

EPA Research - 2015 Call

EPA Research – Water Research Call 2015

Technical Description

Revised version of 22/06/2015:

Changes are highlighted in **yellow** on pages 10, 11, 12, 13



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

The EPA Research Programme is funded by the Irish Government.

Environmental Protection Agency Research Call 2015: Water

This document provides the **Technical Description** for the Environmental Protection Agency (EPA) **Water** Research Call 2015. Applicants should read the following carefully and also consult the other documentation provided (i.e. Guide for Applicants, Guide for Grantees, EPA Terms and Conditions for support of grant awards).

Contents

Contents.....	2
1. Introduction	3
2. Call Content.....	7
3. Expected Outputs	27
4. Indicative Timeframe.....	28
5. Further Information.....	29
6. Additional Documentation	30

1. Introduction

The EPA's Research Programme 2014-2020 is designed to identify pressures, inform policy and develop solutions to environmental challenges through the provision of strong evidence-based scientific knowledge:

- **Identifying Pressures:** Providing assessments of current environmental status and future trends to identify pressures on our environment.
- **Informing Policy:** Generating evidence, reviewing practices and building models to inform policy development and implementation.
- **Developing Solutions:** Using novel technologies and methods that address environmental challenges and provide green economy opportunities.

EPA Water Research

The EPA Research Programme has been allocated funding of approximately € 2.54m for new commitments in Water research. The overall aim of the water pillar is to support relevant water policy and to protect our water environment, contributing to achieving excellent water quality in Ireland. The EPA Research Water Pillar deals with groundwater, surface water, transitional and coastal water; as well as wastewater, drinking, bathing and shellfish waters. The EPA Research Water Pillar is structured into five thematic areas of research, as follows:

Theme-1. Safe Water;

Theme-2. Ecosystem Services and Sustainability;

Theme-3. Innovative Water Technologies;

Theme-4. Understanding, Managing and Conserving our Water Resources; and

Theme-5. Emerging and Cross-cutting Issues.

Multi- and inter-disciplinary research is required on these themes, with expected social, economic, technological, environmental and policy impacts.

Funding Structure

The EPA invites research proposals under the specific topics listed in the table below. These proposals will be Desk Studies, Medium Scale or Large-Scale Projects:

- **Desk-Study** will typically last from 6 to 12 months with an indicative cost range of €50,000 to €100,000
- **Medium-Scale Project** will typically last from 24 to 36 months with an indicative cost range of €100,000 to €350,000;
- **Large-Scale Project** will typically last from 36-48 months with an indicative costs range of €350,000 to €500,000.

Depending on the scope and quality of research proposals received, **up to one** project will be funded under the proposed topics detailed in this document, unless otherwise stated.

Open Topics

For these topics, applicants can choose to apply for a Desk-Study, Medium-Scale project or a Large-Scale project (see definition above) responding to (**or part of**) the scope of the particular topic. It is expected that **up to one** Large-Scale project or a **combination** of Medium-Scale / Desk-Studies will be funded. For these topics, proposals will be selected based on their scientific merit, their value for money, relevance to the scope and based on the budget available. In the cases where more than one project is funded, the scope covered by each proposal will also be taken into account (i.e. to avoid duplication) when selecting projects for funding. Applicants selecting a Desk-Study or Medium-Scale project are expected to build synergies and linkages with other projects funded under the same topic, in the event, where more than one project would be funded.

Value for Money

All research proposals must **build on findings and recommendations** from past and current research¹ projects (where relevant) and **demonstrate value for money**.

Open Access and Open Data

All projects must comply with the EPA's **Open Data** and **Open Access** rules, which are aligned with Horizon 2020 for the 2014-2020 EPA Research Programme.

Where project outputs include data and/or technical solutions (websites, developed software, database solutions etc.) Then the format of same **must be agreed with the EPA** to ensure that they are compatible with EPA IT infrastructure and can be maintained by EPA after the completion of the project.

¹ including EPA-funded, other Irish and EU and international research projects and initiatives/activities

List of Topics

Call Topic Ref.	Thematic Areas and Project Titles	Max. Budget (€) per project
Safe Water		
2015 Water Call Project 1	<i>Innovative water monitoring water technologies</i>	500,000
Ecosystem Services and Sustainability		
2015 Water Call Project 2	<i>Development of a catchment services approach</i>	75,000
Innovative Water Technologies		
<i>Water Joint Programming Initiative waterworks2014 cofunded Call on Water Treatment</i>		
Understanding, Managing and Conserving our Water Resources		
2015 Water Call Project 3	<i>Cost effective approaches to targeting mitigation measures within catchments</i>	350,000
2015 Water Call Project 4	<i>Disentangling the impact of multiple stressors on the ecology of water bodies</i>	500,000
2015 Water Call Project 5	<i>Linking saltmarsh ecological status to anthropogenic pressures</i>	350,000
2015 Water Call Project 6	<i>Modelling of Irish transitional and coastal systems to determine nutrient reduction measures required to achieve good status</i>	160,000
2015 Water Call Project 7	<i>Nutrient dynamics and eco-physiology of opportunistic macro-algal blooms in Irish estuaries and coastal bays</i>	350,000
2015 Water Call Project 8	<i>Water Framework Directive – Habitats interface: Hydromorphology and barriers / river continuity</i>	500,000

Application Process

Making an application online:

Applications must ONLY be made online at <https://epa.smartsimple.ie> .

Guide to the EPA online application system:

The guide to the EPA online application system, '2015 Quick guide to the EPA online portal (making an application), is available for download at <http://www.epa.ie/pubs/reports/research/call2015>

What to include in the application form:

To make the best application possible, it is recommended that you read the '2015 EPA Research guide for applicants' before drafting and submitting an application, available at <http://www.epa.ie/pubs/reports/research/call2015> .

To make an application under any of the topic areas:

Applicants must use the correct **Call Topic Reference**, as indicated in this document, from the drop down menu on the EPA online system e.g. *Water 2015 Call Project 1*

It is the responsibility of the **Applicants** to ensure that proposals are submitted before the **call deadline**, and of the relevant **Grant Authoriser** (i.e. Research Offices / Managing Directors for companies) to ensure that the proposals are authorised before the **organisation approval deadline**.

