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Background

Sewage wastewater in the UK exceeds 5.6 trillion L per year. For the most part this water is treated in sewage treatment plants prior to its release into UK rivers. Given that the UK has a limited amount of freshwater to dilute the vast amount of sewage effluent it produces, UK rivers have been suffering from the effects of nutrient pollution and dissolved persistent pharmaceuticals.

Driving a Paradigm Shift in Wastewater Management

Britain will see its population swell from today's 62.2 million to 77 million by 2050, an increase of 24%.

The Telegraph

Urban sprawl may eat up countryside by 2100

THE INDEPENDENT

Britain will be the biggest country in Europe by 2050 (Germany, according to official projections)

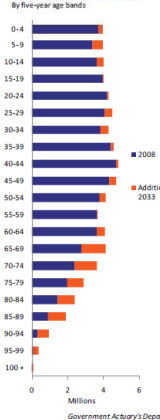
Rural land lost to urban sprawl

Millions in UK at risk of urban flooding (New research warns of the flood risks in UK cities as drainage systems struggle to cope with intense episodes of rain-fall)

Expanding cities funnel rainwater into increasingly larger sewage works creating more waste that needs to be treated and increasing the risk of sewage overflow during high rainfall events

The number of urban residents at risk of flooding is expected to increase by more than half, to 3.2million people, by 2050, largely the result of regional population growth, and climate change.

The projected increase in the UK population 2008-2033 is concentrated in older groups



Egobna bill to purify water system after toxic impact of contraceptive pill (Drug firms oppose an EU call for controls on potent chemicals that have been blamed for the gender mutation of freshwater fish)

Britain's growing reliance on drugs from GPs (Environmental concentrations of antibiotics are potentially damaging to aquatic life)

To upgrade the 1,400 sewage-works in England and Wales with granular activated carbon to cut ethinyl estradiol (EE2) levels would cost a total of more than £30bn.

The UK's over 65 year old population is expected to double to around 19 million by 2050. The over-60s received on average 42.4 prescription items each in 2007, nearly 50% more than in 1997 and 270% higher than the national average.

Rising population density has meant increasing the size of our cities and by extension decreasing the greenbelts and rural land uses.

Drive to decarbonize the energy sector. Greater energy security.

The Water Framework Directive and the EU Biodiversity Strategy require improvements in water quality, biodiversity and ecosystem function with ambitious targets for the years running up to 2050

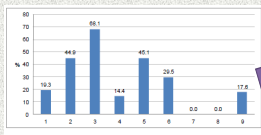


Figure A 4.3. Graph of percentage of surface water bodies affected by different pressures

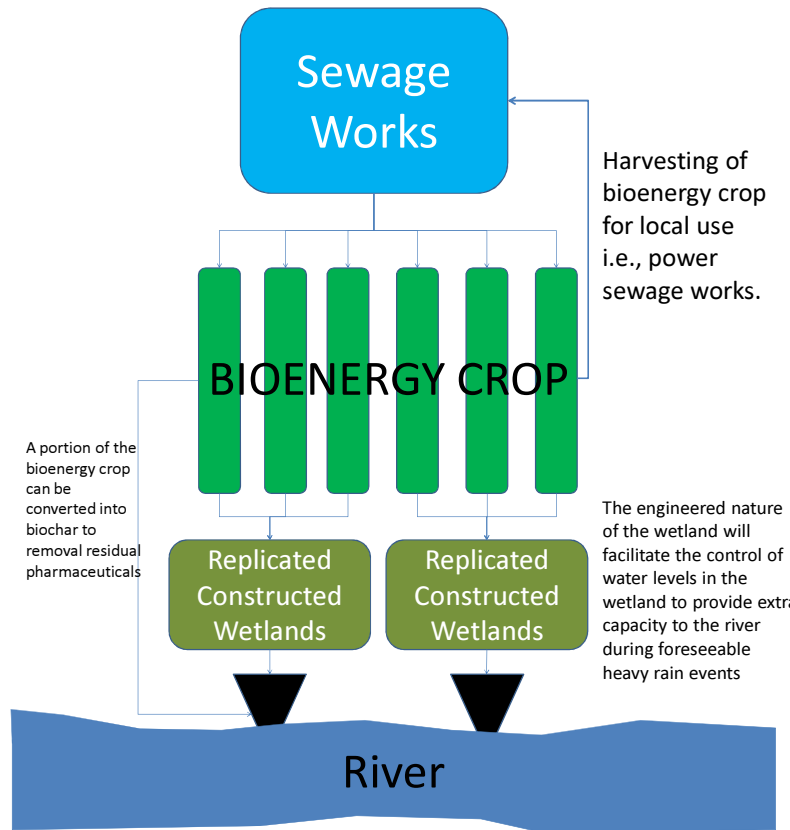
Source: WFD

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Project Aims and Aspirations

The constructed wetland will be designed to receive treated waste water, fertilize and water a bioenergy crop (e.g., willow) that will be used for local energy production as well as the production of biochar, which itself will facilitate the removal of additional bioactive pharmaceutical pollutants not already removed within the constructed wetland.

The constructed wetland will be designed to maximize: 1) nutrient removal; 2) pollutant removal; 3) buffer extreme changes in river flow regime (e.g., drought and flood); 4) habitat development; 5) increasing biodiversity; 6) aesthetic improvement. This holistic approach will be a paradigm shift in waste water management as it will spawn local energy security, additional tools for catchment hydrological management, solutions to habitat loss and low cost solutions to Water Framework Directive pollution challenges.



Project Development & Opportunities for Collaboration

The proposal will build-off existing models of nutrient removal in constructed wetlands. It will also aim to further parameterize these models with empirically derived measures of nutrient and pharmaceutical removal rates in novel and existing constructed wetlands within the UK and Europe.

Existing bioenergy crop plantations receiving wastewater will be examined for their productivity in sequestering carbon, nutrient uptake, pharmaceutical removal, greenhouse gas emissions and habitat creation. In addition, the range of species and design of wetland habitat will be examined from synthesizing evidence from the UK and Europe. The potential impact of the wetlands on improving biodiversity, creation of corridors, and natural capital will be determined using currently evolving methodology in assessing Natural Capital. Reversing biodiversity loss through the proposed system will support the 2050 EU Biodiversity Strategy goals.

Existing flood management models will be adapted to examine the role that different sized wetlands can have on river flow regime management, particularly in times of drought and flood.