PA Consulting Group

Review of STRIVE Research Programme

The Environmental Protection Agency

May 2012

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Version no: 1.0

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Document reference:

Executive summary

Background

The Environmental Protection Agency (EPA) has a statutory role to support and co-ordinate environmental research in Ireland. The EPA's role in supporting research activity has evolved since 1994. The current Science, Technology, Research and Innovation for the Environment (STRIVE) programme, 2007-2013 builds on the previous Environmental Research Technological Development and Innovation (ERTDI) programme, 2000-2006. At the end of 2011, the EPA commissioned PA Consulting Group to carry out a review of the STRIVE research programme to assess the programme's performance against the original scope and objectives set for the programme, to assess the overall efficiency and effectiveness of the programme, its policy impact and the effectiveness of programme management. This report sets out PA Consulting Group's key findings and recommendations based on the review carried out.

The STRIVE Programme

The overall objective of the STRIVE Programme is to protect and improve the natural environment by addressing key environmental management issues by providing world class scientific knowledge generated through a vibrant, competitive programme for research developed, supported and co-ordinated by the EPA. Consisting of three priority research pillars (as outlined in Figure A), the Programme is funded through a number of sources, primarily:

- the Environmental Research sub-programme of the NDP 2007-2013 (the Environment Fund)
- the Inter Departmental Committee for the Strategy for Science, Technology and Innovation (IDC-SSTI);
- co-funding with other state agencies and funding groups; and
- EPA core funding.

Figure A: Overview of the STRIVE Programme Structure (updated in 2010)

Strategic Rationale for the STRIVE Programme

Public investment in research is typically directed at addressing a 'gap' in the research landscape that will realise benefits for the public good. In addition to the formulation and implementation of national policy, the EU and other bodies continue to establish environmental policies and Directives at international level, which must be implemented at a national level. Therefore, there is a continued need for environmental research to provide information, data and evidence to inform and support development and implementation of national and international environmental policy. In assessing the strategic rationale for the STRIVE Programme, it is clear that funding under the STRIVE programme facilitates research for the public good that otherwise would probably not take place. Thus, STRIVE research funding fills a research 'gap'.

Key findings

The programme was assessed in relation to inputs, outputs, outcomes and impacts. The overarching finding of the review is that the STRIVE Programme is both effective and efficient in achieving the objectives set for it. Furthermore, there is clear evidence that the STRIVE Programme is a well-managed programme, which provides a value for money investment in environmental research across universities, institutes of technology, state agencies and the private sector.

Assessing the Inputs and Outputs - key findings

STRIVE Inputs

The review of the STRIVE funding inputs highlights three categories of inputs to be analysed:

- **Commitments:** €67.8M in research funding has been committed to fund 405 STRIVE projects between 2007 and 2011, with the distribution of funding well-balanced across the three existing STRIVE pillars of sustainable environment, climate change and water. STRIVE funding has been invested in universities, institutes of technology, public sector agencies, private sector companies and 'other' organisations, including NGOs, lobby groups, etc. 78% of funding committed to-date has been allocated to the universities.
- **Payments:** €59m of payments have been made under the STRIVE programme since 2007.
- **Programme Overheads:** The costs of managing and implementing the EPA programmes are appropriate and efficient relative to the programme budget, with total direct costs at 7% of the total research budget for the year.

STRIVE Outputs

The STRIVE programme outputs are the projects funded under the programme. In total, €44.6M has been committed for 188 project-based awards and €23.2M has been committed for 218 researcher-based awards under the STRIVE programme. The number of projects funded peaked in 2008. This would be expected from the significant increase in commitments in that year.

Programme Management

Overall, the review found that the STRIVE programme is well managed and extremely efficient as demonstrated by the relatively low overhead cost associated with the programme. The key findings in relation to our analysis of the programme management were:

- The importance of cooperation and partnerships are recognised and supported through the newly established pillar research coordination groups;

- SmartSimple provides a very useful project management tool that supports effective project management for the EPA and for research teams. However, some concerns were raised in terms of the user-friendliness of the system;
- While stakeholders were broadly content with the end-to-end process for designing, developing and managing calls, ways of enhancing the process further were identified;
- The project steering group has provided a very effective structure to support and guide successful delivery of research projects;
- In general, research projects are well-managed. However, there is a missed opportunity to leverage the benefits of managing research projects as a portfolio and long delays in finalising projects still arise;
- STRIVE financial and technical reporting requirements are proportionate and appropriate for the programme;
- All STRIVE research outputs are available on the EPA website. However, the policy-research interface could better support more effective, proactive and systematic dissemination of STRIVE research findings among the target end users.

STRIVE Outcomes and Impacts - key findings

Programme Outcomes

The STRIVE programme set eight clear objectives. At a high level, four of the eight objectives are entirely within the control of the EPA STRIVE team to deliver and there is robust evidence to demonstrate that Objectives 1-3 are very clearly being achieved. Further work can be done to support Objective 4.

1. Contribute to a better environment by delivering applicable and relevant Science, Technology, Research and Innovation data, information and knowledge, based on high quality science and technology;
2. Develop new techniques, methods and systems for measuring, recording and predicting the quality of the environment;
3. Ensure that emerging international, EU and national environmental and research plans, policies and legislation are supported and implemented within the research programme;
4. Disseminate the findings of the individual research projects and the overall programme to the widest possible audience in a coherent and timely manner.