FAILURE TO MEET EITHER OF THE ABOVE DEADLINES MEANS YOUR PROPOSAL WILL NOT BE CONSIDERED FOR FUNDING

2. Call Content

Theme 1: Safe Water

Water quality and human health may be threatened by emerging pollutants, priority substances, endocrine disruptors and emerging risks, such as pathogens (including antibiotic resistant bacteria and viruses), cyanotoxins and nanomaterials. Key knowledge gaps remain concerning their environmental behaviour in surface water, treated waters and groundwater, and their impact on human health through the irrigation of crops, water supply, distribution and storage in rural or urban environments. In addition, water quality and supply can be threatened by climate change, natural hazards and extreme events, such as droughts and floods.

This thematic area will:

- Provide a better understanding of the fate and behaviour of new or poorly understood contaminants and their impacts on water quality with a particular emphasis on drinking and bathing waters, and on ecosystems and human health.
- Improve our resilience to climate change, extreme events and natural hazards. It will support the implementation and refinement of the relevant policies and also develop new tools and best practices in relation to water infrastructure and the prediction & management of natural hazards to ensure that economic investments in this area will result in the on-going availability and delivery of high quality water.
- Develop a better understanding of the socio-economic aspects, governance and behavioural changes associated with this area, including impact of water charges on water consumption, as well as behavioural changes.

One topic is included in this 2015 EPA Water Call under *Theme 1: Safe Water*:

2015 Water Call Project 1. Innovative water monitoring technologies

In addition, the EPA is also providing funding towards the [Science Foundation Ireland \(SFI\)/EPA 2015 Investigator Programme](#), which could be of relevance to this theme.

Project Title: *Innovative Water Monitoring Technologies*

Project Type: **Open Topic**

*To make an application under this topic area, you must use the following **Call Topic Reference:***

Water 2015 Call - Project 1

Background:

Maintaining a clean water supply is one of the key challenges facing humanity today. Pollution, over-use, and climate change are just some of the factors putting increased pressure on water resources. Contamination of water supplies presents an increased risk to public health, water supply security, and the environment, in general. However, few real-time methods exist to detect the wide range of potential contaminants. While the use of in-situ sensors has been developed over recent years, many suffer from problems with bio-fouling and require regular maintenance / sensor replacement. The range of parameters monitored can also be limited simply due to the practicalities of sensor design / light absorption issues (for colorimetric assays). There is a need for portable, low cost, and easy-to-use systems with the capability of being adapted to the quantitative (and qualitative) monitoring of a range of trace contaminants in the field, as an alternative to complex off-site laboratory analysis.

Numerous micro-pollutants are discharged to the water environment from both point sources, such as wastewater treatment plants (WWTPs), and diffuse sources, such as urban and agricultural run-off. These compounds may generate adverse effects on aquatic life and contaminate drinking water resources. Equally, micro-pollutant contamination of water can arise from urban and agricultural runoff. Micro-pollutants² occur in water, either at levels, which are below current limits of detection (extremely low concentrations) or sporadically. As such, conventional sampling and monitoring approaches may not present a true picture of their prevalence within the environment. The potential to deploy embedded assay sensors to measure cumulative build-up of micro pollutants in raw and treated drinking water will provide a further level of evidence as to the extent and nature of problems we face.

The Water Framework Directive (WFD) mainly focuses on the quality of receiving waters, which should be “good”, both in terms of ecological status and chemical quality. In view of this legislation, management practices must take into account concentrations of specific parameters (i.e. the concentrations in the river) to ensure compliance with requirements of the WFD. The characteristics of both the receiving waters and effluent of WWTPs change continually, being affected by weather, seasonality, time of day, etc...

There is also a need for good and accurate measurement of flow at a specific moment in time. An efficient information management system and the ability to anticipate problems, or to plan operations in an efficient way, are critical aspects to wastewater utilities, both because of more demanding environmental regulations, and the need to increase systems exploitation efficiency and safety, as well as improve the information provided to the consumer and to the general public.

² *endocrine disrupting chemicals (EDCs) and potential EDCs are mostly man-made, found in various materials such as pesticides, metals (lead), additives or contaminants in food and personal care products*

Scope:

Proposals submitted under this topic should cover **at least one** of the topics below:

Topic 1

The development, demonstration, and testing of **real-time monitoring technologies, capable of covering a wide range of water contaminants**, including (but not limited to) **drinking and/or bathing waters**

Parameters (or relevant surrogates) could include:

- Trihalomethanes (thms): for the evaluation of drinking water quality;
- Escherichia Coli (*E.Coli*) and Intestinal Enterococci: to provide more rapid evaluation of bathing and drinking water quality;
- Cryptosporidium and Giardia: for the assessment of drinking water supplies;
- Pesticides, such as MCPA, Cypermethrin and Isoproturon, all of which have been found in Irish rivers;
- Polyaromatic hydrocarbons (pahs): these ubiquitous substances are widespread at low concentrations in most natural waters;
- Neonicotinoid pesticides, such as the antibiotics erythromycin and 2-ethylhexyl 4-methoxycinnamate;
- Hormone disrupting substances, such as 17-beta-estradiol (E2), 17-alpha-ethinylestradiol (EE2), and Estrone (E1): from contraceptive products;
- Pharmaceuticals, such as Amoxicillin and other commonly used antibiotics, which may be present in wastewater discharges;
- Polymers, such as Acrylamide and Epichlorohydrin: used in drinking water treatment, where concentrations in treated water are based on product specifications;
- Metals (e.g. Lead, Mercury, Arsenic, Cadmium, Copper and Zinc): at present analysis requires offline laboratory analysis using plasma spectroscopy to achieve low limits of detection.

And/or

Topic 2

The identification and development of appropriate **bio-accumulating** sensors for **micro-pollutants**, in particular pesticides, and thereafter deploy and test sensors in **raw and drinking water**. Considerations should be given to the possible use of the presence of these pollutants as a **measure of the efficiency** of various water treatment removal processes.

