Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

EPA-STRIVE

Water Research in Ireland

Comhshaol, Pobal agus Rialtas Áitiúil
Environment, Community and Local Government

Ireland's waters are one of our major natural resources. Plentiful availability of good quality water offers a significant competitive advantage to sectors such as agriculture, industry and tourism, but is a resource that must be carefully managed. Improving water quality status is a national priority for Ireland.

The EPA Water Research programme has a strong focus on policy and has been driven by national regulations and European Directives. Policy-related research plays a vital role in ensuring that EU and national policies are implemented in the most cost-effective manner. A sustained water research programme is an essential component of Ireland's role in protecting its water resources and meeting its requirements under water-related EU directives and national policies.

The research programme of the EPA is based on three pillars that represent key research priorities associated with protecting Ireland's environment.

PILLAR 1	***PILLAR 2***	***PILLAR 3***
Water	*Climate Change*	*Sustainable Environment*

Between 2007-2012, the EPA STRIVE Programme has funded 90 Research Projects (with budget > €10,000) related to water with a total commitment from the EPA of approximately €18m. The range of projects funded include desk-studies, scholarships, fellowships and large-scale multi-annual and multi-partner awards.

The EPA STRIVE Water Research programme 2011-2013 is carried out under the following four areas:

- Area-1: Improve our Knowledge on the State of Water Resources and Pressures;
- Area-2: Impacts on Ecosystems & Human Health (including Drinking Water);
- Area-3: Protecting our Water Resources;
- Area-4: Governance Framework and Socio-Economic Considerations in Water Management.

Area-1: Improve our Knowledge on the State of Water Resources and Pressures

The scientific knowledge of water ecosystems must be strengthened to support the implementation of the Water Framework Directive, other relevant Directives (Marine Strategy Framework, Groundwater, and Environmental Quality Standards Directives) and national regulations implementation. *Under this area, research aims at furthering our understanding of processes, current state of and pressures on water resources.*

Area-2: Impacts on Ecosystems & Human Health (including Drinking Water)

Ireland has an abundant supply of freshwater, although this is not evenly distributed across the country. The quality of this resource is vital, as we depend on surface-water and groundwater sources for our drinking-water supplies. Water quality is currently threatened by emerging pollutants. Pollution by municipal & industrial sources and diffuse pollution from urban & agricultural areas continue to build up pollution levels in the environment. *Research in this area aims at identifying new contaminants and their impacts on water quality, ecosystems and human health; providing the knowledge base to ensure high-quality Drinking and Bathing Water.*

Area-3: Protecting our Water Resources

Water resources must be managed in a sustainable way to protect our aquatic environment and its beneficial uses. Reliable water supply and the protection of aquatic resources through adequate water management are essential to support all aspects of human life and dependent aquatic and terrestrial ecosystems. Water scarcity requires new integrated concepts related to water re-use, energy, recovery of valuable substances, monitoring and control, as well as to the interaction with natural resources. *This area covers research looking into sustainable and integrated water management; measures and efficiency of measures to protect/restore water quality; novel treatment options and also sustainable water balance.*

Area-4: Governance Framework and Socio-Economic Considerations in Water Management

There is a strong need to develop ideas and come up with innovative proposals for institutional arrangements that could help to implement integrated water resource management better. When implementing policies, the institutional, economic, social and cultural components need to be understood to ensure that the policy is accepted. There is a need to provide people with an understanding of the many beneficial services provided by aquatic ecosystems to economic and social welfare. *This area covers governance issues such as public participation and facilitating the buy-in/policy acceptance from the public; socio-economic considerations such as costs of inactions and value of ecosystem services; as well as the integration of water considerations into policies and the improved transferability of research results into policy (science to policy interface).*

Linkages

- Synergies and enhanced collaboration with other national funders is a key objective of the research programme which is facilitated by the Water Research Coordination Group set up by the Environmental Protection Agency (EPA) and Enterprise Ireland (EI) in 2010. Members include Department of the Environment, Community and Local Government (DECLG), Marine Institute (MI), Science Foundation Ireland (SFI), Department of Agriculture, Food and the Marine (DAFM), Office of Public Works (OPW), Geological Survey of Ireland (GSi), Industrial Development Authority (IDA), National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI).