The other four objectives (5-8) are shared objectives, where the STRIVE Programme plays a significant role, along with others, in their achievement. The nature of those objectives is such that they require cooperation and collaboration with other stakeholders, particularly the Department of Environment, Community and Local Government and other state agencies:

5. Develop practical methods for the integration of environmental considerations into policies and programmes of the main economic sectors;
6. Collaborate and assist other agencies / organisations in their environmental decision making by providing high quality, relevant, responsive and timely scientific information and research results;
7. Provide knowledge to support the mainstreaming of environmental decision making by providing high quality, relevant, responsive and timely scientific information and research results;
8. Develop and integrate the environmental component of the knowledge economy, and ensure that environment is a key issue for research priorities at a national level.

While there are examples of progress against these additional objectives, progress in their implementation is less clear and systematic than progress made against the first four objectives listed.

Programme Impacts

Analysis of the programme impacts of STRIVE involves assessing the high-level policy, legislative, environmental, economic, commercial and quality of life impacts of the STRIVE programme.

- **Policy Impacts:** The programme has had a strong impact on supporting policy development along the policy pathway from design to implementation. A formal, coordinated and strategic approach across the EPA, the Department of the Environment, Community and Local Government and other relevant stakeholders would ensure that environmental research carried out under the STRIVE programme supports the wider national policy agenda.
- **Environmental Impacts:** Through the data, information and knowledge provided, the STRIVE programme has supported improved environmental management and protection in Ireland.
- **Economic Impacts:** The STRIVE programme has resulted in direct and indirect benefits for the Irish economy, including savings on international fines that would otherwise have been incurred, additional international funding leveraged and supporting the attraction of foreign direct investment.
- **Commercial Impacts:** STRIVE research projects have the potential to develop commercial opportunities, while maintaining a policy focus. It is important to ensure that the commercial potential of research projects funded under the programme is enabled and that appropriate structures are established to support commercial development through the correct channels.

Recommendations

Based on our analysis and the key findings emerging from this review, we have made a series of 14 recommendations. The findings fall into three categories and the recommendations associated with those categories are tailored accordingly:

- Programme strengths: Continue as is and build on the strong platform developed
- Areas for improvement: Improvement actions required to address particular issues identified
- Opportunities: Use the programme as an opportunity to develop the programme's profile and maximise strategic environmental impact.

Recommendations
Programme Strengths: **The STRIVE Programme has made significant progress in achieving the objectives set for it at the outset. As a result the programme has had a significant impact in relation to policy formulation through environmental research. A number of programme strengths were highlighted throughout the Review. The STRIVE Programme can further build on these strengths to continue its success in supporting the design, formulation and implementation of environmental policy.**
R1: The existing programme management structure should be continued broadly as is. The current structure represents an efficient, effective and value for money approach to the management and implementation of the STRIVE programme.
R2: Continue to develop the pillar research coordination group structure across all STRIVE pillars, ensuring that: • The water and sustainable environment pillars, particularly, are further enhanced and developed; • Appropriate representatives are engaged across each of the pillar research coordination groups; • Pillar research coordination groups meet regularly to discuss progress, strategic priorities and next steps.
R3: The project steering group should continue to support project management of STRIVE research, guiding the research projects, ensuring that they deliver against the Terms of Reference and providing insights and expertise based on their own knowledge and experience.

Recommendations

- The project steering group should always include a representative end user of the research project;
- Project steering groups should meet regularly to support active engagement with the project

R4: The financial and technical reporting requirements are appropriate in terms of frequency. The current requirement for 6 monthly financial and technical reports is appropriate and fit for purpose.

A more robust approach to the collection of programme outcome data, particularly the number of peer-reviewed publications produced, is required. Researchers funded under the STRIVE programme should be required to provide data on programme outcomes during the life of the project and for 12 months after the project has closed.

R5: The STRIVE programme should continue to develop on the platform established for building research capacity and capability by:

- Supporting ongoing interaction among the research community to share ideas
- Ensuring that researchers are made aware of future funding opportunities to support continuity of research teams
- Continuing the DERP programme to support excellence in environmental research

R6: The programme's focus on providing data, knowledge and information to support evidence-based policy and decision making should continue. However, a more pro-active approach to dissemination of research findings to the target end users would further increase the programme impact (discussed further under recommendation 11).

R7: The STRIVE programme should continue to support environmental research that provides a robust evidence base to meet our international commitments, supports leveraging additional national and international research funding and contributes to the attraction of foreign direct investment into the Irish economy.

Areas for Improvement:

The review finds the STRIVE Programme to be effective and efficient in delivering against its objectives. A number of areas were identified where there is scope for further improvement to enhance achievement of the Programme objectives and to maximise the environmental, policy and economic impact of the programme.

