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Research to Policy Impact through Effective Knowledge Transfer

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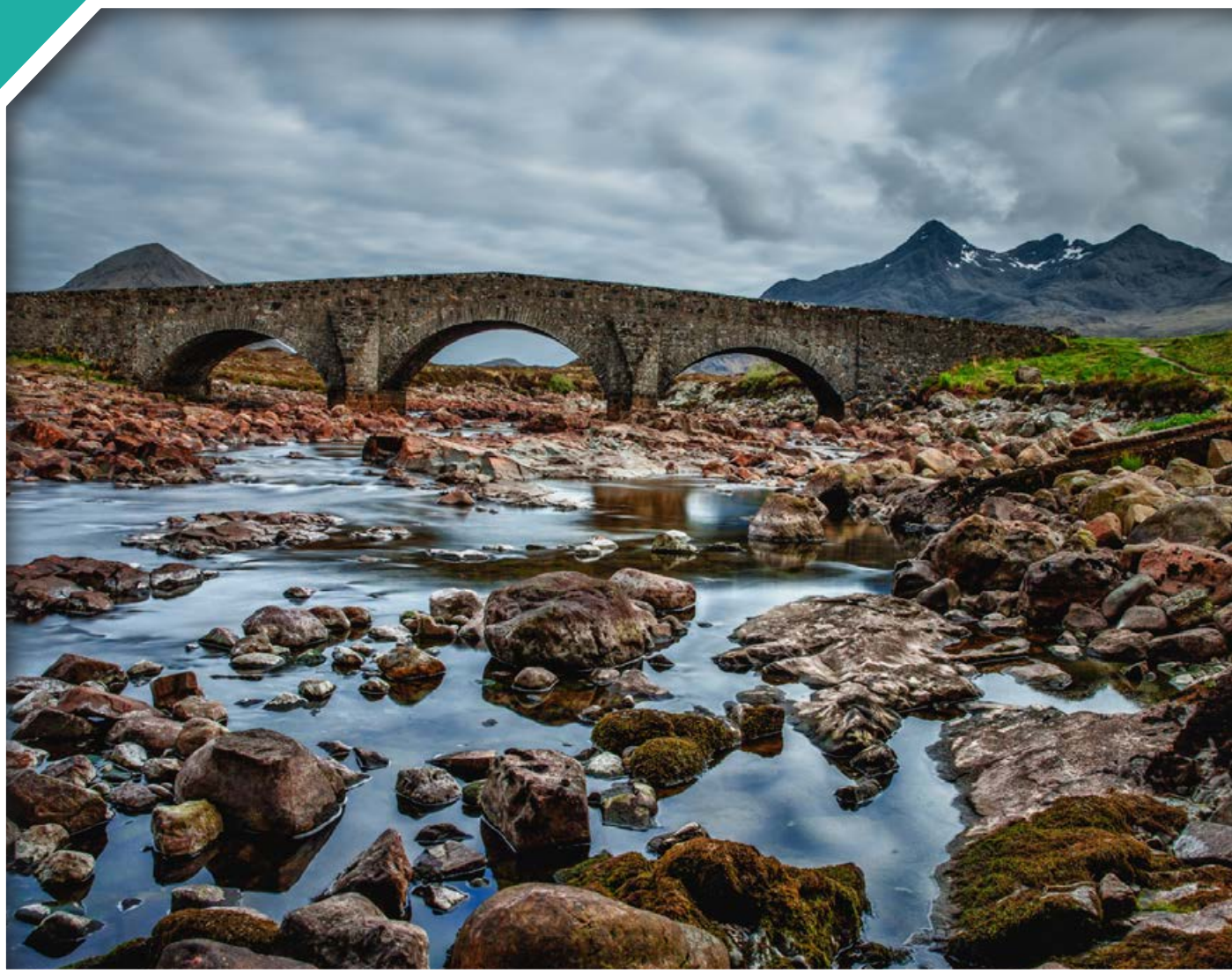

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Rialtas na hÉireann
Government of Ireland

ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: *We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.*

Advocacy: *We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.*

Our Responsibilities

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We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities *(e.g. landfills, incinerators, waste transfer stations)*;
- large scale industrial activities (*e.g. pharmaceutical, cement manufacturing, power plants)*;
- intensive agriculture *(e.g. pigs, poultry)*;
- the contained use and controlled release of Genetically Modified Organisms *(GMOs)*;
- sources of ionising radiation *(e.g. x-ray and radiotherapy equipment, industrial sources)*;
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

National Environmental Enforcement

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by co-ordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

Water Management

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

Monitoring, Analysing and Reporting on the Environment

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government *(e.g. periodic reporting on the State of Ireland's Environment and Indicator Reports)*.

Regulating Ireland's Greenhouse Gas Emissions

- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

Environmental Research and Development

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

Strategic Environmental Assessment

- Assessing the impact of proposed plans and programmes on the Irish environment *(e.g. major development plans)*.

Radiological Protection

- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
- Assisting in developing national plans for emergencies arising from nuclear accidents.
- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

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- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making *(e.g. My Local Environment, Radon Maps)*.
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

Awareness Raising and Behavioural Change

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

Management and structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

EPA RESEARCH PROGRAMME 2014–2020

Research to Policy Impact through Effective Knowledge Transfer

(2017-W-DS-30)

EPA Research Report

End of project report available for download on http://erc.epa.ie/safer/reports

Prepared for the Environmental Protection Agency

by

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DISCLAIMER

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

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Executive Summary

The Irish Environmental Protection Agency (EPA) has funded research projects that have increased national understanding of our environment; the challenges it faces; and how Ireland can move towards a more resource-efficient and environmentally friendly economy. However, despite efforts to improve the communication of project findings, translating research into measurable impact – beyond publications – remains a challenge for the scientific community.

Through the "Research to Policy Impact through Effective Knowledge Transfer" project, AquaTT applied a self-designed and proven knowledge transfer methodology to 20 selected EPA-funded projects. The objectives of the project were to identify completed communication activities of the projects and assess what impact had been achieved and where further impact could be facilitated. The findings were consolidated into knowledge transfer recommendations for Irish environmental research funding organisations and are available in a guidelines document, available at www.epa.ie/researchandeducation/research/researchpublications/. The full results of the project are available in the final report, which can be accessed at http://erc.epa.ie/safer/. This synthesis report describes the activity and outputs of each task relating to this study, as detailed in the following sections.