And/or

Topic 3

The feasibility of utilising **pseudo real-time sensors** located in receiving waters and WWTPS to monitor the **variations in the physico-chemical impacts of wwtps effluent on the receiving waters**. The project could gather records of river flow (level sensors correlated with permanent hydrometric stations), rainfall, temperature and physico-chemical characteristics of (i) receiving waters, including (but not limited to) dissolved oxygen (DO), Phosphorous and Nitrogen; and of (ii) WWTPs effluent, including (but not limited to) volume, Total Organic Carbon/Chemical Oxygen Demand, Nitrogen and Phosphorous. By employing appropriate sensors and utilising available process simulation software, the feasibility of optimising wastewater treatment processes to meet discharge standards aligned with the prevailing assimilative capacity of the receiving waters, could be investigated. In addition, critical scenarios could be identified, in the case where the impacts of discharges on the receiving waters are potentially significant. It is not envisaged that full real-time process control is practicable or viable in the vast majority of plants. However, specific interventions, such as lowering levels in tanks to increase storage in advance of heavy rainfall, may be viable. Operational savings and reduced carbon footprint could arise, where it can be demonstrated that receiving waters are capable of assimilating a greater loading, with no negative

impacts. Early and appropriate intervention strategies at WWTPs during critical scenarios should be developed, in order to mitigate risk to water quality through plant/process management.

For all proposals:

- Irish Water³ will provide access to drinking water treatment plant(s), WWTPs and data, as required for this project. Applicants **MUST** consult with Irish Water before submitting their proposal to ensure that it is feasible.

The deadline for submission of queries to Irish Water is the 10th July 2015 – 5pm. No queries will be entertained afterwards. Research@epa.ie MUST be copied in all communication.

- It is critical that the research **build on existing technologies**, if appropriate.
- All proposals should carefully consider how the collated monitoring data will be formatted/made available in order to meet the **standard of current reporting/database** in the context of the WFD and the Drinking Water Directive.
- In addition, proposals **should consider** how the technologies developed could be implemented in Ireland, as part of the national WFD and Drinking Water Directive monitoring programme, with reference to the following areas:
 - ❖ Legal and economic issues;
 - ❖ Improved monitoring coverage;
 - ❖ Real-time data capture (where appropriate);
 - ❖ Protection of public health;
 - ❖ Visualisation of monitoring data on interfaces such as those used for air quality monitoring; and
 - ❖ Comprehensive water quality and nutrient monitoring tools, including their use as early warning systems for pollution and pathogen detection.

Project Structure and Funding:

It is expected to fund **up to one** Large Scale **and/or a combination of** Medium Scale/Desk Studies projects under this topic – The maximum budget allocated per project is €500,000 (which includes a 5% provision for communication costs⁴). Please refer to the **2015 Guide for Applicants** for further details.

³ Irish Water Contacts:

- **Topic 1:** Irish Water should **only** be contacted in the case where applicants will require access to Irish Water facilities or data, to verify that the proposal is feasible (use contacts below).
- **Topic-2:** Eadaoin Joyce: ejoyce@water.ie;
- **Topic-3:** Mark O’Callaghan: mocallaghan@water.ie.

⁴ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Theme 2: Ecosystem Services and Sustainability

Water demand and availability pressures, amplified by climate change (including the apparent changing frequency and severity of extreme events, such as floods and droughts) have increased the stress on water bodies and associated ecosystems. The environment does not exist in isolation; it both affects and is affected by many aspects of our lives.

Environmental resources and ecosystem services are direct inputs into the economy. The concept of ecosystem services is based upon the assumption that there is a connection between good ecological status and the provision of several benefits, such as water supply, food supply, biodiversity, landscape value, and others. It is already used by some managers and decision makers as a powerful tool for building and implementing programs of measures. Approaches using ecosystem services could therefore support the Water Framework Directive (WFD) objectives.

This thematic area will:

- Further our understanding of ecosystems context, functions and processes, and safeguard natural resources for future generations by identifying measures to help the adaptation and reaction to current and future pressures on the aquatic environment.
- Develop new tools in the field of ecological engineering and early warning systems.
- Develop a better understanding of the socio-economic aspects, governance and behavioural changes associated with this area, including issues of preservation vs. Restoration costs and the demonstration of the economic value and social benefits of aquatic ecosystem services.

To-date, the EPA has funded several projects related to Ecosystem Services. These include, for example:

- [ESManage](#);
- [ECORISK](#);
- [Valuing the significant ecosystem services provided by Irish coastal, marine and estuarine habitats](#);
- [Integrating ecosystem approaches, green infrastructure and spatial planning \(ECO-Plan\)](#);
- [Research Report: 127](#): Estimating the Value to Irish Society of Benefits Derived from Water-Related Ecosystem Services: A Discrete Choice Approach;
- [Research Report: 129](#): Are we willing to pay for good river Water Quality? Willingness to pay for achieving good status across rivers in the Republic of Ireland;
- [Economic Assessment of the Waterborne Outbreak of Cryptosporidiosis in Galway, 2007](#);
- [Delivering Integrated Water Management through the bottom-up approach: A critical analysis](#);
- [Towards Integrated Water Management \(TIme\)](#).

One topic is included in this 2015 EPA Water Call, under Theme 2: *Ecosystem Services and Sustainability*:

2015 Water Call Project 2. Development of a catchment services approach

In addition, other topics relevant to this theme are included in the **2015 EPA Sustainability Call**.

Project Title: *Development of a catchment services approach*
Project Type: Desk-Study
*To make an application under this topic area, you must use the following **Call Topic Reference:***
Water 2015 Call - Project 2

Background:

Achieving successful management of our water and biodiversity resources is a major challenge. Meeting the challenge will be hindered, if a holistic, integrated approach is not taken to consider the related elements of water management, biodiversity and land-use management together to their mutual benefit.

