with a 2024 implementation). At a high level, these criteria could be achieving a reduction of phosphorus concentrations in rivers to levels which achieve Good status under the WFD. However, the requirement to achieve this by 2027 will be dependent on factors outside the control of the programme, including the levels of phosphorus stored in the environment (for example in riverbed sediment and high levels of naturally occurring phosphorous). More specific local metrics need to be considered, including necessary implementation of agricultural measures, or reduced concentrations of nutrients in agricultural drains. Not achieving a given criteria should also not necessarily be considered a programmatic failure and require implementation of an engineered solution. The principles of adaptive management dictate that schemes be reviewed according to data collected and lessons learned during implementation and improved if 'success' is still deemed achievable. To facilitate this, the Environment Agency need to demonstrate local flexibility and pragmatism if the goal of achieving longer-term sustainable solutions, which will deliver wider benefits, are to be realised.