R8: Carry out a detailed review and consultation process to understand the concerns arising with the SmartSimple system. The review should seek to understand:

- where there is scope for simplification
- how the interface can be improved
- where technical issues are arising
- how the system could be further improved to support the grant application and project management process

R9: A clear end-to-end process for designing, developing and managing calls should be mapped, communicated and implemented so that all stakeholders have a clear view of the process involved and the role they play in the process so that they are confident that the call governance arrangements are sound and robust.

An enhanced call process would help to maximise the response rate, the quality and the competitiveness of the calls, the STRIVE team must ensure that all potential respondents hear about research calls and that they have enough time to develop and submit a response to relevant calls.

R10: Establish environmental social network that allows policy makers and researchers to engage in a convenient and accessible way to share ideas, exchange views and discuss research and policy priorities.

R11: A more pro-active approach to dissemination of research findings to the target end users and to the general public (where appropriate) is required. The approach used will vary somewhat and should be tailored to what is appropriate, depending on the nature of the research carried out, the target audience for that research, the level of public interest, etc. For very technical, specialised projects, there is often a small, defined target audience and a workshop bringing together the appropriate stakeholders is an appropriate channel for dissemination of research outputs. For projects that have a specific industry or sector appeal, a conference might be a suitable method for disseminating the findings and if projects have wider public interest, such as projects around health implications, a national press release would support effective dissemination of the research findings.

Establish an environmental social network that allows policy makers, researchers and other relevant stakeholders to engage in a convenient and accessible way to share ideas, exchange views and discuss research and policy priorities.

Recommendations
Programme Opportunities: **The STRIVE Programme has already achieved significant impacts, while providing a platform for inter-agency, inter-departmental and multi-stakeholder cooperation to support environmental research across the wider research agenda. The outputs of the recent Research Prioritisation Exercise require a focussed effort on coordination of environmental research interests across the priority research areas identified. As the core environmental research programme, STRIVE is positioned to support, promote and safeguard environmental research interests in the implementation of research prioritisation exercise.**
R12: The STRIVE programme should continue to support environmental policy decision making and negotiation of international obligations. A horizon scanning exercise would support effective engagement with relevant stakeholders at a strategic level to identify the big environmental challenges and opportunities, assess how research can support a strategic response to those challenges and opportunities and develop an appropriate implementation plan across the EPA, the Department and other stakeholders.
R13: Coordinate and manage a regular horizon scanning event that includes the EPA, the Department of the Environment, Community and Local Government, representatives from relevant sectors prioritised in the research prioritisation exercise, industry bodies and other relevant stakeholders to support a strategic and comprehensive approach to the planning, design and implementation of environmental research under STRIVE. A horizon scanning exercise would support effective engagement with relevant stakeholders at a strategic level to identify the big environmental challenges and opportunities, assess how research can support a strategic response to those challenges and opportunities and develop an appropriate implementation plan across the EPA, the Department and other stakeholders.
R14: In order to maximise the impact of the STRIVE programme, a structure needs to be embedded into the programme to identify potential commercial opportunities and to ensure that those projects access the most appropriate support channels, such as Enterprise Ireland, Intertrade Ireland, City and County Enterprise Boards etc.

Conclusion

In summary, the report demonstrates that the STRIVE Programme is both effective and efficient in achieving the objectives set for it as a Programme. Furthermore, there is clear evidence which supports that the STRIVE Programme is a well-managed programme, which provides a value for money investment in environmental research across universities, Institutes of Technology, state agencies and the private sector. As with similar research programmes there are, of course, areas for improvement and opportunities for the Programme to capitalise further on the successful impact that it has had to date. Given how the current programme is being managed, and the manner in which it has responded to previous recommendations from the CIRCA report, it is reasonable to assume that the Programme is fully capable of responding to the recommendations outlined in this report.

Contents

1 Introduction

The Environmental Protection Agency (EPA) commissioned a review of the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme to evaluate the performance of the programme to date, and make recommendations regarding the future direction of the programme. This section of the report outlines the context for the review. It also details the programme objectives, together with that of the Review.

1.1 The EPA and environmental research funding

Environmental research and development, together with independent reporting to inform policy making, are key areas of responsibility for the EPA. Consequently, the EPA has supported research since 1994, through funding researchers in third level institutions, state agencies, local and regional authorities and the private sector. This is set out in the EPA Act (1992),

Nationally, the EPA has developed cooperative funding links with other sectoral Research and Development (R&D) agencies (e.g. Teagasc, Sustainable Energy Authority of Ireland, Enterprise Ireland and the Marine Institute), as well as with other agencies such as the National Roads Authority (NRA). Internationally, the EPA has promoted participation in the EU Framework Programme and is linked to a number of EU environmental expert groups including the European Research Area Networks (ERANETS) and initiatives such as Global Monitoring for Environment and Security (GMES) and the Group on Earth Observations (GEO).

During the National Development Plan (2000 - 2006), the EPA provided €39m in support to environmental research, administered through the Environmental Research, Technological Development and Innovation (ERTDI) Programme. An evaluation completed by CIRCA in 2007 found that the programme had successfully built up a national environmental research capability which contributed to the meeting of national research objectives and targets; helped inform decision makers; and ensured that Ireland was in a position to comply with national legislation, EU Directives and international agreements on the environment.

