

WORK PACKAGE 1.2: WATER RESOURCES AND FLOOD RISK

The aim of Work Package (WP) 1.2 is to develop effective ways to manage land and water to improve quality of the water environment and manage water flows, both now and under future changes in environment and society.

Understanding how the biological, chemical and physical processes within our water catchments are affected by land use and climate change, will help us design more effective actions to protect the ecosystem services which we value, such as clean water supplies, wastewater removal, aquatic habitats and species, and flood protection. The work will provide evidence, data and tools to tackle issues such as: flood risk management using natural land features, Natural Flood Management (NFM), restoration of river channels, hydropower generation, diffuse pollution, quality of raw drinking water, waste water treatment, and impact of urban development. It will also be applied to predict future risks associated with new pollutants (including pharmaceuticals), and climate change.

Socio-economic research will also explore ways to bring different areas of water policy and management together in order to maximise benefits (e.g. flood management and the water environment), and develop strategies to encourage landowners and other stakeholders to carry out measures and best practice.

The research will engage with national and local government (Scottish Government, Local Authorities), agencies and regulators (Scottish Natural Heritage, Scottish Environment Protection Agency, Drinking Water Quality Regulator), landowners and the water industry (Scottish Water) to help deliver the Water Framework Directive, Flood Risk Management Act (Scotland), drinking water quality objectives and sustainable waste water treatment. The work is complemented by research on water in agricultural systems (see WP 2.3), and will also feed into integrated approaches to land management (see WP 1.4).

WP 1.2 will deliver knowledge and tools to:

- Design effective, nature-based measures such as NFM, rural sustainable urban drainage systems, buffer strips, and restoration of river channels, including issues of effectiveness, spatial location, scale and uncertainty.
- Model impacts, refine monitoring and improve measures to reduce diffuse pollution from nitrates, phosphorus, sediment and pathogens. Assess the risk from emerging organic contaminants (pesticides, pharmaceuticals and personal care products) to rivers and coastal waters, and develop novel materials to remove them from waste water.
- Inform the regulation of river flows from hydropower schemes to optimise economic and environmental benefits.
- Explore impacts of urbanisation upon catchments at the peri-urban interface, and opportunities to use green infrastructure to improve water quality and flows.
- Identify catchments and conservation areas most vulnerable to environmental change, and evaluate measures to mitigate the impacts of increasing water temperatures upon aquatic organisms.
- Develop novel statistical techniques for detecting and predicting sudden ecological changes (tipping points), and for interpreting high volumes of data from environmental sensor networks.
- Incorporate information on catchment management and resilience into decisions on operation of and capital investment in drinking water and waste water treatment. Evaluate risks and benefits of novel, energy-efficient systems to treat waste water using short rotation coppice and anaerobic digestion.
- Improving design and co-ordination of incentives and other policy measures to encourage and enable stakeholders to take action, including catchment partnerships and payment for ecosystem services.

Work Package co-ordinator:

Marc Stutter (James Hutton Institute), marc.stutter@hutton.ac.uk