An approach called ‘integrated catchment management (ICM)’ is being considered by the EPA, as the basis for effective water management (see Daly (2013) and Harris (2013) for further details on ICM⁵) and Water Framework Directive (WFD) implementation. ICM is a philosophy and a process that recognises the catchment, as the appropriate organising unit, for understanding and managing hydro(geo)logical and ecosystem processes, in a context that includes scientific, social, economic and political considerations. The WFD is essentially an ecologically-driven directive, and therefore is closely linked to biodiversity and ecosystems. The catchment also has the potential to be an appropriate land-based unit for many components of biodiversity.

The catchment services concept is being considered by the EPA as an overarching framework that includes all the relevant elements in a catchment – ecosystem services, geosystem services and human/social system services – see illustration below (for further information, a draft discussion paper is available⁶). It links all, in the case of water, and most, in the case of biodiversity, relevant elements – disciplines, organisations and work processes – required to help achieve successful water and biodiversity management. The inclusion of human-social system services indicates that local communities have a critical role in catchment management (and thereby water and biodiversity management), thus sign-posting that bottom-up, as well as top-down approaches are relevant.

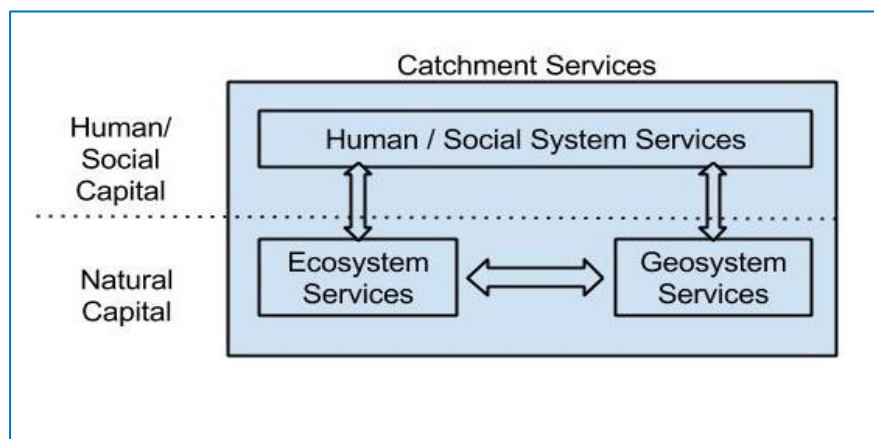


Illustration of how natural capital, consisting of ecosystem and geosystem services, links with human/social system services to give the holistic catchment services

⁵ Daly, 2013. A healthy catchment initiative for Ireland – Making Integrated Catchment Management Happen. Proceedings of IAH (Irish Group) Conference “Groundwater and Catchment Management”, Tullamore, April. Paper available at: http://epa.smartsimple.ie/files/347278/102824/2015_EPAWaterCall_Project_2-1/

Harris, B, 2013. The catchment based approach. Proceedings of IAH (Irish Group) Conference “Groundwater and Catchment Management”, Tullamore, April. Paper available at:

http://epa.smartsimple.ie/files/347278/102824/2015_EPAWaterCall_Project_2-1/

⁶ http://epa.smartsimple.ie/files/347278/102824/2015_EPAWaterCall_Project_2-1/

Scope:

This project could explore:

- The potential of the catchment services concept to provide a means of considering water/catchment, biodiversity and land-use management in an integrated and holistic manner.
- The benefits and disbenefits of such an approach.
- The implications for governance frameworks and regulations.
- The implications for community engagement.

The project could also review on-going research and activities (e.g. mapping) related to ecosystem and geosystem services at national, EU and international level. It is essential that the project build on existing research projects, such as those outlined on page **11**.

Project Structure and Funding:

It is expected that this project will be a 6-12-month **Desk-Study** project, with an **indicative** budget of up to €75,000 (which includes a 5% provision for communication costs⁷). Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

⁷ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Theme 3: Innovative Water Technologies

Innovative technologies are required by the water industry to create products and services. This thematic area will contribute to improving the quantity and quality of water bodies, so that our resources will be used in a more efficient way; and to gaining a better understanding of the socio-economic aspects, governance and behavioural changes associated with this area.

The objectives of this research area are aligned with the aims of the European “[Resource Efficiency Roadmap](#)”.

This thematic area will:

- Develop novel treatment & distribution options, and improve water systems efficiency, focusing on aspects, such as new materials and processes, new management tools, Information and Communication Technology (ICT), energy efficiency, and small scale water storage.
- Develop problem-solving research leading to the development of market-orientated solutions, such as the development of sensor networks & real-time information systems in the water cycle, and improved water treatment technologies.
- Improve the quantity and quality of water bodies and developing ways to use these resources more efficiently. Gain a better understanding of the socio-economic aspects, governance and behavioural changes associated within this area, including social acceptance of reused waste and assessing costs against beneficial outcomes to avoid disproportionate costs.

The EPA is funding this theme through its participation in the second [Water Joint Programming Initiative \(JPI\) Cofunded Call on Water Treatment \(waterworks2014\)](#).

This call opened on the 2nd March 2015 and the deadline for submission of pre-proposals was on the 4th May 2015.

In addition, of relevance to this theme, the EPA is also providing funding towards the [Science Foundation Ireland \(SFI\)/EPA 2015 Investigator Programme](#).

The **Water 2015 Call – Project 1** (under Theme 1) is also relevant to this area.

Theme 4: Understanding, Managing and Conserving our Water Resources

This thematic area will contribute to better use and protection of water resources, by gaining a better understanding of (i) the potential impacts of human activities, such as abstractions, discharges and land-use on groundwater, rivers, lakes, estuaries and coastal waters; (ii) the views of local communities and the ways of encouraging behavioural change; and (iii) the means of minimising these impacts. Particular attention will be given to pressures on water arising from agricultural activities. Regulatory measures are essential tools to ensure compliance with environmental standards of water quality and quantity. Understanding the mechanisms leading to improved water management will lead to better policy design, implementation and adaptation.

