

UKCEH Case Studies for UK Water Partnership Resilience White Paper

Case Study (99 words)

Forecasting surface water flooding for the Commonwealth Games

UKCEH, in collaboration with the Met Office, the James Hutton Institute and SEPA, developed an award-winning novel real-time system for forecasting surface water flooding and its potential impact. The system was piloted by the Scottish Flood Forecasting Service during the 2014 Commonwealth Games in Glasgow, and found to be very useful in alerting the Games organisers and emergency responders to the localised flooding events that occurred during the Games. A similar approach, developed collaboratively under the Natural Hazards Partnership initiative, is now in national operational use by the Flood Forecasting Centre.

Case Study (102 words)

Flood Estimation Handbook

Our flood estimation expertise, the result of many years of hydrological monitoring, modelling and analysis, has been a primary focus of UKCEH and its predecessor organisations for more than 40 years. Building on the ground-breaking Flood Studies Report (1975) and Flood Estimation Handbook (1999), ongoing research improves the accuracy and reliability of flood frequency estimates in the UK primarily for the design and appraisal of flood management schemes and flood risk maps, but also for other catchment management activities.

UKCEH's latest statistical rainfall model (FEH13) has been formally adopted by OFWAT as the standard method for assessing the severity of rainfall events.

CASE STUDY (95 words)

Modelling nutrients and algae in Thames Water's reservoirs

UKCEH carried out work on future water quality for Thames Water, modelling nutrients and algae in their reservoirs and rivers under different drought scenarios. We used our long-term river flow and water quality records for the reservoirs' supply rivers to estimate nutrient concentrations during major droughts of the past century, based on current-day wastewater treatment levels, using our Load Apportionment Model. We then applied our PROTECH model to predict impacts on the algal community in the reservoirs, to help determine how Thames Water would cope if different kinds of droughts were to occur in future.

CASE STUDY (143 words)

Sampling microplastics in water supplies for UKWIR

UKCEH carried out a novel study of microplastics for UKWIR, the UK and Irish water industry's research body, so that it could better understand where and in what quantities microplastic particles exist within wastewater treatment and water supply systems. Scientists carried out sampling at a total of 16 different water company premises – water treatment works and wastewater treatment works – across the country in order to assess how much microplastic material was removed by treatment plants.

They found that water treatment works removed 99.99 per cent of microplastic particles detected prior to treatment, with microplastic particles only being quantifiable in drinking water on three out of 39 occasions after the treatment process. They found that wastewater treatment plants similarly removed 99.9 per cent of microplastic particles from wastewater before the treated wastewater was discharged into the rivers.

CASE STUDY (104 words)

Working with Scottish Water to deal with Dissolved Organic Matter.

A team of water and catchment scientists, led by UKCEH, have delivered the FREEDOM project, funded by NERC and Scottish Water. Over 2018, the team worked to establish the main drivers of changes in Dissolved Organic Matter (DOM) in Scottish Water's drinking water sources, and the physical and biological processes that affect DOM levels within reservoirs.

The resulting knowledge fed into a tool to equip catchment managers, plant operators and strategic planners with a better understanding of where, and by how much, DOM concentrations are likely to change in future in order to inform future management decisions.

CASE STUDY (141 words)

Increased biodiversity linked to improved sewage treatment

A recent study by our scientists demonstrated that a higher standard of wastewater treatment in the UK led to substantial improvements in a river's biodiversity over a 30-year period. UKCEH analysed data from historic regular monitoring records of chemicals and invertebrates in the River Ray in Wiltshire between 1977 and 2016. This tributary runs through Swindon from where the flow becomes 60-80 percent wastewater dominated before joining the River Thames.

The study, funded by Defra, found that after 1991, following the commissioning of activated sludge treatment, a steady increase in both the diversity and abundance of freshwater invertebrates downstream occurred. The improvement in biodiversity was principally associated with reductions in ammonia and organic matter together with an increase in oxygen levels as a result of less organic matter being discharged into the river.

CASE STUDY (73 words)

Zebra Mussels

The zebra mussel arrived in the UK around 200 years ago and is now thriving in our waterways. If zebra mussels get into water treatment works, they can clog up pipes causing considerable damage. They can also profoundly alter communities of plants and animals, water clarity, and the chemical makeup of water systems. UKCEH are mapping the distribution of this species and tracking its spread over time to inform biosecurity approaches.

How our science helps to predict, mitigate and manage the impacts of floods and droughts (includes 1 minute video intro):

<https://www.ceh.ac.uk/our-science/science-challenges/flood-and-drought-impacts>

How are science supports improvements to the availability and quality of water now and into the future (includes 1 minute video intro):

<https://www.ceh.ac.uk/our-science/science-challenges/water-quality-and-resources>

Case studies (from the recent research centre evaluation)

<https://www.ceh.ac.uk/case-studies/case-study-helping-uk-communities-and-businesses-become-more-flood-resilient>

<https://www.ceh.ac.uk/case-studies/case-study-mitigating-impacts-climate-change-west-africa>