Pilot Exercise on Knowledge Transfer

AquaTT's knowledge transfer methodology is a stepwise process, modular and easily replicable across different funding programmes, themes and project types. AquaTT breaks projects down into distinct knowledge outputs. Furthermore, these knowledge outputs are not limited to *de novo* or pioneering discoveries, but may also include new methodologies, processes, adaptations, insights and alternative applications of prior know-how and knowledge. AquaTT applied this methodology to 20 past projects proposed by the EPA as part of the pilot study.

Understanding Project Communication Activities and Related Cost-effectiveness

During interviews with the researchers, AquaTT analysed the communication activities originally undertaken by the projects, finding that:

- over half of the projects completed communication activities satisfactorily;
- often the most significant measurable impacts came from engagement with users;
- benefits are clearly seen when significant focus is placed on communication;
- communication outside the project could have been improved with the addition of targeted knowledge transfer activities;
- further success was recorded when post-project activities combined/clustered findings from multiple projects;
- one-quarter of the projects had no budget specifically allocated to communication; and,
- projects with the most effective communication and dissemination activities had a dedicated work package and a communication budget of close to 5% or more.

Knowledge Transfer Guidelines and Recommendations for Irish Funding Agencies

The incorporation of more knowledge transfer principles into environmental research funding programmes could help improve the uptake of state-of-the-art knowledge and application in important processes such as environmental policymaking, implementation and monitoring. An increase in measurable impacts from research investments can help funding bodies demonstrate value creation and justify investments in research going forward. This project produced six recommendations for funding bodies on incorporating knowledge transfer principles into funding programmes:

- **Recommendation 1:** Funding call topic descriptions should provide clear expectations of the anticipated impacts of a project, distinguishing

between what is expected within the lifetime of a project and what ultimate impacts the project may contribute to over time (post project).

- **Recommendation 2:** Funding agencies should consider providing guidance, support and training, with corresponding application form templates, to help projects design fit-for-purpose communication activities.
- **Recommendation 3:** Funding agencies should provide guidance and training to evaluators so that they can assess the suitability of communication activities. Where needed, improvements to proposed communication activities should be made at the project negotiation stage for successful bids.
- **Recommendation 4:** Funding agency staff tasked with monitoring project implementation should understand knowledge transfer principles and strategies so that they can effectively monitor and support projects.
- **Recommendation 5:** Templates and instructions for official project reporting should prioritise the identification of generated knowledge outputs, executed knowledge transfer activities and the impacts of the application of such knowledge.
- **Recommendation 6:** Funding mechanisms for supporting post-project knowledge transfer would help maximise the potential of measurable impacts from research investments.

This project highlighted a lack of established terminology and processes for knowledge transfer. Currently, there are few relevant guidelines for Irish-funded research, and the methods and understanding vary widely project to project. The objectives of and methods for communication activities within projects must be better defined – delineating dissemination, outreach, knowledge transfer, exploitation and technology transfer. Actors throughout the research system require upskilling to help them better understand the concepts of and methodologies for effective communication and how to measure their success. The roles and responsibilities of actors in the process need to be reassessed as it is often unclear who is responsible for knowledge transfer.

1 Introduction

The Europe 2020 Flagship Initiative Innovation Union (EC, 2010) states that "we need to get more innovation out of our research" and, as stated by Máire Geoghegan-Quinn, the previous European Commissioner for Research, Innovation and Science, "Europe needs to better capitalise on its inventions [and] build a fully functioning 'Single Market for Innovation'" (EC, 2011). Capitalising on innovation and invention necessitates, first, that it is recognised when a piece of knowledge may have an application beyond the research environment. Second, this knowledge must be successfully transferred to and applied by a relevant party. Acknowledging this, the European Commission (EC) is demanding improved systems and methodologies for knowledge capture and transfer to show demonstrable impact from EC-funded research. Activities to exploit research and innovation results are now a fundamental aspect of the EC's current Research and Development (R&D) Framework Programme, Horizon 2020.

Despite the efforts of funding agencies to support impact creation and to support researchers to improve the communication and dissemination of their findings, communication beyond publications remains a challenge for the scientific community. The single action of making knowledge publicly available, through dissemination, does not always result in application, nor exploitation and subsequent impact. A more proactive approach, known as "knowledge transfer", is required in order to be able to demonstrate measurable value creation.

For several years, AquaTT has focused on developing a robust methodology for knowledge transfer to help unlock the potential of research knowledge. Through several distinct knowledge transfer projects, AquaTT has developed a proven, innovative methodology to capture and transfer knowledge from research, which was often previously unknown or inaccessible. Unlike standard dissemination activities, which tend to focus nearly entirely on the final results of projects and research, AquaTT's methodology breaks projects down into distinct knowledge outputs. Furthermore, these knowledge outputs are not limited to *de novo* or pioneering discoveries, but may also include new methodologies, processes, adaptations, insights and alternative applications of prior know-how and knowledge (AquaTT, 2015a). This unique approach increases the likelihood of finding high-potential knowledge that might not otherwise be known or accessible, thus broadening opportunities for impact.

The current iteration of the AquaTT knowledge transfer methodology was developed under the COLUMBUS project (AquaTT, 2015a), and ensures that the transfer of knowledge is strategic, co-ordinated and effective. Written and managed by AquaTT, the COLUMBUS project is recognised as the EC's largest investment into knowledge transfer to date (€4m, 2015–2018, 26 partners). COLUMBUS built significant capacity in a community of knowledge transfer professionals; ensured the accessibility and uptake of research knowledge outputs by end-users from policy, industry, science and the wider society; and created measurable added value from EC investment into marine and maritime research (AquaTT, 2015b).

Affirming the message that communication plays an important role in creating impact from research, it is now mandatory for all Irish Environmental Protection Agency (EPA)-funded projects to have a communication plan and allocate 5% of the overall budget to communication activities (EPA, 2017). However, it is recognised by the EPA that providing support to researchers on how to carry out knowledge transfer, through the provision of tools such as the EPA Resource Kit (developed by AquaTT, 2013), is only one step towards maximising research impact. There is also a critical necessity to review the processes within the Irish funding programmes and research system to ensure that the required culture, support and processes exist to enable effective knowledge transfer implementation.

The EPA-funded "Research to Policy Impact through Effective Knowledge Transfer" project (January 2017–December 2018) was developed to identify key knowledge outputs of relevance to policy and society from past EPA-funded projects and explore whether successful knowledge transfer has been or could be carried out to maximise the impact of research investments. The EPA's expressed goal for this project

was to better understand how knowledge transfer principles could improve communication between researchers, society, industry and policymakers regarding Irish environmental issues and challenges. In recent years there has been a growing recognition that, for environmental policy to be most effective, policymakers and regulators need to be well informed by science. The major barriers to successful science-to-policy communication relate largely to the nature of environmental science and policymaking, and the endemic gaps between them. This report provides an overview of the work carried out in determining how effective dissemination of outputs and findings to users (including public bodies, non-governmental organisations and other researchers) can be supported by Irish funding agencies through improved processes and policies. These findings also informed the development of recommendations for Irish environmental research funding organisations on how knowledge transfer principles can be incorporated into funding programmes and increase their impact potential.