- A number of critical international linkages have also been established to promote Irish environmental research into the international arena including enhanced participation in the European Research Area (e.g. Framework Programme, Joint Programming Initiatives, SNIFFER). By ensuring that Ireland is represented in significant European initiatives related to Water, the EPA will promote an increased efficiency, critical mass and impact of water research in Ireland.

Key Achievements

- Contributions from research under the Water Framework Directive (WFD) include the development of novel methodologies for the characterisation of waterbodies and determination of reference baseline conditions. Detailed analysis of the impact of WFD-related research projects has indicated that 62% of projects demonstrated a high level of policy impact.
- A cluster of research projects on eutrophication has provided scientific data to support appropriate measures or actions for use in the implementation of national policy for reducing phosphorus and nitrogen losses to waters from agricultural sources. Findings from this work provided the basis of existing advice and measures for reducing nutrient losses from agriculture to water.
- Researchers funded have developed new research capability and have provided timely knowledge and assistance to local & health authorities in dealing with significant health scares and outbreaks.
- A state-of-the-art experimental wastewater treatment plant at Tuam, Co. Galway, has been established through EPA funding with the co-operation of the National University of Ireland, Galway (NUIG) and Galway County Council. The facility will advance the development of environmental protection measures nationally and facilitate the testing of novel technologies and practice-based training & education.
- The EPA research team has published a number of documents on the value for money from the investment in water research.[1] [2]
- The EPA funded research into Marine Strategy Framework Directive (MSFD) Noise resulting in a key achievement with a research report[3] forming part of part of Ireland's MSFD obligations, to the European Commission Technical Sub-Group on Noise for the MSFD i.e. it is work towards the establishment of a common noise register.
- EPA funded researcher Gerry Sutton from UCC now represents Ireland on the EU Technical Sub-Group on MSFD Noise.
- The EPA is a partner on the EU Joint Programme Initiative Water – Challenges for a Changing World (JPI Water).[4]

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1 An evaluation of the role of EPA research in the Water Framework Directive implementation in Ireland. Wemaere, A. et al., Biology and Environment: Proceedings of the Royal Irish Academy, 109B, 385–402. (2009).

2 Providing a framework for accountability and learning in Environmental Research IPA Administration, vol. 55, no. 4 (2008), pp. 159–170. G O' Leary, R Boyle, B Donlon, L Sheils.

3 EPA STRIVE 96 report **"Assessment and Monitoring of Ocean Noise in Irish Waters"** Dr Joanne O'Brien and Suzanne Beck GMIT STRIVE 96: Assessment and Monitoring of Ocean Noise in Irish Waters.

