



## **A Catchment Systems Engineering approach to managing floods, droughts and pollution using local knowledge and community partnerships**

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Farming communities play a key role in increasing local scale runoff and erosion rates, resulting in water quality issues, flooding problems. Increased runoff rates also indirectly give rise to increased drought risk due to a lack of recharge in larger storms. Agricultural intensity and soil degradation are likely to increase in the future. However, there is a potential for agricultural management to become a major part for controlling runoff processes. Here, a Catchment Systems Engineering (CSE) approach has been explored to solve the above problems. CSE is an interventionist approach to altering the catchment scale runoff regime through the manipulation of hydrological flow pathways throughout the catchment system at key location at key times (i.e. during events). By identifying and targeting active hydrological flow pathways at source, such as overland flow, drains and ditch flow, a significant component of the runoff generation can be slowed and stored which in turn reduces soil nutrient losses. Here, a framework for applying a CSE approach to the catchment is shown in a guide to implementing mitigation measures in flood and drought impacted catchments. The framework is based around engagement with many catchment stakeholders operating as a catchment partnership, including local population, NGO's and local environmental policy bodies. The partnership uses evidence arising from local knowledge, field observations, field visits and the co-design and delivery of full scale demonstration measures. The framework allows the communities to understand the floods, drought and pollution issues and that the problems can be addressed through multiple local interventions. Once the impact of altering the local processes is recognised by the catchment partnership then wider uptake follows at the catchment scale. Initial findings suggest that attenuating and storing large amounts of flow at many locations across landscapes can alter the water balance at the catchment scale. Initial findings from constructing many runoff attenuation features also show improvements in soil nutrient losses during storm events. We will show case studies from the UK and also highlight several global examples of similar practice where local flooding and drought risk has been reduced. We will argue that as little as 5% of a catchment needs to be managed in order to gain many catchment system level benefits.