1.1 Objectives

This project was developed to explore and, where possible, describe how to maximise the impact potential of selected EPA-funded projects. Its objectives were to:

- unlock the potential of past and current knowledge from a sample of EPA-funded research projects ($n = 20$) by using proven innovative methodologies to identify and collect knowledge outputs;
- identify best practice examples of communication activities funded by the EPA that have resulted in impact;
- analyse research knowledge outputs in order to identify key promising results that have the potential to support environmental protection;
- carry out targeted and customised knowledge transfer activities that result in a measurable impact on application by a targeted end-user (from science, policy, industry or society);
- provide a set of recommendations to improve the Irish research funding system's capacity to optimise, encourage and reward effective knowledge transfer.

2 What is Knowledge Transfer?

The differences between communication, dissemination, exploitation and knowledge transfer can be subtle, with the different terms often used interchangeably. Differing understandings of terms can lead to variances in project expectations, which can be a challenge, specifically for those responsible for administering research funding. For example, if general communication activities are specified at call stage by the funder as the approach to be taken, yet the expected outcome at project end is a targeted communication campaign and measurable impact, then there is likely to be a mismatch. Such a discord in expectations may lead to frustrations on both sides and there is a high likelihood of resources allocated to communication activities not being used effectively. Clear consistent use and understanding of terminology at all stages, aligned with management of expectations, can greatly improve this situation. For the purposes of this project, AquaTT defined the terminology as follows:

- *Communication* is considered to be the overarching term that covers dissemination, outreach and knowledge transfer. It is the act of imparting or exchanging information, ideas or feelings by speaking, writing or using another medium.
- *Dissemination* is a one-way form of communication, spreading knowledge widely, often to a non-specific audience. Dissemination is commonly used to promote activities and raise awareness of research projects' aims and objectives, using a range of media such as leaflets, websites and events.
- *Knowledge transfer* describes a two-way process through which a knowledge output moves from a knowledge source to a targeted potential user, who then applies that knowledge. A *knowledge output* is a unit of knowledge or learning generated by or through research activity.[1] The reason that knowledge transfer is described as a two-way process is because its core philosophy is to frame transfer activities around target users' needs.

Whereas dissemination activities determine an audience and result in development of materials that are suitable for that group of people, effective knowledge transfer requires that a specific target user is profiled and bespoke materials are developed in a medium that is framed for and specific to that user's motivations, role, needs and interests.

2.1 Key Terms

Several terms are regularly used in this document. This section provides an explanation of how these terms relate to each other. The definitions below may differ from those used in other sources but are the adopted definitions of AquaTT:

- *Knowledge transfer.* The term for the overall process of moving knowledge between knowledge sources to the potential *targeted* users of knowledge. Knowledge transfer consists of a range of activities that aim to capture, organise and assess knowledge, skills and competence and transmit them from those who generate them to those who will utilise them.
- *Knowledge output*. A unit of knowledge or learning generated by or through research activity. Knowledge outputs are not limited to *de novo* or pioneering discoveries but may also include new methodologies/processes, adaptations, insights and alternative applications of prior know-how/ knowledge.
- *Knowledge output pathway*. This can be one step or a series of steps required to carry a knowledge output to its eventual impact. It is also called a pathway to impact. When there is a series of steps, it will include detailed mapping of the steps, the users involved at each step and their predicted role in the pathway to eventual impact.
- *Eventual impact*. The ultimate *end* benefit of the application of the knowledge output.
- *Transfer impact*. The demonstrable evidence that a knowledge output has travelled down a single step on the knowledge output pathway.

1 Definition developed by AquaTT in the context of knowledge management in the MarineTT project.

- *Target user(s)*. The individual(s) identified in the knowledge output pathway to whom a knowledge fellow will transfer the knowledge output.
- *End-user(s)*. The individual(s) who will apply the knowledge output at the end of the knowledge output pathway.
- *Exploitation partner*. An *external* organisation/ institution/individual who has an interest and/ or expertise that may assist in transferring the knowledge output down the knowledge output pathway to its eventual impact.

2.2 The AquaTT Knowledge Transfer Methodology

The knowledge transfer process developed by AquaTT has been steadily refined and tailored over the years to keep pace with emerging cultural and communication trends, as well as both European Union and Member State research policies. It is designed to ensure that the transfer of *generated knowledge* is strategic, co-ordinated and effective and that impact is measurable.

Knowledge outputs are at the very core of AquaTT's knowledge transfer philosophy. AquaTT has found that one of the reasons scientific research struggles to find practical application is that the implications of traditional research outputs are not readily understood by users further down the value chain or who do not have expertise in the subject area. The first step in AquaTT's process therefore breaks project results down into distinct units of knowledge generated through research activity, called knowledge outputs, as defined previously.

The AquaTT knowledge transfer methodology can be broken down into five steps:

1. collect knowledge;
2. assess knowledge;
3. profile target users;
4. develop knowledge transfer plans;
5. transfer and measure impact.

3 Pilot Exercise on Carrying Out Knowledge Transfer

The basis of this EPA-funded project was to pilot the AquaTT knowledge transfer methodology on 20 projects (Table 3.1), proposed by the EPA. This was conducted to better understand the impact that their resultant knowledge had already achieved; identify and carry out any further activities that could result in more impact; and, overall, propose recommendations for Irish funding agencies on how knowledge transfer principles could be applied to current or future funding programmes to make them more impact orientated.

The following sections outline the activities performed, as well as the insights and experiences that have informed the recommendations for funding agencies detailed in Chapter 5.

3.1 Knowledge Collection

During the collection phase, AquaTT reviewed the 20 projects selected by the EPA and preliminarily identified and described the generated knowledge outputs based on available project reports. Following this, interviews were carried out with the lead researchers of the projects to review the captured information and add any missing knowledge outputs. The descriptions of these knowledge outputs were then expanded, refined and returned to the researchers for validation before moving on to the next step.

For each knowledge output, the following details were identified:

- short title;
- project number;
- project title;
- knowledge output description;
- knowledge type;
- contact information;
- link to knowledge output;
- project policy relevance;
- sectors and subsectors;
- end-user(s);
- potential application;
- intellectual property rights;
- status;
- end-user description;
- potential impact;
- potential impact to environmental protection objective;
- project exploitation;
- key selling point(s);
- potential exploitation mechanism.