This thematic area will:

- Further an integrated approach to water management by improving our understanding of the impact of pressures on water quality and quantity, looking at adaptive water management approaches, as well as socio-economic issues.
- Promote the concept of water foot-printing while increasing water resource efficiency and reducing water pollution.
- Strengthen socio-economic approaches to conserve our water resources, covering governance issues, such as public participation and decision-support systems (DSS), as critical tools to integrate scientific knowledge into decision-making and facilitating buy-in/ policy acceptance from the public.
- Deal with socio-economic considerations and practical measures for mitigating the impacts of pressures.

Six topics are included in this 2015 EPA Water Call, under *Theme 4: Understanding, Managing and Conserving our Water Resources*:

2015 Water Call Project 3.	Cost effective approaches to targeting mitigation measures within catchments
2015 Water Call Project 4.	Disentangling the impact of multiple stressors on the ecology of water bodies
2015 Water Call Project 5.	Linking saltmarsh ecological status to anthropogenic pressures
2015 Water Call Project 6.	Modelling of Irish transitional and coastal systems to determine nutrient reduction measures required to achieve good status
2015 Water Call Project 7.	Nutrient dynamics and eco-physiology of opportunistic macro-algal blooms in Irish estuaries and coastal bays
2015 Water Call Project 8.	Water Framework Directive – Habitats interface: Hydromorphology and barriers / river continuity

Project Title: *Cost effective approaches to targeting mitigation measures within catchments*
Project Type: Medium-Scale Project
To make an application under this topic area, you must use the following Call Topic Reference:
Water 2015 Call - Project 3

Background:

Currently across Ireland, mitigation measures to control agricultural pollution are largely implemented at farm-scale, with very little consideration given to intra- and inter-farm variation. Within a catchment, the contribution of agricultural land to changes in water quality is heterogeneous, with some areas posing a greater threat. The ability to identify these high-risk areas within catchments increases the cost-effectiveness of mitigation measures and the likelihood of achieving the objectives of the Water Framework Directive (WFD).

To-date, there has been no incentive or policy drive in Ireland to delineate these areas, largely because of a poor evidence base for policy development. A lot of research has been done nationally and internationally on how and where to target measures in catchments (e.g. EPA-funded PATHWAYS project^[1] and Agriculture Catchment Programme^[2] (ACP)).

This has resulted in the development of tools/methods such as (but not limited to) the EPA Catchment Characterisation Tool⁸, SCIMAP: Diffuse Pollution Risk Mapping⁹, source apportionment models and Phosphorus Risk Indexes.

Although further research could be done to refine these tools/methods, **the main research gaps relate to the means of making these tools/methods operational in terms of costs and integration into policy, institutional structures and farming practices.** For example, how will the cost effectiveness of mitigation measures targeted at critical source areas be affected by farmer viewpoints and by the administration and advisory support required to implement such an approach?

Scope:

Proposals submitted under this topic could consider the following questions:

- How can existing tools/methods be used to **cost effectively target mitigation measures** at agriculture diffuse and small-point sources in catchments across a wide geographical area?
- What are the administrative, operational, practical and behavioral **barriers to implementing** such tools/methods at farm- and catchment-scale, and **how can they be overcome?**
- What administrative, operational and practical **costs need to be taken into consideration when implementing** these tools/methods?

The outputs of this work could be either an operational framework for the implementation of a targeted approach through the WFD structures, and/or the demonstration of a fully operational model in selected catchments. Although, challenging, the demonstration of a fully operational model would be preferable, but could be difficult to achieve within a three-year project timeframe, especially if improvements in water quality are to be demonstrated.

Developing an operational framework for the implementation of a targeted approach through the WFD structures is a more realistic outcome.

^[1] <http://erc.epa.ie/smartsimple/displayFullProjectDetails.php?internalID=9>

^[2] <http://www.teagasc.ie/agcatchments/>

⁸ <http://erc.epa.ie/safer/iso19115/displayISO19115.jsp?isoID=196>

⁹ <http://www.scimap.org.uk/>

This work will require an integrated team of socio-economic and bio-physical scientists, to successfully carry out the research.

Project Structure and Funding:

It is expected that this project will be a **Medium-Scale** project, which will last 24-36 months, with an **indicative** budget up to €350,000 (which includes a 5% provision for communication costs¹⁰). Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

¹⁰ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Project Title: *Disentangling the impact of multiple stressors on the ecology of water bodies*
Project Type: Large-Scale Project
To make an application under this topic area, you must use the following Call Topic Reference:
Water 2015 Call - Project 4

Background:

Catchments are complex systems, and land-use intensification has altered the balance and prevalence of the multiple geomorphological, hydrological, biochemical and ecological stressors that affect aquatic communities. The effect of land-use on aquatic ecosystems is not straightforward and is highly catchment specific, making the effects of catchment management interventions extremely difficult to predict. Despite there being a relatively strong relationship between agriculture intensity and decline in water quality/ecology, previous research has demonstrated a significant variation in this relationship.

It is **this variation that necessitates further research** to disentangle the biophysical and chemical factors that constrain/maintain the status of water bodies, including *inter alia*: geomorphology, environmental drivers (temperature, light), chemical thresholds, recolonisation, and hydrology. Variation may result from different characteristics of catchment/water bodies, such as their position in the landscape, history of the catchment, land-use, the physical characteristics (e.g. Hydrogeology, natural water chemistry and soil/sediment qualities), and the ecology. **The ability to identify the key factors that constraint/impact on aquatic ecology in different catchments, will result in a much higher probability of achieving the targets of the Water Framework Directive (WFD) and a more cost effective targeting of measures.** For example, the lack of biological recovery in some water bodies could mean that the current target threshold values for some pollutants are not low enough due to a hysteresis effect and/or that other stressors, such as hydromorphology, are constraining recovery. Unknown effects of the synergistic impacts of stressors will impede the derivation of realistic water quality targets, and therefore, the likelihood of achieving the objectives of the WFD.