4 Click on link **http://www.epa.ie/downloads/pubs/research/water/name,51067,en.html**

Water Research Projects funded 2007-2012

Improve our Knowledge on State of Water Resources and Pressures

Organisation	Principal Investigator	Title
Queen's University Belfast	Raymond Flynn	PATHWAYS Assessing, modelling and managing water and contaminant movement along pathways (underground and over-ground) from the land surface to aquatic receptors, including the roles of contaminant transport and attenuation.
University College Dublin (UCD)	Mary Kelly-Quinn	Assessment of the impacts of forest operations on the ecological quality of water (HYDROFOR)
University College Dublin (UCD)	Michael Bruen	Measurement of sediment and silt flux in rivers, benefits of enhancement measures and policy implications SILTFUX
Dublin City University (DCU)	Fiona Regan	Monitoring Criteria for Priority Chemicals Leading to Emission Factors
University of Dublin, Trinity College (TCD)	Jean Wilson	Development of Remote Sensing as a Tool for Detection, Quantification and Evaluation of Submarine Groundwater Discharge (SGD) to Irish Coastal Waters
University of Dublin, Trinity College (TCD)	Ian Donohue	Development of a tool for assessing general anthropogenic pressure on lakes using littoral invertebrates
University College Dublin (UCD)	Ahmed Nasr	Critical Analysis of Flow Regimes: Current Situation and Future Scenarios for the Impact of Climate and Land Use Changes
University of Dublin, Trinity College (TCD)	Katie Tedd	Evaluation and Interpretation of Groundwater Monitoring Data and the Implications for Groundwater in Ireland
Queen's University Belfast	Christine A. Maggs	Alien invasive species in Irish water bodies
University of Ulster	Joerg Arnscheidt	Distribution, structure and functioning of subterranean fauna within Irish groundwater systems
University of Ulster	Phil Jordan	Flow-Proportional passive sensor validation of phosphorus and nitrogen in Irish rivers (Flow-Pro)
Dublin City University (DCU)	Fiona Regan	Smart Catchment Demonstration: Long-term deployment of sensor monitoring system (DEPLOY)
University of Dublin, Trinity College (TCD)	Katherine Webster	Integrating hydromorphology into typology to improve risk assessment of Irish lakes
National University of Ireland Galway (NUIG)	Sorcha Ni Longphuirt	Trends in nutrient concentrations in Irish estuarine and coastal waters: implications for ecological status
University of Dublin, Trinity College (TCD)	Caroline Wynne	Predicting ecological status of unmonitored lakes based on relationships between status, hydrogeomorphological and landuse characteristics
University College Cork (UCC)	Gerald Sutton	MSFD – Support Research on Descriptor 11 (Noise)
Galway-Mayo Institute of Technology (GMIT)	Joanne O'Brien	Assessment and Monitoring of Ocean Noise in Irish Waters
University of Limerick (UL)	Catherine Dalton	Limno- and palaeo-ecological responses to lake water dissolved organic carbon (DOC)
University of Dublin, Trinity College (TCD)	Andrew Jackson	Testing hydromorphological integrity to support High and Good status of lakes
University College Dublin (UCD)	John Walsh	Quantitative analysis of fractures systems and their impact on flow pathways in Irish bedrock aquifers
National University of Ireland Galway (NUIG)	Michael Hartnett	Assessment of environmental compliance of waterbodies through integration of monitoring and modelling
National University of Ireland Galway (NUIG)	Solene Connan	Macroalgal biomonitoring – applying phenolic compounds as biomarkers for metal uptake characteristics in Irish coastal environments
Galway-Mayo Institute of Technology (GMIT)	Samuel Shephard	MSFD-Support Research on OSPAR Ecological Quality Objectives
Dublin City University (DCU)	Fiona Regan	Assessing, preventing & managing Priority & Hazardous Substances in surface and groundwaters.
University of Dublin, Trinity College (TCD)	Catherine Coxon	Environmental Supporting Conditions for Groundwater Dependent Terrestrial Ecosystems (GWDTEs)
Scotland & Northern Ireland Forum for Environmental Research (SNIFFER)	Kirsty Irving	Development of improved understanding of phosphorus fate and transport within groundwater and significance for associated surface water receptors.
Scotland & Northern Ireland Forum for Environmental Research (SNIFFER)	Helen Simcox	River Fish Classification Tool
Scotland & Northern Ireland Forum for Environmental Research (SNIFFER)	Helen Simcox	Review of the Legislative Requirements and Responsibilities Relating to On-Site Wastewater Treatment Systems and their Impact on Water Quality
University of Dublin, Trinity College (TCD)	Laurence Gill	The impact of on-site wastewater effluent on rivers and wells
Dublin City University (DCU)	Fiona Regan	The role of passive sampling in screening and monitoring of new and emerging chemicals
Ryan Hanley Consultants	Michael Joyce	Management options for the collection, treatment and disposal of domestic waste water treatment systems
National University of Ireland Galway (NUIG)	Cindy Smith	Biogeochemical cycling of nitrates in Irish Estuaries