Each project's knowledge outputs were collected using a standardised template, referred to as a knowledge output table. The knowledge output tables for all of the projects listed in Table 3.1 have been provided to the EPA in a confidential document until plans for their public release have been determined. These knowledge output tables were used to inform the next steps of the process.

From the 20 projects, a total of 68 knowledge outputs were described. The final descriptions of these knowledge outputs were then clustered into three topics to simplify analyses processes:

1. strategies for the Marine Strategy Framework Directive and Water Framework Directive;
2. tools for monitoring;
3. tools to improve water quality.

3.2 Knowledge Analysis

The lack of a proper assessment of generated knowledge has been found to be a significant barrier to knowledge transfer in many research projects. This is because effective transfer requires an in-depth understanding not only of the science, but also of the knowledge landscape, value chain and potential applications both within the field and within other disciplines. Within this project, the assessment, often referred to as the "analysis", stage of the process was deemed highly successful and reinforced its importance in planning and carrying out robust knowledge transfer activities.

The assessment stage clarifies how the knowledge outputs could be beneficial to different stakeholders by defining who the "end-user(s)" of the knowledge may be and what "eventual impact" will be had by their application. Frequently, however, once end-users and

Table 3.1. EPA-funded projects for the pilot exercise on knowledge transfer

No.	Project type	Title of report	Start date	End date
1	Desk study	Economic Assessment of the Waterborne Outbreak of *Cryptosporidium hominis* in Galway, 2007	01/04/2014	01/03/2016
2	Capability development	Contaminant Movement and Attenuation along Pathways from the Land Surface to Aquatic Receptors: The PATHWAYS Project	01/07/2008	01/01/2015
3	Desk study	Towards an Integrated Policy Framework for Marine Spatial Planning in Ireland	02/01/2015	02/02/2016
4	Desk study	Ecosystem indicators for the Marine Strategy Framework Directive (MSFD)	01/12/2011	01/09/2012
5	Medium-scale project	Development of a Pulsed Light Approach as a Novel Solution in Drinking Water Treatment	09/01/2012	09/01/2014
6	Medium-scale project	Assessment and Monitoring of Ocean Noise in Irish Waters	09/01/2012	30/10/2013
7	Desk study	Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems	10/10/2012	14/12/2013
8	Desk study	Scope, Fate, Risks and Impacts of Microplastic Pollution in Irish Freshwater Systems	16/02/2015	15/02/2016
9	Medium-scale project	Assessment of Exposure to Metallic Nanoparticles (NPs), Focusing on Silver (AgNPs) on Marine and Fresh Water Model Organisms at a Cellular and Genetic Level	01/09/2008	02/04/2012
10	Medium-scale project	Cryptosporidiosis: Human, Animal and Environmental Interface	01/10/2008	03/06/2013
11	Fellowship	Development of Remote Sensing as a Tool for Detection, Quantification and Evaluation of Submarine Groundwater Discharge (SGD) to Irish Coastal Waters	01/04/2009	01/11/2012
12	Large-scale project	Assessment of Disposal Options for Treated Waste Water from Single Houses in Low Permeability Subsoils	01/03/2011	01/06/2014
13	Medium-scale project	Towards Developing a *Cryptosporidium* Monitoring Protocol	01/09/2010	28/02/2014
14	Desk study	Management Strategies for the Protection of High Status Water Bodies	13/12/2010	13/02/2012
15	Capability development	Assessment of the Impacts of Forest Operations on the Ecological Quality of Water	01/05/2008	31/01/2015
16	Medium-scale project	Identifying the Biological and Geographical Origins of Faecal Contamination	01/11/2008	31/10/2014
17	Developing environmental research potential	The Assessment and Potential Human Impact of Exposure to Environmental Contaminants on Marine and Freshwater Bivalves	01/03/2008	01/08/2013
18	Medium-scale project	On-site Wastewater Treatment: Investigation of Rapid Percolating Subsoils, Reed Beds and Effluent Distribution	01/01/2005	Not listed
19	Large-scale project	Water Saving Technologies to Reduce Water Consumption and Wastewater Production	01/03/2011	01/06/2014
20	Medium-scale project	Monitoring of Priority Substances in Waste Water Effluents	01/10/2007	Not listed

The reports are available in the EPA research reports database (http://www.epa.ie/pubs/reports/research/).

eventual impacts have been identified, it becomes apparent that the knowledge outputs being evaluated are not sufficiently developed/ready for direct transfer, as was often the case within this project. The AquaTT knowledge transfer methodology thus also uses the assessment stage to map the knowledge landscape, including any relevant authorities or influential parties – and their respective roles, responsibilities and interests – who might serve as intermediaries in the transfer process. AquaTT defines these actors as “target users” and the ultimate goal of the assessment stage is the development of “knowledge output pathways”, otherwise known as “pathways to impact”, that prescribe potential routes for guiding

knowledge outputs through the knowledge landscape to their eventual impact. Intensive and encompassing analysis requires multiple perspectives, which is why the assessment stage encourages the use of expert analysis meetings to evaluate and map the knowledge and its surrounding landscape.

Working with the EPA, an initial list of potential experts was created in September 2017. These experts were invited to join the Expert Committee and to participate in an analysis meeting to review the knowledge identified in the 20 EPA-funded projects. On 31 October 2017, AquaTT hosted an external analysis meeting to provide third-party validation of the knowledge outputs and to identify priority knowledge outputs with high potential for impactful knowledge transfer. This meeting was attended by 10 water quality and environmental experts from six different institutions. This meeting proved to be a useful exercise for validating and evaluating the potential of knowledge outputs, as well as for gathering feedback on the analysis process itself. The meeting identified specific ways in which the collection and analysis process could be further refined, such as adding further detail to the knowledge output descriptions and organising tailored analysis meetings related to specific knowledge outputs, with experts selected based on their area of expertise.

As the project progressed, it became apparent that the knowledge outputs could be neatly clustered into three topics: (1) strategic options to improve the Marine Strategy Framework Directive (MSFD) and Water Framework Directive (WFD); (2) tools for monitoring, detection and identification; and (3) tools for improving water quality. It was felt that a single expert committee would not have sufficient expertise to cover all of these topics in the detail that they required. Accordingly, three groups were constructed. Twenty-one experts engaged in the analysis process from different organisations, including the EPA, Geological Survey Ireland (GSI), National University of Ireland Galway, Department of Housing, Planning and Local Government, Teagasc, Local Authority Waters and Communities Office (LAWCO) and Fresh Thoughts. AquaTT organised three further analysis meetings focusing on the specific topics, allowing each of these three expert groups the opportunity to discuss in detail their allotted portion of the 68 knowledge outputs.