Scope:

Proposals submitted under this topic could consider the following questions:

- Can we **identify the factors that are constraining ecological recovery** in lakes and/or rivers?
- Is it possible **separate the relative contribution of contaminant sources and physical stressors** on ecological impacts in water bodies?
- Can we **link agricultural practices to the forms and timing of ecological impact** in water bodies?

The main output from this project could be the **delivery of an assessment framework for multiple stressors and their synergistic impacts**. The assessment framework should be applicable over a wide geographical scale and allow for evaluation at catchment scale to determine which stressor(s) are impacting on which aquatic ecosystems. The development of this framework will allow for more targeted investigations at catchment scale in the future. Development of this framework should make use of existing national/international data & literature, supplemented where necessary, by additional experimental and modelling investigations.

Project Structure and Funding:

It is expected that this project will be a **Large-Scale** project, which will last 36-48 months, with an **indicative** budget up to €500,000 (which includes a 5% provision for communication costs¹¹). Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

¹¹ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Project Title: *Linking saltmarsh ecological status to anthropogenic pressures*

Project Type: Medium-Scale Project

To make an application under this topic area, you must use the following **Call Topic Reference:**

Water 2015 Call - Project 5

Background:

A previous EPA-funded research on Irish saltmarshes (Saltmarsh Angiosperm Assessment Tool Ireland (SMAATIE))¹² developed a Water Framework Directive (WFD)-compliant ecological classification scheme. Through this previous desk-study, a number of knowledge gaps were identified.

A key area requiring further investigation is linking anthropogenic pressures to changes in the saltmarsh communities. Additional community information is also required to further understand the ecological functioning of Irish saltmarshes.

This will allow us to refine the current assessments and better describe the environmental condition of these valuable communities. The assessment tool for Irish saltmarshes is a key biological quality element for WFD classification purposes.

A better understanding of the pressure-response relationship for saltmarsh will allow for the refined assessment tool to be intercalibrated with those from other Member States in the North East Atlantic Geographical Intercalibration Group (NEA GIG) to ensure comparability.

Scope:

Proposals submitted under this topic could:

- Gather further information on Irish saltmarsh;
- Gather information on pressures acting on Irish saltmarsh;
- Link anthropogenic pressure to ecological and conservation status;
- Refine previously developed assessment tools;
- Describe the ecosystem services provided by and ecological functions of saltmarsh communities;
- Contribute to WFD ecological status of transitional and coastal waters.

This research is of direct relevance to the WFD and Habitats Directive. **It will contribute to a better understanding of key biological communities and increase our confidence in the assessments underpinning measures to improve environmental status.**

Project Structure and Funding:

Project Structure and Funding:

It is expected that this project will be a **Medium-Scale** project, which will last 24-36 months, with an **indicative** budget up to €350,000 (which includes a 5% provision for communication costs¹³). Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

¹² <http://erc.epa.ie/smartsimple/displayFullProjectDetails.php?internalID=741>

¹³ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Project Title: *Modelling of Irish transitional and coastal systems to determine nutrient reduction measures required to achieve good status*

Project Type: Research Fellowship

To make an application under this topic area, you must use the following Call Topic Reference:

Water 2015 Call - Project 6

Background:

Characterisation, within the scope of the EU Water Framework Directive (WFD), requires the identification of areas at greatest risk of not achieving the objective of good status. Further to this, an assessment of the possible implications of nutrient reduction scenarios for targeted water bodies will help to prioritise future measures. The response of systems to these measures depends not only on the direct relationships between nutrient loadings and primary productivity (benthic and pelagic), but also on a number of physico-chemical and hydromorphological factors, which impact factors such as the availability of light, residence time and nutrient cycling processes. Bio-physical models, which incorporate these factors, have been tested on a number of Irish transitional and coastal water bodies (e.g. The Dynamic Combined Phytoplankton Macro-algae (DCPM) model¹⁴). These models can help identify the required nutrient reduction necessary to ensure a water body reaches its WFD objectives.

The proposed project would involve the **application of a suitable modelling tool to a selection of transitional water bodies identified as being at risk from the WFD characterisation work** that is on-going in the EPA. This work would **identify the necessary nutrient reductions needed to achieve established water status objectives**. This would help to inform catchment management decisions with regard to the most appropriate sectors to target in reducing nutrient loads (e.g. urban wastewater discharges and diffuse agricultural inputs). It would also assist in predicting the impacts of any proposed future catchment level changes (e.g. Land-use changes or population growth), which influence nutrient loading on water quality.

Scope:

Proposals submitted under this topic could:

- Review the **links between measures**, which have been applied, such as investment in urban wastewater infrastructure, implementation of the Nitrates Directive (Good Agricultural Practices for the Protection of Waters Regulations (S.I. No. 31 of 2014), river basin management plans and other national programmes to reduce point and diffuse nutrient loadings, **to the current status of Irish water bodies**.
- **Apply a suitable modelling tool to at-risk transitional water bodies identified under tier-one of the WFD characterisation to identify nutrients reduction requirements to achieve good status**. This will involve running a number of different nutrient reduction scenarios to help inform decision makers on what options would be available to meet the required objectives.
- **Investigate the potential biological implications of nutrient reduction** in transitional waters on **downstream receiving coastal water bodies**.
- **Inform the preparation of the second-cycle River Basin Management plans and programmes of measures**.

¹⁴ Aldridge, J.A., S.J. Painting, D.K. Mills, P. Tett, J. Foden, and K. Winpenny. 2008. *The Combined Phytoplankton and Macroalgae (CPM) Model: predicting the biological response to nutrient inputs in different types of estuaries in England and Wales. Report to the Environment Agency. CEFAS Contract C1882.*

- Identify and liaise with **current Irish research projects to obtain information on process level mechanisms**, which can be incorporated into the model (e.g. Nitrogen cycling in sediments) and catchment level scenarios.
- **Identify gaps in data and processes required to improve our understanding of the temporal and spatial cycling and response** of transitional and coastal waters to seasonal nutrient loadings.