Protecting our Water Resources

Organisation	Principal Investigator	Title
National University of Ireland, Maynooth (NUIM)	Bernadette Alcock-Earley	The Protection of Water Resources: New Materials for the Sensing of Nitrates and Heavy Metals and for the Removal of Organic Contaminants
University of Dublin, Trinity College (TCD)	Laurence Gill	Assessment of disposal options for treated wastewater from single houses in low permeability subosoil
National University of Ireland, Maynooth (NUIM)	Denise Rooney	New Nano-Structured Polymeric Membranes for the Treatment and Purification of Water.
University of Dublin, Trinity College (TCD)	David Taylor	An Effective Framework For assessing aquatic ECosysTem responses to implementation of the Phosphorus Regulations (EFFECT)
Dublin City University (DCU)	Anne Morrissey	One-step drinking water treatment using nanofiltration and nanostructured composites
National University of Ireland Galway (NUIG)	Eoghan Clifford	The effect of the wastewater treatment process, in particular UV treatment, on pathogenic virus removal
National University of Ireland Galway (NUIG)	Xinmin Zhan	Development of an intelligent intermittently aerated sequencing batch reactor (IIASBR) technology for nutrient-rich wastewater treatment with-a-view to commercialisation
Dublin City University (DCU)	Ian Marison	Development of novel, environmentally neutral, biodegradable, flocculants and biofilters based on biomass and derivatives for water treatment
University of Dublin, Trinity College (TCD)	Laurence Gill	The impact of on-site wastewater treatment for small community developments on groundwater
Dublin City University (DCU)	Brid Quilty	Photoinduced Advanced Oxidative Processes (PAOP) for the removal of pathogenic bacteria from drinking water
Dublin City University (DCU)	Fiona Regan	Novel Passive Sampling Devices for the Monitoring of Priority Pollutants
National University of Ireland Galway (NUIG)	Michael Rodgers	Treatment and Monitoring of Nutrients, Odour and Sludge at a Small-town Demonstration Wastewater Treatment System.
University of Dublin, Trinity College (TCD)	David Styles	Modelling national emissions to air and water
RPS Ireland Limited	Grace Glasgow	Management Strategies for the protection of High-Status water bodies
University of Limerick (UL)	Gary Walsh	An environmental analysis of biopharmaceutical manufacturing in recombinant E. coli, with a view to waste minimisation of Phosphorous and Nitrogen content in waste streams generated.
National University of Ireland Galway (NUIG)	Edmond O'Reilly	Comparison of two biofilm technologies at an EPA/NUI Galway/Galway County Council small town research and demonstration wastewater treatment facility
Limerick Institute of Technology	Josephine Treacy	Application of Wireless Sensor Technology in Waste Water Treatment Plant Environmental Monitoring Systems
Dublin City University (DCU)	John Tobin	Development of novel photocatalytic adsorbents for organics removal from water and wastewater
University College Cork (UCC)	Michael A Morris	Development of chemically engineered nano-porous absorbents for phosphate removal from waste water streams
Athlone Institute of Technology (AIT)	Neil J Rowan	Pulsed-UV light inactivation of Cryptosporidium spp. oocysts in drinking water supplies in Ireland
Waterford Institute of Technology	Peter McLoughlin	The development of a bioremediation product A study of factors affecting biosorption of chromium by a variety of seaweed species
University of Dublin, Trinity College (TCD)	Jean Wilson	Combining Earth Observation and Geochemical Tracing Techniques (CONNECT) for groundwater detection and evaluation in Ireland
Dublin City University (DCU)	Lorna Fitzsimons	Increasing Resource Efficiency in Waste Water Treatment Plants
Institute of Technology Sligo	Michael Millane	Impact of the zebra mussel on the Water Framework Directive Ecological Status of Irish lakes

Governance Framework and Socio-Economic Considerations in Water Management

Organisation	Principal Investigator	Title
National University of Ireland Galway (NUIG)	Stephen Hynes	Using discrete choice method to calculate generic values for water
Teagasc	Cathal O Donoghue	Research on Public Attitudes towards Water resources
Teagasc	Cathal O Donoghue	Moving from physical measures of water quality to user values
National University of Ireland Galway (NUIG)	Stephen Hynes	Benefit Transfer for Irish Water
Limerick Institute of Technology	Josephine Treacy	The Development of a Quality Management System for Urban Wastewater Treatment Plants in Ireland.