Prior to attending the analysis meeting, the experts were asked to review the knowledge outputs remotely. First, the experts were asked to read each knowledge output description to gain enough understanding of the presented knowledge. They were then asked to score each of these knowledge outputs according to the potential level of impact (in their opinion) on four main sectors: science, society, policy and industry. The level of impact denotes the opinion of the experts on the level of potential impact that the knowledge output could have on its intended end-user, if it were transferred. The levels of impact were defined as:

- Low – the transfer of this knowledge would have little or no impact or may lead to localised uptake by a narrow, peer community.
- Medium – the transfer of this knowledge may result in some impact in a specific sector or region. Notable adaptation of behaviour or processes is likely to be observed because of the transfer activity.
- High – significant effect on or change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia. The reach of the transferred knowledge may be national or global and could lead to cross-sectoral pollination of new research areas, projects, technologies or relationships.

Once the analysis process was completed, of the 68 knowledge outputs that were collected and assessed, 42 were identified as having a high potential for transfer (within the limits of the project, in terms of resources and time).

3.3 Developing Pathways to Impact

A major function of the analysis meetings was collecting information about the landscape and value chain surrounding the knowledge outputs. All experts were invited to add, amend or query important information relating to the prioritised knowledge outputs. Next, they were asked to identify an application and eventual impact for each knowledge output (that could differ from that proposed by the project researchers itself). They were then asked to provide advice on key actors (competitors, target users, potential partners) and activities (projects, policy developments, events) that might inform future transfer activities for each knowledge output

and corresponding impact. They were also asked to identify a target user who should be approached first and/or targeted.

Based on the discussions, AquaTT developed nine knowledge output pathways that clustered 29 high-priority knowledge outputs, mapping a pathway to impact with the best identifiable chance of reaching the end-user and eventual impact.

3.4 Profiling Target Users

Following on from the development of the pathways to impact, or knowledge output pathways, the necessary next step was to profile the identified target users to inform a detailed and customised "knowledge transfer plan". It is important to note that a target user is not an organisation; rather, it is the individual (or individuals) within an organisation with a specific mandate or responsibility to carry out the proposed uptake activities. Target users should be selected for their specific capacity and motivation to carry the knowledge along the knowledge output pathway towards its eventual impact. It is a common trend within the communication, dissemination and exploitation plans and actions of many research projects that targeted audiences or potential stakeholders are only ever described to the organisational level. This often results in vague messaging and can make it difficult for even well-crafted activities to take hold in the desired institutions, as they may never reach the correct individual target user. Ireland has the advantage of having a relatively small and interconnected community, particularly within environmental sectors. This is another reason for the importance of the analysis meetings with numerous experts described earlier, as they increase the odds that someone will be able to name specific target user(s).

Profiling the targets user is a crucial step. These individuals are not necessarily the end-users or beneficiaries of the knowledge outputs, but they can be the stepping stone needed for the knowledge outputs to progress towards eventual impacts. This step ensures that sufficient information is collected about target users to design knowledge transfer activities that will suit their profile, including their incentives, motivations, preferences and needs. Developing a sufficient profile of a target user often requires drawing from contacts and experience and conducting a desk-based study.

The following was considered when profiling a target user:

- the target user's mandate or responsibilities;
- their background knowledge, attitude and practice in relation to the issue;
- their knowledge needs;
- what and who may influence their decisions;
- their preferred sources of information and knowledge.

3.5 General Notes on Stakeholder Profiles by Type

- *Policy actors*. Persons associated with policy (e.g. politicians, policymakers, decision makers) typically come from very different backgrounds, including scientific disciplines. They have many issues to deal with in their job and varying roles and responsibilities, and without the correct pitching it is difficult to gain their attention and become a priority. They also have conflicting sources of information and knowledge. They are likely to receive information from mass media, lobby groups, civil society organisations and other scientists. Definition: Any individual(s) who by mandate or interest play a role in policy decision making at any stage within the policy process. The position encompasses many roles, from influence or direct involvement in the creation of a policy to enabling its compliance.
- *Industrial stakeholders*. In industry, profitability will be at the forefront of any organisational decision. It is important to be aware of competition and the market, and to have a deep understanding of the landscape of a distinct industry. The breadth of industry relevant to scientific research is near to endless, so innovative thinking is required to discover opportunities for transferring knowledge to create value and successful case studies. Definition: Any individual(s) who by employment, association or interest play a role in decision making at any stage of the industrial process. The position encompasses many roles including investment, invention or distribution and enabling the adoption of knowledge outputs.
- *Peer scientists and academics*. Albeit operating in a similar way (testing hypotheses and reporting the outcomes), academics and peer scientists will often be specialists in a

very particular discipline and may have no comprehension of closely related fields and cross-disciplinary opportunities. The level of their understanding within a specific area will be robust and rigorous. Their depth of knowledge in associated fields, and therefore the insight into what benefits their knowledge outputs could lead to, may be lacking. Definition: Any individual(s) who by employment, association or interest play a role in decision making at any stage within the research acquisition and development process. The position encompasses many roles, from influence or direct involvement in the creation of a policy to enabling its compliance.

- *Society and its citizens*. This group will cover a greater cultural and academic scope of backgrounds than the other stakeholder groups and will vary in age and interest. They are likely to receive a disproportionate amount of their information from mass media, lobby groups and civil society organisations, and competition for intellectual space, particularly that hoping to lead to action, will be high.

3.6 Designing Knowledge Transfer Plans

AquaTT understands that implementing an efficient knowledge transfer plan and maximising the chance of successful transfer resulting in uptake and application requires the plan to be tailor-made to the needs and capacities of a specific target user. The key to success is achieved through fully understanding the target user and developing the knowledge transfer plan according to their preferences. The profile of the identified target user, as described previously, provides the insights required to develop tailored knowledge transfer plans. In this step, specific consideration was given to the type of message, as well as the channel by which it was to be communicated.

When determining the message to communicate, the following were considered:

- the technical level of the target user, the depth of information needed and the style and language used (e.g. a layperson is less likely to read and interpret a scientific paper; a scientific adviser is unlikely to rely on information from an outreach article);
- the background knowledge of the target user;
- any pre-conceived ideas that the target user may have relating to the area of interest;
- ways to relate the knowledge to examples that the target user is familiar with or can easily envisage;
- the level of evidence or validation that the target user requires.