The Evaluation of ERTDI 2000-2006 concluded that the EPA's research programme should continue to be funded and operated along the same lines as the 2000-2006 programme, subject to the implementations of a number of recommendations that would address a number of areas:

- Building research capability: by appointing a principal investigator (PI) for larger projects, and the greater communication of the EPAs views of the success of funded projects to the research teams, so that the teams can plan for the future;
- Increasing coordination in the research system: through the effective use of the Interdepartmental Committee on Science and Technology with regard to sectoral research;
- Management processes: including improving the speed and flexibility of the call for research funding and improving the customer experience in terms of reporting and financial draw down arrangements;
- A more strategic process to research, achieved via developing a strategic plan for research in each of the thematic areas the EPA supports;
- Dissemination of research findings, through greater use of press activities for major reports, and more pointed mechanisms for getting the research findings to the end users;
- Value for money, including the increased use on-going programme evaluations, and more detailed VFM reviews of larger projects (over €200,000).

These recommendations were to be taken on board when designing the next research funding programme, i.e. the Science, Technology, Research and Innovation for the Environment (STRIVE) Programme. A review of the implementation of those recommendations is provided in Section 6 of this report.

1.2 Overview of the STRIVE programme

The overall stated objective of the STRIVE programme is to protect and improve the natural environment by addressing key environmental management issues through the provision of world class scientific knowledge generated through a vibrant, competitive programme for research developed, supported and co-ordinated by EPA.

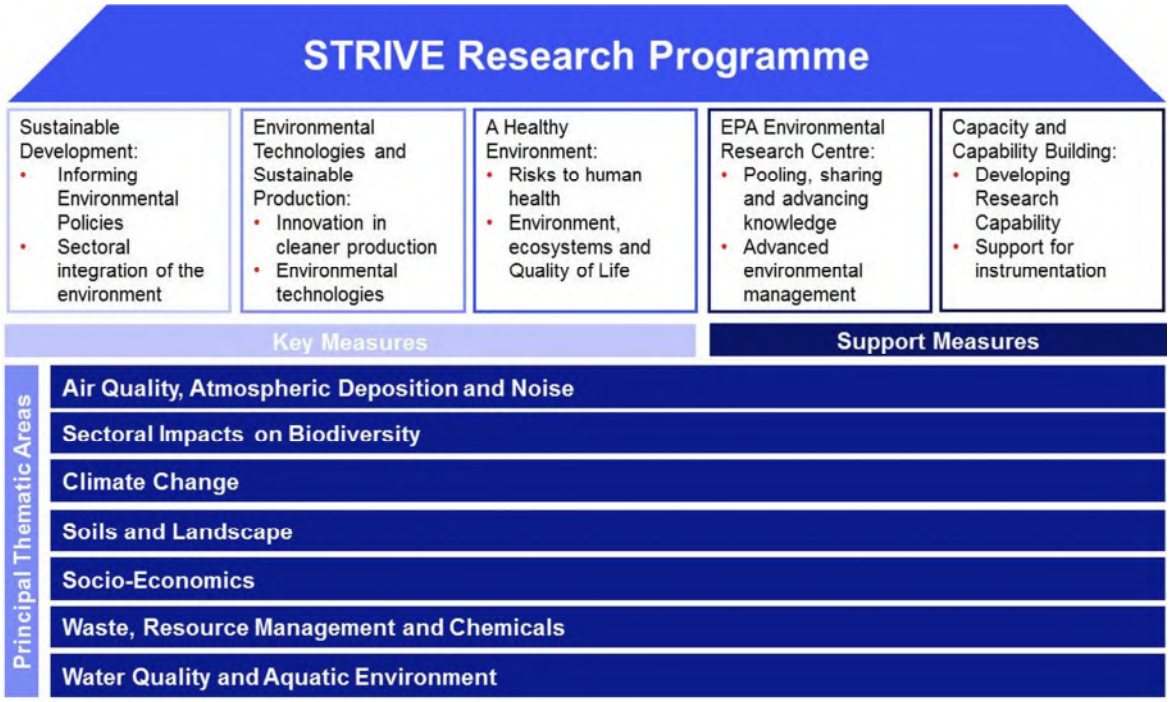
Underlying this objective is a number of particular aims, including to:

- Contribute to a better environment by delivering applicable and relevant Science, Technology, Research and Innovation data, information and knowledge, based on high quality science and technology;
- Develop new techniques, methods and systems for measuring, recording and predicting the quality of the environment;
- Develop practical methods for the integration of environmental considerations into policies and programmes of the main economic sectors;
- Provide knowledge to support the mainstreaming of environmental decision making by providing high quality, relevant, responsive and timely scientific information and research results;
- Collaborate and assist other agencies / organisations in their environmental decision making by providing high quality, relevant, responsive and timely scientific information and research results;
- Develop and integrate the environmental component of the knowledge economy, and ensure that environment is a key issue for research priorities at a national level;
- Ensure that emerging international, EU and national environmental and research plans, policies and legislation are supported and implemented within the research programme;
- Disseminate the findings of the individual research projects and the overall programme to the widest possible audience in a coherent and timely manner.