This research will support the **identification of nutrient reduction measures required to achieve good status in Irish coastal and transitional water bodies**. Application of the model would ensure the production of results for the tier-2/3 of the WFD characterisation and preparation of the second-cycle River Basin Management Plans and programmes of measures by the new deadline of December 2017. **It is expected that, during the course of the project, the research team will be requested to provide interim outputs in order to inform policy**. The timeframe for this will be discussed and agreed with the Steering Committee once the project has started.

Project Structure and Funding:

It is expected that this project will be a **Research Fellowship**, which will run for **24** months. The maximum funding available is **€160,000** (which includes a 5% provision for communication costs¹⁵). Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

¹⁵ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Project Title: *Nutrient dynamics and eco-physiology of opportunistic macro-algal blooms in Irish estuaries and coastal bays*

Project Type: Medium-Scale Project

To make an application under this topic area, you must use the following **Call Topic Reference:**
Water 2015 Call - Project 7

Background:

In Ireland, the presence of extensive mats of macro-algae growing in the intertidal zone often indicates the presence of nutrient over-enrichment. These large blooms of seaweed can cause ecological disturbance, as well as a risk to human amenity and health. In some estuaries and coastal bays, the extent and abundance of these opportunistic macro-algae has contributed towards these areas being classified at moderate or worse ecological status under the EU Water Framework Directive (WFD). This, in turn, means that management measures to control these blooms will have to be put in place.

To ensure that the right measures are identified, **a better understanding of the local environmental conditions that result in the development of these blooms is required.** The **relationship between the occurrence of these blooms and their physico-chemical environment** needs to be better understood. Key to this is **understanding the underlying mechanisms of why blooms of macro-algae in different areas are dominated by different bloom-forming species.** The purpose of this study is to **investigate the effects of nutrients on the eco-physiology of the main opportunistic macro-algae species (*Ulva* spp, *Ectocarpus* spp)** in a selection of estuarine waters, where extensive blooms are known to occur (i.e. Dundalk Bay, Dublin Bay, Tolka Estuary, Argideen Estuary).

The improved knowledge from this research will **help to identify more accurately the causes of blooms and therefore, inform catchment management decision-making regarding the most effective nutrient reduction management options** (e.g. Investment in urban wastewater infrastructure, and/or increased control of diffuse nutrient inputs from agriculture). The findings of this research will inform the selection and development of measures for the next WFD River Basin Management cycle 2016-2021.

Scope:

Proposals submitted under this topic could include:

- **Monitoring and characterisation of nutrient conditions** in areas, which are known to be impacted by opportunistic macro-algal species.
- **Seasonal measurement of the main eco-physiological characteristics** (e.g. Photosynthetic efficiency, tissue nutrient content, nutrient ratios, nutrient uptake rate) of species of opportunistic macro-algae in estuarine and coastal environments over a calendar year.
- **Improved understanding of how changes in nutrient conditions influence the development, abundance, persistence and species composition** of opportunistic macro-algal blooms.
- **Improved understanding of the environmental factors responsible for the occurrences** of opportunistic macro-algal species.
- Improved scientific knowledge that can be used to **inform water management decisions.**

It is expected that, during the course of the project, the research team will be requested to provide interim outputs in order to inform policy. The timeframe for this will be discussed and agreed with the Steering Committee once the project has started.

Project Structure and Funding:

It is expected that this project will be a **Medium-Scale** Project, which will last 24-36 months, with an indicative budget up to €350,000 (which includes a 5% provision for communication costs¹⁶). Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

¹⁶ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

Project Title: *Water Framework Directive – Habitats interface: Hydromorphology and barriers / river continuity*

Project Type: Large-Scale Project

To make an application under this topic area, you must use the following Call Topic Reference:

Water 2015 Call - Project 8

Background:

Many fish species in rivers spend much of their life cycle in a relatively small geographic area – they have a strong residency. This contrasts with migratory fish species, many of which have both a marine and a freshwater component to their life cycle. The adults of migratory species found in Ireland, such as salmon, sea- and river-lamprey and shad species, have the capacity to travel long distances up main stem channels to find spawning grounds. Similarly, juvenile eel migrating into Irish rivers will seek to travel long distances upstream.

Physical barriers to fish migration include both natural barriers, such as waterfalls and geological irregularities, and man-made or artificial barriers. The latter may contain fish pass structures, designed to accommodate upstream-migrating adult salmon. There is evidence that physical structures in rivers and lakes may act as partial or complete barriers to fish passage. The barrier effect may be temporal, may be affected by flow levels etc., but the overall effects associated can be:

- Complete barrier to fish movement;
- Temporal delay to natural fish movements;
- Physical damage to fish species trying to ascend the structure;
- Delay in reaching spawning areas;
- Exposure to stress from temperature effects; and
- Exposure to predation from human, mammalian or bird sources.

The common sight of sea-lamprey spawning effort being focussed downstream of major weirs on main Irish rivers is indicative of a barrier effect. Similarly, adult salmon can be seen in low-flow conditions attempting to ascend structures.

The issue of barriers is relevant to both the Habitats Directive and the Water Framework Directive (WFD). Migratory fish species listed in the Habitats Directive, and for whom Special Areas of Conservation (sacs) have been designated in Irish rivers, include the Atlantic salmon, sea- and river-lamprey and Twaite shad. Evidence indicates that barriers in rivers, including SAC rivers, impact on the conservation status of some of these species. **Within the WFD, the hydromorphology quality element for rivers identifies the importance of ‘continuity’ and of natural river form and characteristics. Barriers act as a discontinuity, impeding natural sediment movement and natural up-and downstream movement of life stages of fish and of invertebrates.** The ‘discontinuity’ effect of barriers may impact directly on upstream fish and invertebrate community composition – species that would be expected to form part of the natural upstream community may be reduced in quantity or be absent. This, in turn may lead to a reduction in the ecological status of the upstream area.

The potential extent of barriers in the River Nore catchment, and impacts on fish species, has been examined by Gargan *et al* (2011)¹⁷. However, Ireland does not have a geo-referenced layer of

¹⁷ Gargan, P. G., Roche, W. K., Keane, S., King, J. J., Cullagh, A., Mills, P. and O’ Keeffe, J. (2011) Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland. *J. Appl. Ichthyol.* 27 (Suppl. 3) (2011), 66–72

‘structures’ in rivers and lake systems. Such a layer would be of significant value in conservation management and in infrastructure planning, the latter allowing a range of potential or actual ecological issues to be examined in the context of road / bridge construction projects, etc..