When determining the ideal communication channel, the following were considered:

- How does the target user prefer to receive and assimilate knowledge?
- How could the channel affect the message (e.g. highly technical knowledge would be used neither in a Twitter post nor on the radio)?
- How combining communication channels as part of a knowledge transfer plan could have several benefits:
  - It makes it possible to layer the knowledge, thereby first catching the attention of the target user and then providing in-depth material once they are engaged.
  - When there is a mixed profile of target users, it allows them to have a choice of their preferred channel to receive the same knowledge (e.g. different age profiles of the same target user).
- When the target user profile allows for a choice of channels, to compare the cost versus effectiveness of each channel considering the following questions:
  - How many target users could be reached by this channel?
  - How much would it cost to use this channel?
  - How much time resource would it require?

When determining the indicators of impact, the following were considered:

- How can the success of the knowledge transfer activity be ascertained?
- How can the *effective uptake* by the target user be measured?
- How can the *application of the knowledge* by the target user be assessed?
- Which indicators can be used to *track progress* through the knowledge output pathway?

Nine knowledge transfer plans (Box 3.1), based on the first step of each of the previously described nine

Box 3.1. Knowledge transfer plan titles

- How to Address Microplastics Contamination
- Medical Point Care Technology for Chemical Screening in Water and Seafood
- Expanding a Shared Database of Knowledge
- Geographic Information System Decision-making Tool for Siting Domestic Waste Water Treatment Systems
- Instituting Better Practices for Sludge Collection and Treatment
- Expanding Remote Sensor Coverage of High-status Water Bodies through Citizen Science
- Best Practices for Microplastics Flow Research
- Expanding the Toolset of the Waters and Communities Office
- Pulsed Ultraviolet Technology for Implementation in Recirculating Aquaculture Systems

knowledge output pathways, or pathways to impact, were developed to transfer 29 knowledge outputs, as in many cases the knowledge was clustered for added value. For each knowledge transfer plan, the proposed knowledge transfer activity, channel, format, timeline and level of resources are outlined.

3.7 Carrying out Knowledge Transfer and Measuring Impact

Once a knowledge transfer plan was developed, knowledge transfer activities were planned within the remaining time frame of the project. Nine knowledge transfer activities took place and were written up as case studies, and they cumulatively represent the transfer of 29 individual knowledge outputs from 14 of the sample research projects. These nine case studies represent activities that AquaTT hoped would be achievable over the course of the study according to time and budget restraints; however, there would be scope for further transfer activities if further resources were available within the project or if they were to be assigned in the future.

In order to demonstrate the broad application of the knowledge transfer methodology, AquaTT targeted a range of sectors (i.e. industry, policy, science or public) and attempted to demonstrate a variety of mechanisms of transfer.

Each case study described:

- *Original project*. The title of the project(s) from which the knowledge output(s) were collected.
- *Knowledge output*. A brief description of the knowledge output(s). These may have been condensed or reworded slightly from the original knowledge output table to more accurately reflect the language that was used in the course of the knowledge transfer.
- *Knowledge need*. A description of the landscape of knowledge that led to AquaTT identifying a potential application and impact of the knowledge.
- *Knowledge output pathway*. A brief narrative explaining the logic and plan behind AquaTT's selection of the target users and the overall objective of the knowledge transfer.
- *Target users and knowledge transfer*. A description of who the target users were identified as and how the knowledge transfer itself was carried out.
- *Measuring impact*. An explanation of how the knowledge transfer activity was measured.
- *Next steps*. A brief explanation of the next actions needed to continue the knowledge output down the knowledge output pathway.

4 Understanding Project Communication Activities and Related Cost-effectiveness

During the interviews with the researchers, AquaTT reviewed the communication activities[2] that had been undertaken in the projects. For example, project co-ordinators were asked to describe how they had fulfilled their dissemination and communication obligations in the original proposal (i.e. disseminating the project goals, outcomes and impacts). This information was compared against the original proposals and the project objectives to assess the effectiveness of their efforts. The total budget of each reviewed project was compared with the budget that was allocated to dissemination and communication. In many cases, these costs were hidden within project management work packages or the costs were not clearly outlined in the proposals. A full report detailing the cost-effectiveness of the 20 projects that formed this pilot exercise has been provided to the EPA on a confidential basis. Key findings are described below.

In terms of communication activities:

- In total, 60% of the 20 projects ($n = 12$) were found to have completed communication activities satisfactorily or made a step towards achieving their potential impact.
- Often, project results were presented at many conferences and referred to in many publications and theses; however, the most significant measurable impact could be seen from engagement with the end-users over the duration of the project (which was often not reflected fully in the final report).
- When significant focus was placed on communication in the project design, for example by inclusion of a specific work package, the benefits are more clearly seen in terms of visibility of the project by stakeholders, as well as commendation by the funding body.
- It was proposed that one of the challenges of trying to hold workshops for small projects is competition for stakeholder attention with several other small projects, and that research is often too specific to attract stakeholders' interest. Additionally, such workshops place a large administrative and logistical burden on researchers.
- Communication of the project results to stakeholders outside the project was sometimes limited and could have been improved with the addition of targeted knowledge transfer activities.
- Further success was recorded when post-completion activities combined findings from multiple projects.

In terms of budget:

- One-quarter of the projects had no budget allocated to communication activities.
- The budget that would pay for dissemination and communication activities was commonly allocated in broad work packages and therefore its distribution is unclear.
- When the amount spent on communication was clear, only one project allocated a budget to dissemination and communication that exceeded the EPA's 5% cut-off.
- Interestingly, those projects that completed the most effective communication and dissemination activities had described a work package that includes communication with a budget of close to 5% or more.

2 It is important to note that the scope of this assessment extended only to reviewing the impacts of the communication activities carried out in these specific projects. Therefore, this study has not considered the communication activities of any follow-on research that might have been conducted, as this would not accurately reflect the potential impact from any single research project.

5 Knowledge Transfer Guidelines and Recommendations for Irish Funding Agencies

> In line with Irish, European and international policies, Ireland needs to transition towards a resource-efficient, low-carbon and environmentally-friendly economy in which the resources and services provided by our planet are protected and enhanced, and citizens' health and wellbeing are safeguarded. (EPA, 2014a)

Environmental research provides essential scientific support for environmental policy development, implementation and broader decision making. The Irish EPA, as well as other government-supported initiatives, have funded research that has increased the national understanding of our environment, the challenges it faces and the responses to these challenges. They have also developed high-quality research capacity and supported innovation that is internationally respected. However, despite making efforts to improve the communication of research findings, the translation of research into measurable impact – beyond publications – remains an ongoing challenge.