1.2.1 Programme and funding structure

On inception, the STRIVE Programme was structured to focus on seven principal thematic areas, as illustrated in Figure 1.1 below. Across these themes, research was to focus on three key areas, namely sustainable development, environmental technologies and sustainable production, and a healthy environment.

Figure 1.1 Overview of the STRIVE Programme Structure from 2007 to 2010



In order to simplify and clarify (for communication and management purposes) the research focus of the STRIVE programme, the EPA restructured the programme into three pillars in 2010. These are: sustainable environment, water, and climate change. However, this did not dilute the range of research areas that would be undertaken: rather it sought to make the focus of STRIVE easier to communicate and manage. The updated structure is outlined below (see Figure 1.2)

Figure 1.2 Overview of the STRIVE Programme Structure from 2010 onwards

The EPA provides funding to support science, technology, research and innovation projects in third level institutions, state agencies, local and regional authorities and the private sector. Funding is provided to support project based awards, researcher based awards and research fellowships. Some characteristics of these are outlined below.

Table 1.1: Funding characteristics

Project type	Typical funding	Typical duration
Project based awards		
Desk studies	Up to €100,000	6 - 12 months
Medium scale studies	Up to €350,000	24 - 36 months
Large scale studies	Up to €1,000,000	36 - 48 months
Capability development projects	> €1,000,000	48 - 60 months
Researcher- based awards		
Masters scholarships	Up to €40.,000	24 months
Doctoral scholarships	Up to €90,000	36 months
Researcher fellowships	Up to €300,000	36 months

The EPA's environmental research funding is funded through a number of funding channels:[1]

- €93Mn provided in the Environmental Research sub-programme of the NDP 2007-2013 (the Environment Fund);
- €8Mn provided for research under the Climate Change Research Programme (CCRP).This funding is provided by the Inter-Departmental Committee for the Strategy for Science Technology and Innovation. This programme is directed at addressing specific knowledge gaps of direct relevance to the National Climate Change Strategy prepared by the Department of Environment Heritage and Local Government;
- EPA core funding for staffing the management of the programme;
- Co-funding with other state agencies and funding groups for projects / themes where such an arrangement would deliver synergies and increase the utilisation of results.

The figures shown represent the original commitments made to the STRIVE programme. However, these have been revised downward in subsequent budgets. Therefore, the overall STRIVE funding is likely to be somewhat less than originally planned.

1.3 Terms of reference for the STRIVE review

In September 2011, the EPA commissioned a review of the STRIVE Research Programme to assess performance of the programme to date. The terms of reference for the review of STRIVE set out a number of specific tasks to be addressed, including:

- Review of the original scope of the STRIVE programme 2007 - 2013 and update with key priorities identified in
  - the EPA and European Environment Agency (EEA) State of the Environment Reporting
  - Europe 2020
  - Government priorities and other relevant policies and legislation

[1] It appears from recent budgets and current budget estimates that actual expenditure on the STRIVE programme will be somewhat less than originally planned for the programme in 2007. Exact figures on the size of that reduction are not yet available at the time of finalising this report.

  - This work should identify research areas (if any) where resources may need to be focussed.
- Evaluation of the impact of the STRIVE programme on national Policy Development in a number of discreet areas. The evaluation should include the following policy areas as a minimum:
  - Climate change
  - Water
  - Waste
  - Sustainable environment
  - This should include a representative assessment of programme outputs for each area (e.g. research reports, peer reviewed publications, input of programmes to policy development, data sets, models etc.)
- Undertake a review of the progress made towards the implementation of the findings of the CIRCA report "Benchmarking of the ERTDI Programme for the period 2000 - 2006". This should include an assessment of programme management relating to timeliness of research payments and an examination of the timeline from the submission of the final project report to its publication.
- Obtain feedback by way of a survey of customer experience of the STRIVE programme, including the use of SmartSimple (The EPA's Grant Application and Project Management portal).
- Investigate whether the initial phase targets established for the STRIVE programme have been met.
- Determine the probable outcomes that could result from the discontinuation, reduction or expansion of the programme.
- Identify a minimum level of funding necessary to maintain a viable STRIVE research programme.
- Assess the overall efficiency (including value for money) and effectiveness of the programme, including its impact on policy development.

1.4 The remainder of this report

In line with the above requirements, the remainder of this report is structured as follows:

- Section 2 provides an overview of our approach and methodology in undertaking the review;
- Section 3 examines the strategic rationale for the STRIVE Programme, and looks at both the landscape when STRIVE began, compared to today;
- Section 4 presents a profile of the Programme inputs and associated outputs;
- Following this, section 5 summarises the impact of the STRIVE Programme to date;
- Section 6 details our findings and recommendations from the evaluation process;
- A number of technical and more detailed appendices are also included, including a full list of consultees and detailed customer survey results.

2 Our evaluation framework and evidence base for the review

In Section 2 we define the evaluation framework used to frame the undertaking of this study. This provides a structure for the assessment of the STRIVE Programme performance in the remainder of the report, with funding inputs, programme outputs, overall outcomes, additionality and impact discussed in turn. To build up the analysis in this way, we have undertaken a robust programme of research and consultation, which we summarise to highlight the evidence base on which our findings are based.

