

Strategic Programme

Strong and Resilient Sources and Supply Chains For Water and Renewable Energy



A view of the River Tay from Kinnoull Hill, Perthshire
Photograph: © The James Hutton Institute



Muck spreading on stubble field
Photograph: © The James Hutton Institute

Introduction

The Water and Renewable Energy Theme carries out research into issues of quality and quantity of water, and of land-based renewable energy. It will provide tools to understand current and future interactions between water and renewable energy sources, their availability, their impacts upon the environment and ecosystem services, and future shifts due to environmental and societal change. This work is constructed and disseminated in partnership with catchment management networks, farmer focus groups, regulatory and policy consultative groups and industry partners.

Intended benefits from the Theme's research

- Identification of the benefits, implications and limitations of renewable energy and water supply chains, including renewable energy generation, driving down energy use in water supply and alternative water treatment options.
- Evaluation of current best management practices and policy for water quality, helping to deliver more effective river basin management plans, informing funding schemes, bringing improvements to chemical and ecological status and providing the tools for evaluation.
- Development of approaches to evaluate natural flood management practices, including awareness of risk, access to data, methods to target and evaluate natural flood mitigation approaches in flood prone areas.
- Identification of opportunities to achieve multiple benefits from combining water quantity and quality management with wider aspects of land, energy and climate policy, and to enable more efficient solutions to complex catchment decision making.

Key policy areas supported

The research will contribute across a wide range of national, European and International policies/agreements. The leading policies are: The Water Framework Directive (2000/60/EC), The Flood Risk Management (Scotland) Act 2009, The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (including the General Binding Rules for Agriculture), EC Nitrates Directive (91/767/EEC) (incorporating Nitrate Vulnerable Zones), The 2020 Routemap for Renewable Energy in Scotland, The Climate Change (Scotland) Act 2009, Natura 2000 and river habitat designations (e.g. SAC), the Land Use Strategy for Scotland and The Water Resources (Scotland) Bill and Scottish Government's agri-renewables policy.

Outcomes and Outputs of the Research

- Renewable energy & water provision, including current and projected supply and demand and the potential impacts of land use and climate change.
- Greater understanding of the opportunities for land based renewable energy, potential environmental conflicts and better practices for realising multiple benefits through appropriate design and management.
- Enhanced understanding of current and future water resource availability, including the supply-demand balance for water and renewable energy and how these are inter-related.
- Evaluation of the impacts of future scenarios for land use and climate change on capacity for water and renewable energy production.
- Enhanced understanding of community, local and regional scale development of renewable energy and inter-relationships with water.
- Establishment of a water quality baseline for Scotland based on new measurement techniques for organic matter, isotopes and microbial contamination.

Improving the sustainability of supply chains for water and renewable energy:

- Integration of water, energy and nutrient cycles and the facilitation of communication between various associated stakeholders. The result will be improved, integrated decision making.
- Delivery of objectives at a national level that will inform strategic decisions, and at a site-specific level to inform planning decisions.
- Use of common metrics across four different renewable energies (wind, water, biomass, anaerobic digestion) and an improved understanding of what they tell us.
- Assessment of combinations of management approaches and technologies for delivering more sustainable water and energy supply in different regions of Scotland.
- To improve decisions on which developments may be considered 'environmentally acceptable', and ultimately save time and money. To inform current sectoral route maps.
- Deliver knowledge of the most appropriate locations for renewable energy options in terms of GHG emission reductions and carbon accounting.

Effectiveness of measures to manage water quality and control diffuse water pollution:

- Development of assessment tools/indicators which can be used to evaluate the effectiveness of diffuse pollution mitigation policy at a range of scales, in the context of land use and environmental change.
- Modelling the extent and trends of nitrate pollution of groundwater, particularly in Nitrate Vulnerable Zones, and of phosphorus and sediment at national to farm scales and linking this with new methodologies for assessing cost-effectiveness in diffuse pollution mitigation.
- Socio-economic tools to communicate requirements for, and implementation and effectiveness of, diffuse pollution mitigation measures.
- Enhanced understanding of the linkage between quality of water and the aquatic ecology it supports.
- Provision of commonly understood climate and land use change scenarios used to determine ecological and water quality benefits of buffer strips and other diffuse pollution management tools.
- Evidence and guidance on the effect of policy on delivery of multiple benefits and wider ecosystem services and the data required to evaluate and prioritise these under different circumstances.

Methods for mitigating and adapting to flood risk:

- Evidence on the effectiveness of Natural Flood Management (NFM) features in situ.
- Forecasting of the impact of NFM features together with land use change and climate change through modelling.
- Assessment of the multiple benefits of NFM features.
- Evidence on the barriers to implementation of NFM on the ground.
- Links and learning from other demonstration sites around Scotland and further afield.

Related Research Activity

Other work on renewable energy is also being carried out under Themes on Land Use and on Economic Adaptation and through the Centre of Expertise ClimateXChange. The research is being done in collaboration with EU and UK research teams under a number of initiatives addressing: adaptation to climate change (EU REFRESH), climate change and water management (EU Interreg cluster project WaterCAP), Macronutrient Cycles within catchments (NERC), and NERC's Environmental Virtual Observatory. The knowledge generated in this strategic research is also key to delivery through the Centre of Expertise for Waters (CREW), to direct contracts for UK governmental agencies, local authorities and for our role in the River Dee Catchment Partnership.

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