Over the past few years, the EPA has been increasing its focus on the communication activities of its funded projects, as well as providing improved support and guidance to its applicants and grantees, including the provision of knowledge transfer-specific guidelines. However, the EPA has also recognised that providing support to researchers on how to carry out knowledge transfer, through the provision of tools such as the EPA Resource Kit developed by AquaTT (2013), is only one step towards maximising research impact. There is also a critical necessity to review the processes within the Irish funding programmes themselves to facilitate the culture, support system and respective methodologies for enabling effective knowledge transfer.

Over the course of this study, AquaTT interacted with a variety of actors within the research project lifecycle, including researchers, project co-ordinators, representatives of the funding body and users of knowledge generated through publicly funded research. Based on these observations and past experiences, AquaTT has developed a set of recommendations for Irish funding bodies on how to embed knowledge transfer principles into all stages of the research lifecycle. It is the belief of the authors that adopting even some of these would maximise the likelihood of effective knowledge transfer, resulting in increased measurable impacts. It is important to note that not all of these recommendations will be relevant to all of the very different types of public funding programmes covering many scales (e.g. budget, geographic coverage), but it is possible to take on one or several of the recommendations as opposed to them all.

Six recommendations have been proposed for funding agencies to incorporate knowledge transfer principles into funding programmes. These are listed below but are further defined and described along with proposed actions in the EPA-published report "Knowledge Transfer Guidelines and Recommendations for Irish Funding Agencies: How to Embed Knowledge Transfer Principles into Irish Funding Programmes to Help Maximise Measurable Impacts from Public Investments", which will be available for download from the EPA website (http://www.epa.ie/pubs/reports/research/).

On 27 November 2018, AquaTT presented the project findings to the National Water Research Coordination Group. The aims and objectives of this group include facilitating an exchange forum between research funders and key stakeholders and so this was an ideal opportunity to share the findings of this project. This group consists of the Marine Institute, Teagasc, the Department of Agriculture, Environment and Rural Affairs (DAERA), Northern Ireland, the Department of Agriculture, Food and Marine, the Department of Housing, Planning and Local Government, Enterprise Ireland, the EPA, the GSI, Inland Fisheries Ireland, the Irish Environmental Network, the Irish Research Council, Irish Water, Met Éireann, the National Parks & Wildlife Service, the Office of Public Works, Science Foundation Ireland and the Sustainable Energy Authority of Ireland.

Recommendations for national funding agencies to embed knowledge transfer systems in current and future funding mechanisms are as follows:

- **Recommendation 1:** Funding call topic descriptions should provide clear expectations of the anticipated impacts of a project, distinguishing between what is expected within the lifetime of a project and what ultimate impacts the project may contribute to over time (post project).
- **Recommendation 2:** Funding agencies should consider providing guidance, support and training, with corresponding application form templates, to help projects design fit-for-purpose communication activities.
- **Recommendation 3:** Funding agencies should provide guidance and training to evaluators so that they can assess the suitability of communication activities. Where needed, adjustments should be made at the pre-funding/contract negotiation stage.
- **Recommendation 4:** Funding agency staff tasked with monitoring project implementation should understand knowledge transfer principles and strategies so that they can effectively monitor and support projects.
- **Recommendation 5:** Templates and instructions for official project reporting should prioritise the identification of generated knowledge outputs, executed knowledge transfer activities and the impacts of the application of such knowledge.
- **Recommendation 6:** Funding mechanisms for supporting post-project knowledge transfer would help maximise the potential of measurable impacts from research investments.

6 Discussion

This project sought to execute a knowledge transfer methodology in a way that might most feasibly be adapted into standard practice within the context of the Irish environmental research framework. Focus was thus placed on collecting knowledge through minimally invasive, 1-hour interviews with researchers and subsequently assessing this knowledge through manageable, predominantly half-day analysis sessions with experts with either a mandate or an interest in the policy topic.

The first analysis workshop was attended by 10 experts who, in two groups, attempted to assess and prioritise 50 knowledge outputs covering a broad range of water research projects. Although this session was useful for identifying where knowledge had already been implemented into policy, because of the wide range of topics being covered, the organisers had striven for experts with varied backgrounds. Unfortunately, in practice this somewhat hindered dialogue and quality analysis as participants tended to speak only about those projects or topics with which they were very familiar, and there was not enough knowledge in the room to analyse some of the knowledge outputs. Based on lessons learned from the first analysis session, AquaTT decided to redevelop the expert analysis workshop in order to make it not only more accessible and effective, but also more naturally replicable in the future by funding bodies such as the EPA. Each workshop invited individual experts, primarily EPA members of staff, with backgrounds relating to the meeting topic. It was immediately apparent within the three redesigned workshops that the participants were more readily grasping the goals of the knowledge output assessment and were more confident in discussing both how research had already been transferred and how it might find further impact. Each session was able to identify priority knowledge outputs, and for each of these a list of potential end-users, eventual impacts, target users and exploitation mechanisms, all of which fed directly into AquaTT's subsequent knowledge output pathway development.

Perhaps even more encouraging than the analysis outputs was the positive feedback from attendees of all three workshops. Members of each session indicated that the meetings had brought their attention to findings that they either were unaware of or had not had time to read more about. Although dissemination methods exist, many of the attendees noted that the sheer amount of research being produced makes it difficult to identify the most relevant and personally applicable knowledge. Some solutions outlined by the attendees for facilitating internal knowledge transfer were:

- periodic brokerage events or knowledge transfer events for various research areas (perhaps divided by environmental pillars, such as the three proposed by the EPA: Climate Change, Water and Sustainability; EPA, 2014b);
- subscription mailing lists that allow for the distribution of research findings to those who have expressed an interest in the field, thus improving the likelihood that they will be identified and read.

The collection of knowledge transfer case studies presented in this report provide a small sample of the myriad of approaches that can be used to transfer knowledge. Despite the variability, there were some commonalities that emerged, which shaped the planning process and ultimately the knowledge transfer itself. A striking aspect of the transfer planning process was how many of the knowledge outputs simply needed to be passed on to the right audience or to be made more accessible. Indeed, some knowledge transfer occurred during the external analysis workshops as EPA researchers had time to engage with knowledge produced within a different department. Similarly, the next step for several of the knowledge outputs was sharing the data in a more user-friendly, open-access manner to reduce duplicated research and improve future lateral knowledge transfer.

As the projects reviewed had typically been completed 3–5 years previously, an interesting aspect of this project was that the consultations with the researchers afforded them the opportunity to reflect on how their research had been implemented post project and its relevance to the current policy landscape. All of the

knowledge outputs gathered over the course of this project were from past projects, so the state-of-the-science in some of the research areas has progressed significantly since the projects closed. Consequently, as the knowledge transfer plans were built following an analysis exercise that was limited to the 20 selected projects and engagement with a limited number of experts, the plans were frequently adjusted as new information was discovered about the knowledge or stakeholder landscape. Had robust impact measurement and tracking been in place, we would have been in a better position to observe impact over time. Although retrospective knowledge transfer can be beneficial for finding forgotten knowledge and for *ex post facto* analysis, knowledge transfer is far more efficient and effective if it is built into contemporary projects as an ongoing activity carried out before or immediately after the end of the project.