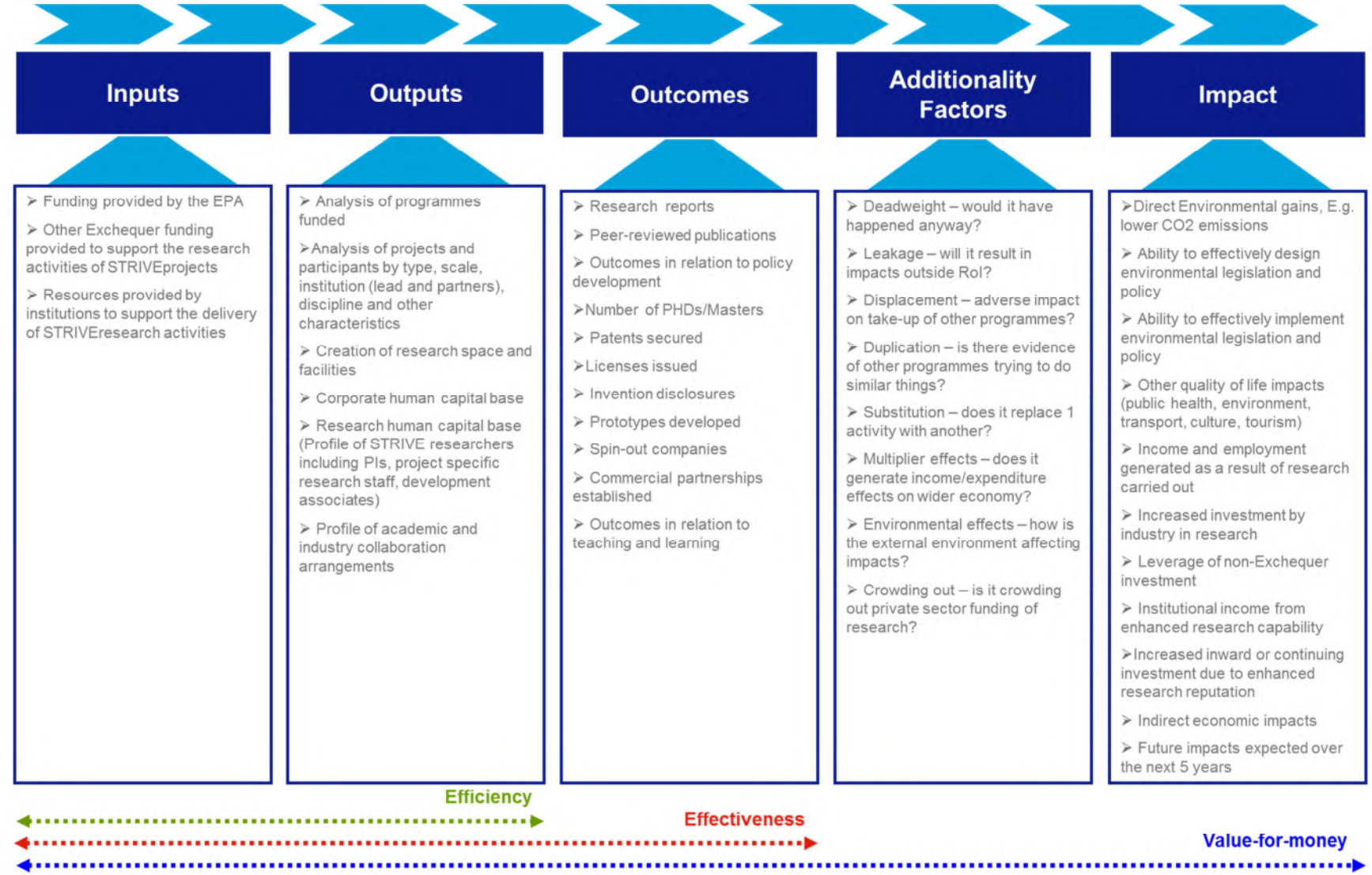
2.1 The evaluation framework

The evaluation framework has been built up by establishing the logical relationship between the public funding inputs via the EPA and the outputs, outcomes and impacts that have been generated as a result. The analysis within this report is structured in this way to provide clear findings of the efficiency, effectiveness and value-for-money of the programme and the learning which can be identified in the assessment of this performance. Specifically, we have examined:

- the inputs in terms of the funding invested under the STRIVE programme, the nature of this funding and how it relates to specific areas of need or policy objectives;
- the outputs and activities delivered in the form of projects supported, institutions and organisations funded and research activity undertaken;
- the outcomes generated from the programme activities, including skills obtained and accredited, papers produced, and policy makers supported;
- Additionality factors, including whether the research would have been undertaken in the absence of STRIVE, plus the incidence of other less obvious impacts of the programme, for example displacement and leakage;
- Finally, the overall impact of the STRIVE programme, in light of the initial objectives.

A summary of the indicators and characteristics that we sought to analyse in the context of the STRIVE Programme is provided in the overview of the evaluation framework in Figure 2.1. This analysis has been facilitated by deployment of a robust methodology which has provided a strong evidence base from which conclusions can be drawn. This evidence base is summarised in Section 2.2.