Impacts on Ecosystems & Human Health (including Drinking Water)

Organisation	Principal Investigator	Title
University College Cork (UCC)	Ioannis M. Dokas	Early Warning System for Water Treatment Plants as Basis for Defining and Supporting the Concept of Early Warning Analysis (SCEWA)
Galway-Mayo Institute of Technology (GMIT)	Brian Quinn	The assessment and potential human impact of exposure to environmental contaminants on marine and freshwater bivalves.
National University of Ireland Galway (NUIG)	Martin Cormican	Hospital effluent: impact on the microbial environment and risk to human health?
University College Dublin (UCD)	Theo De Waal	Cryptosporidiosis: Human, animal and environmental interface
University College Dublin (UCD)	Wim. G. Meijer	Development of Microbial Source Tracking Techniques
National University of Ireland Galway (NUIG)	Lokesh Joshi	Assessment of exposure to metallic nanoparticles on marine and fresh water model organisms at cellular and genetic level.
National University of Ireland Galway (NUIG)	Nicolas Touzet	Population dynamics and molecular characterisation of biotoxin-producing cyanobacteria in west and northwest Irish lakes.
University of Dublin, Trinity College (TCD)	James Wilson	Biological effects and chemical measurements for the assessment of pollution in Irish marine waters
Marine Institute	Bill Dore	Assessing the Impact of Waste Water Treatment Plant Effluent on Norovirus contamination in shellfisheries
University College Dublin (UCD)	Theo De Waal	Towards a Cryptosporidium Monitoring Proposal
Athlone Institute of Technology (AIT)	Neil J Rowan	Development of a pulsed light approach as a novel solution in drinking water treatment
University College Cork (UCC)	Michael Creed	SADOSE – Safe disposal of sewage effluent in coastal waters designated for the cultivation of oysters and for water-contact recreation
Institute of Technology Sligo	Frances Lucy	Efficiency of Sligo Secondary Sewage Treatment Systems in the Removal of Cryptosporidium and other Human Enteric Pathogens
National University of Ireland Galway (NUIG)	Martin Feely	Hydrogeological and Geochemical Investigations of Elevated Arsenic (As) Abundances in Groundwater Wells from the West of Ireland
University of Ulster	James Dooley	Antimicrobial resistant enterococci (ARE) in Irish watersSources, transfers and impacts
Dublin City University (DCU)	Enrico Marsili	Genetic methods to improve Cr(VI) bioremediation in groundwater
National University of Ireland Galway (NUIG)	Vincent O'Flaherty	Detection and quantification of viable and non-viable norovirus in oysters
University College Dublin (UCD)	Wim. G. Meijer	A QMRA Approach to Estimate Public Health Risks Caused by Microbes Associated with Beach Sands
University College Dublin (UCD)	Bartholomew Masterson	Smart Coasts – Sustainable Communities (SCSC)
Tallaght Institute of Technology	Eithne Dempsey	Electrochemical Based Sensor for the Determination of Nitrate and Nitrite in Drinking Water
National University of Ireland Galway (NUIG)	Robin Raine	The Influence of Parasites on Dinoflagellate Bloom Dynamics
Environment Agency (UK)	Danielle Ashton	Collaborative funding for lipophilic substances monitoring trial
National University of Ireland Galway (NUIG)	Eoghan Clifford	Development of filtration technologies for effective, cost-efficient and robust water treatment
National University of Ireland Galway (NUIG)	Gavin Collins	Use of filters for treatment of drinking water

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FURTHER INFORMATION

Over 90 research reports have been published by the EPA in the past 10 years in the area of Water – (policy support for WFD, novel treatment technologies etc.) Further details on the EPA research programme are available at the following link.
http://www.epa.ie/downloads/pubs/research/water/

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