A unique aspect of knowledge transfer in Ireland is the small size and interconnectedness of many of the target user communities. There is an ability to rapidly identify relevant end-users and target users across a spectrum of research and stakeholder areas by transferring knowledge to well-connected individuals who act as knowledge brokerage hubs. In fact, because of the EPA's central position within the environmental funding landscape in Ireland, many of these individuals are resident within the EPA.

Reflecting on the overall process, it is clear that there is a lack of established terminology and processes for knowledge transfer. Currently, there are no clear established rules on utilising knowledge transfer principles in Irish-funded research projects and, as such, the methods and understanding of knowledge transfer vary widely from project to project. There is a need to upskill all actors in the research system to help them better understand the concepts and methodologies for various communication activities, as the value of measuring success in effective communication cannot be underestimated. Furthermore, there must be clarity in who has the responsibility for performing knowledge transfer activities, particularly after the end of a project.

It is also clear that, although there are challenges surrounding the knowledge transfer process (i.e. what it is, how to carry it out, how to measure impact), there are bigger issues at play concerning the manner in which publicly funded scientific research is carried out and the role that it plays in society. Inherent differences exist between the research community, industry, policymakers and other users of knowledge insofar as each group works with and among different technical levels, priorities, vocabularies, agendas and timescales. These differences create multiple barriers that can prevent effective knowledge transfer and innovation. In addition, a culture change within the research community is required that places less emphasis on peer-reviewed publications and incentivises the uptake and application of results. A shift such as this has the potential to influence the evolution of the entire scientific research lifecycle, which in turn could result in an increased return on investment in research and a stronger, more robust knowledge-based economy.

7 Conclusion

The findings from the knowledge transfer activity carried out by AquaTT for this project illustrate that numerous knowledge outputs have been generated by projects funded by the EPA, including *de novo* knowledge, methodologies, products, tools and data. The knowledge outputs have the potential to result in varying types of value creation, at different levels in society. This work also highlights the need for the EPA, as well as other Irish environmental research funding agencies, to continue to work towards a future where high-quality research is more effectively transferred for measurable impact and the benefits are seen on the ground by society at large.

Publication through peer-reviewed scientific journals is still the preferred way for most scientists to communicate their results. In an era of heightened competition for scarce research positions and funding, the mantra of modern academia – "publish or perish" – continues to dominate. Fortunately, the EPA is leading the Irish funding agencies' approach to progressively embrace a knowledge transfer model for communication and outreach. The need for a more focused knowledge transfer approach comes from the realisation that potential benefits can be realised only if research results are adopted and exploited by relevant end-users. Consequently, it is increasingly the case that, for a research project to be successful (both initially funded and impactful), it must be able to demonstrate an effective and well-planned knowledge transfer strategy. There has never been a greater need for researchers to truly consider this knowledge flow, including processes for achieving successful and measurable transfer and clearly delineating between dissemination and knowledge transfer.

The knowledge transfer case studies provide an example of the array of potential direct and indirect impacts that can result from research projects when they are properly analysed and supported in the knowledge transfer process. Interestingly, although the process for some of the knowledge transfer was time-consuming, the entirety of this study cost €100k to complete, which represents just 1.35% of the total cost of the 20 selected projects (€7.4m). This suggests that the impact of funded research could be greatly improved without a hugely significant commitment of resources. These case studies also demonstrate the capacity of a small team to reach a wide range of stakeholders, provided they have the time and are incentivised to do so. Additionally, if such a team were in a position to collect, analyse and transfer state-of-the-art knowledge from ongoing projects, there would undoubtedly be improved uptake among users.

The knowledge transfer planning process in this project proved useful not only for the activities it facilitated, but also for the insights it granted into how knowledge transfer might be effectively implemented within current and future research activities. The Irish environmental knowledge landscape is one in which significant research can have a quick and wide-reaching impact. The incorporation of knowledge transfer principles into environmental research funding programmes could both respond to the need to overcome the challenge of securing enough funding for environmental research (as the value created can be quantified and defended to investors), as well as enable improved uptake and application of state-of-the-art knowledge into important processes such as policymaking, implementation and monitoring.

Research projects have the potential to yield great environmental, social and economic benefits, but in practice only the best-communicated research tends to influence policy, industry or society. Therefore, communication of scientific results to users beyond the scientific community is very important. Over 20 years ago, Jane Lubchenco (1998) codified the idea of a "new social contract for science". She asserted that society expects two outcomes from its investment of public funds in science: "the production of the best possible science and the production of something useful". The EPA's state of the environment report 2016 (EPA, 2016) states that "the aims of the research are (1) to develop national capacity in key areas; (2) to generate data and make assessments of priority issues for Ireland; and (3) to mobilise this knowledge for use in environment and health protection". Activities to disseminate information, exploit research and innovation results and carry out effective knowledge transfer activities could therefore play an integral role in Irish environmental funding programmes.

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Abbreviations

EC	European Commission
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL
Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú
Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha)*;
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil
- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce
- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol
- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil
- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta
- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch
- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas
- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol *(m.sh. Timpeall an Tí, léarscáileanna radóin)*.
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta
- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil
Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:
- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

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Research to Policy Impact through Effective Knowledge Transfer

Authors: M. Keegan Porter, Cliona Ní Cheallacháin, Georgia Bayliss-Brown and David Murphy

Knowledge Transfer

The goal of scientific research is to discover new knowledge that has an impact on society, usually through the advancement of science, industry or policy. Despite the efforts of funding agencies to support impact creation and to support researchers to improve the communication and dissemination of their findings, communication beyond academic publications remains a challenge. The single action of making knowledge publicly available, through dissemination alone, does not always result in uptake and application by potential users, which would then result in measurable impacts. This report advocates a more proactive systematic approach, known as "*knowledge transfer*".

Knowledge transfer is a two-way process through which a "knowledge output" moves from a knowledge source to a targeted potential user, who then applies that knowledge. A *knowledge output* is a unit of knowledge or learning generated by or through research activity. The reason that knowledge transfer is described as a two-way process is because its core philosophy is to frame transfer activities around target users' needs. Effective knowledge transfer requires that a specific target user is profiled and bespoke materials are developed in a medium that is framed for, and specific to, that user's motivations, role, needs and interests in order to maximise the likelihood of uptake and application.

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