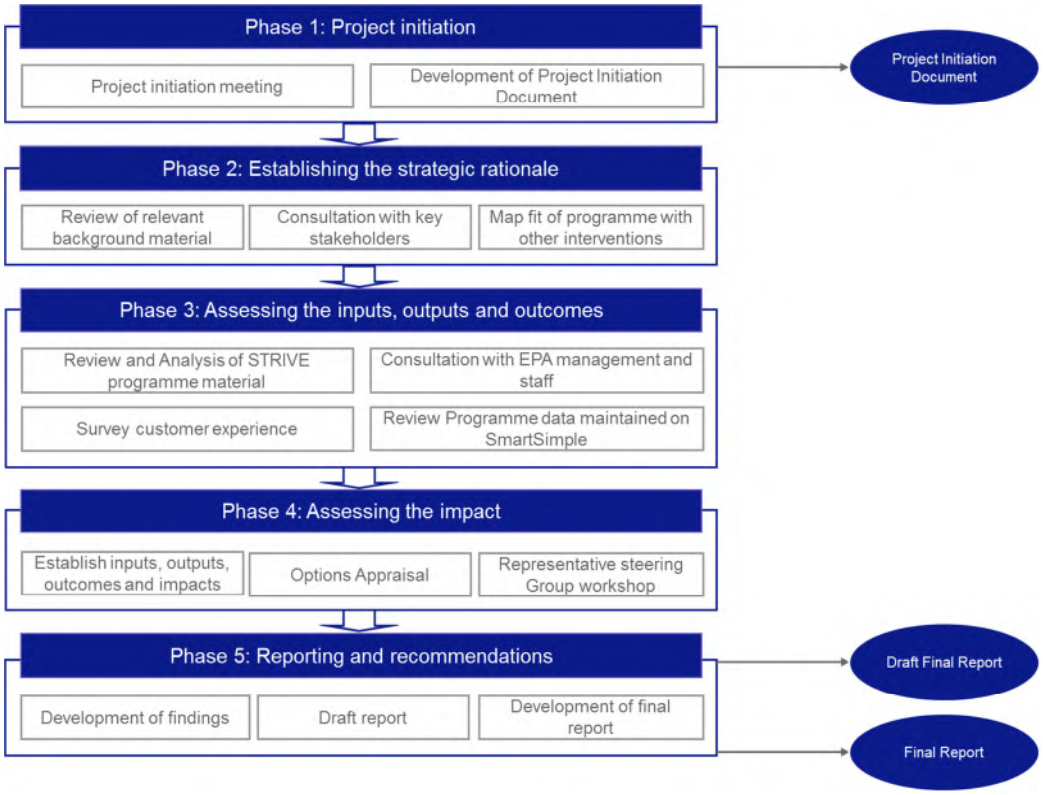
Figure 2.1: Evaluation Framework for the STRIVE Programme 2007 - 2013



2.2 The evidence base

This evaluation has involved an intensive period of research and consultation, delivered across five focused phases. An overview of the methodology which was deployed during its undertaking is provided in Figure 2.2. The core aspects of this work involved:

- Review of policy and strategy material and to establish the strategic rationale for the STRIVE Programme;
- Analysis of programme material and data across all funded projects by reviewing data held on SmartSimple, the EPA's online grant application and project management portal;
- A series of four workshops (engaging up to 40 stakeholders) with relevant policy stakeholders, other research agencies, higher education institutions, and EPA staff;
- A further 13 additional consultations held with individuals that could not attend the series of workshops, or had more detailed specific information to offer which was outside the scope of the workshops. A full list of workshop and consultees is included as an appendix to the report;



- An online survey of customers, i.e. those in receipt of funding under the STRIVE Programme since 2007. This gathered their views on the necessity and effectiveness of STRIVE, as well as providing feedback on the management and organisation of the Programme from their perspective. In total, there were 265 respondents to the survey, representing a 19% response rate;
- A review of emerging findings with a representative Steering Group (including policy stakeholders, EPA staff, members of the HEIs and others), before drafting of conclusions and recommendations.

This evidence base has provided a foundation for the mapping of the inputs, outputs, outcomes, impacts and additionality of the STRIVE Programme in line with the evaluation framework set out in Section 2.1. These aspects of programme delivery are considered in turn in the proceeding chapters of this report.

3 Strategic rationale for the STRIVE programme

This section of the report reviews the original scope of the STRIVE programme, examines the drivers for investment in cross-cutting environmental research which were present on the establishment of the programme, and discusses developments in this area since the programme was established. The chapter concludes by presenting our views with regard to the strategic focus of the STRIVE Programme.

3.1 The need for public sector investment in environmental research

Public investment in research is typically directed at addressing a 'gap' in the research landscape that will realise benefits for the public good. Public investment is required to support environmental research and protection activity in the areas of climate change, water and sustainable environment (the current three STRIVE programme pillars). There are a number of reasons for this:

- Few short-term commercial returns mean that private sector investment in environmental research that supports policy is limited. While a healthy environment is a contributing factor to economic growth and sustainable development, environmental research timeframes, together with the inability to deliver an immediate or short term commercial return on research investment (in many cases), means that the private sector will not invest in environmental research to the level required.
- Environmental research is required to provide the knowledge, information and data to ensure that Ireland meets its international targets and minimises penalties: Environmental research is required to support Ireland in negotiating, managing and implementing our environmental obligations under international law. Failure to meet our international targets would result in penalties and fines on the exchequer; not to mention the reputational impact. In order for public policy makers to be able to negotiate and set achievable targets, they need the evidence base to present to their international counterparts.
- Public investment is required to build our environmental research capacity and capability: Building environmental research capacity and capability provides the foundation for developing Ireland's international reputation, leveraging additional funding from international and private sector sources and providing support to sustainable economic recovery.