Scope:

The proposed project could be undertaken in a limited number of catchments of different characteristics, to cover the following:

- Develop **novel desk- and field-techniques** to contribute to the creation of a **national geo-referenced layer for freshwater barriers in Ireland** (i.e. On rivers and lakes);
- **Assess current on-site recording processes** for barrier data capture and identify any shortcomings;
- **Undertake data capture and model the outcomes**, particularly in regard to process for prioritising selection of structures for modification;
- Examine **feasibility of edna techniques** to examine status/distribution of key fish and invertebrate species in areas up- and downstream of barriers and any potential impact of barriers, singly or in combination, on catchment-wide distribution;
- Undertake studies to examine **fish and invertebrate community composition** in areas up- and downstream of barriers and any potential impact of barriers, singly or in combination;
- **Examine and model the impact of impoundment**, from structures of head height not exceeding 5 m, in rivers and lakes and impact of presence and of removal of the impoundment effect on fish and invertebrate productivity, on river hydromorphology and on sediment composition and movement;
- **Economic analysis** of loss due to barriers; potential gain from remediation; and of different mitigation measures.

It is essential that this project be carried out in close linkages with the Inland Fisheries Ireland (IFI) and the EPA. It is expected that some of the research team will be principally based in the IFI Offices to ensure close collaboration with IFI staff. Outputs from this project **MUST** build on the existing IFI database and be fully compatible with the IFI data collection and recording processes. Applicants **MUST** consult with IFI before submitting their proposal to ensure that it is feasible. **The deadline for submission of queries to IFI^[2] is the 10th July 2015 – 5pm. No queries will be entertained afterwards.** Research@epa.ie **MUST** be copied in all communication.

Project Structure and Funding:

It is expected that this project will be a **Large-Scale** project, which will last 36 months, with an indicative budget up to €500,000 (which includes a 5% provision for communication costs¹⁸). **Overheads for this project will be fixed at 20%**, as it is expected that some of the research team member(s) will be based in the IFI offices. Applicants are asked to **complete the normal budget template** available from the Application Form on the online EPA Grant Application & Management system, keeping in mind that the **overheads will be revised accordingly during the Negotiation process**, if the proposal is successful. Please refer to the **2015 Guide for Applicants** for further details. There will be **up to one** project funded under this topic.

^[2] **IFI Contact:** Dr. James King (jimmy.king@fisheriesireland.ie).

¹⁸ For example, a €100,000 grant award is made up of €95,000 for project costs, and €5,000 for communication costs (€3,000 of which relates to communication activities and events which take place over the lifetime of the project and €2,000 which relates to post completion dissemination costs).

3. Expected Outputs

For all projects submitted under the 2015 Water Call, expected outputs include, but are not limited to:

- **Final Report**, which should provide a clear and detailed account of all the steps and methodologies used during the project and ensure that the objectives, set out above, are met – including recommendations.
- **Synthesis Report** (20-30pp), which provide a clear non-technical summary of the research and of the recommendations.
- **Dissemination 2-pager**, which will be used to disseminate the findings of the research to the key stakeholders.
- **Workshop/Dissemination event(s)** to all stakeholders in the relevant arena (e.g. Policy, monitoring, regulatory, NGOs, media, public, etc.).

The list provided above is indicative and relevant alternatives will be considered. Please consult the **2015 Guide for Applicants**, **2015 Guide for Grantees** and the **EPA Terms and Conditions of award** for the **full list** of interim and final reporting requirements.

A **dedicated website/webpage/Twitter account** should be created and maintained, presenting the project and work carried to-date. If you create a Twitter account, please let us know, so we can add you to our [list of EPA funded projects](#) and promote your content to our followers.

It is also expected that a number of **dissemination outputs**, such as policy briefs, peer-reviewed publications and presentations, will arise from the projects.

It is essential that applicants clearly demonstrate, in their proposal, the **policy-relevance** of the outputs of their proposed research; the **applicability** of their findings; and how these outputs address a knowledge-gap and can be **efficiently transferred/applied to the implementation** of water-related policies and the protection of our water resources.

4. Indicative Timeframe

12th June 2015:	Call Opening
10th July 2015 (5pm):	Deadline for queries relating to the technical contents of this call , as well as queries/communication with Irish Water and/or Inland Fisheries Ireland, where relevant
17th July 2015 (5pm)	Deadline for submission of applications by applicants
29th July 2015 (5pm)	Organisation Approval Deadline for authorisation by Research Offices
August/September 2015	Evaluation Process
September/October 2015	Negotiation ¹⁹
November 2015	Grant Award of Successful Projects

¹⁹ The EPA may consider calling the shortlisted applicants for interview at this stage.

5. Further Information

Information on current research projects being supported by the programme is available in the Research Section of the EPA web site (www.epa.ie/researchandeducation/research).

Alternatively, for further information on this call, please contact research@epa.ie

Follow us on Twitter [@eparesearchnews](https://twitter.com/eparesearchnews) to keep up-to-date with all of our activities

ALL QUERIES, OTHER THAN ON THE SUBMISSION PROCESS, SHOULD BE SUBMITTED BY THE 10TH JULY 2015, 5PM AT THE LATEST.

Research@epa.ie MUST BE COPIED IN ALL EMAILS. NO QUERIES WILL BE ENTERTAINED AFTERWARDS.

6. Additional Documentation

Additional Documents available at <http://www.epa.ie/pubs/reports/research/call2015>

- *2015 EPA Research Guide for Applicants*
- *2015 EPA Research Guide for Grantees*
- *2015 EPA Research Terms & Conditions for Support of Grant Awards*
- *2015 Quick guide to the EPA on-line portal (How to make an application)*
- *EPA's Open Data and Open Access Rules*