Each of these are compelling points for continuing public sector involvement in environmental research. These existed on the establishment of the ERTDI programme, and continued to be of relevance on the design and commencement of STRIVE.

3.2 Design of the STRIVE programme

In the design of the STRIVE programme, the EPA sought to build on the progress and research capability built up during the previous ERTDI programme, while taking account of national and international environmental needs, and the existing programmes and policies of the time. The key inputs and influencing documents are highlighted in Figure 3.1 below.

Figure 3.1: The strategic basis for the design of the 2007 - 2013 STRIVE Programme

Through a combination of detailed environmental needs assessment, key stakeholder workshops, and national and international policy review, the EPA identified Ireland's principal environmental challenges to be our ability to meet our international commitments on air quality, waste management, and the eutrophication of surface water. Consequently it was stated that emphasis would be placed on research in these areas. The EPA sought that environmental research should be integrated to all sectors, and be undertaken as part of as many NDP measures and programmes that have an environmental impact. This was to include the energy, transport, agricultural and marine sectors, as well as environmental infrastructure.

Key policy documents, including the Strategy for Science, Technology and Innovation (2006 - 2013) stated that the future strategic direction of environmental research should be to anticipate and respond to changing circumstances and to engage in research to generate new knowledge of the environment and environmental technologies. Meeting international environmental obligations will demand continued engagement in such areas as climate change, biodiversity loss, environment and health, the urban environment, air pollution, waste management and water quality. The need for close cooperation with the HEIs to build capacity in environmental data handling, modelling, assessment and guidance was also identified. It also stated that knowledge and better understanding from environmental research would improve Ireland's ability to negotiate norms/limits in future international legislation and agreements.

3.3 Developments at a national level

3.3.1 Identification of environmental research focus areas

In 2008, the EPA's State of the Environment report identified four priority challenges for the environment, namely: limiting and adapting to climate change; reversing environmental degradation; mainstreaming environmental considerations and compliance with environmental legislation and agreements. Also, the EPAs strategy statement, 2020 Vision identified six specific thematic areas that it would seek to address:

- Limiting and Adapting to Climate Change;
- Protected water Resources;
- Sustainable Use of Resources;
- Protected Soil and Biodiversity;
- Integration and Enforcement;
- Clean Air.

Each of these priority areas are reflected in the structure of the STRIVE programme. There were a number of other national environmental policy papers which complemented the focus of the STRIVE programme. For example, the National Climate Change Strategy 2007-2012 stated that a key role of publicly funded research is its potential to inform policy-making and increase understanding and awareness of the issues among the wider community, while research outputs should support decision-making by local authorities, businesses, community groups and the public on actions to address climate change.

Government commitment to sustainable development was also set out in Towards 2016 and the National Development Plan 2007-2013, while a number of relevant white papers were also produced including the White Paper on Energy, the Bio-Energy Action Plan and the Sustainable Transport Action Plan.

3.3.2 Research Prioritisation Steering Group

Ireland’s recent research prioritisation exercise establishes environmental research as an important cross-cutting research theme that is related to many of the priority research areas identified. While environmental research is not one of the 14 stand-alone priority areas identified, it is a core component of many of those areas, particularly "sustainable food production and processing”, “marine renewable energy”, “smart grids & smart cities", and is also important for the manufacturing competitiveness and processing technologies and novel materials areas.

In identifying many of the key priority areas associated with our natural resources, (e.g. “sustainable food production and processing”, “marine renewable energy” and “smart grids & smart cities”) it is acknowledged that all of these areas need to be developed in a sustainable manner that will minimise and ideally reduce our impact on our finite natural capital while also being realised in an economically competitive way. For example, with respect to developing research for Smart Cities, the Report states that we need to ensure that binding environmental requirements in the areas of water, waste water, and waste management and emissions levels are satisfied. Further, the Report on the Research Prioritisation Exercise noted the importance of evidence-based policy research that is not driven principally by a commercial motive. Climate change and related environmental research, bioenergy, and environmental health research are listed as important relevant research areas in this regard.

3.3.3 The deterioration of the national economy and public finances

Publicly funded environmental research was also originally established with a view to bringing environmental issues and considerations to the forefront of policy makers' minds, rather than being a secondary consideration. The current economic climate could pose a risk to achievements in this area, as policy makers come under increasing pressure to ensure the direct, quantifiable, commercial and economic benefits of investment are realised. As discussed, investment in environmental research supports a public good that is not as easily measured as commercial or economic benefits.

However, important policy guidance documents, such as the Report of the Research Prioritisation Steering Group, identify the importance of environmental research and its contribution to sustainable economic development and recovery. For example, Ireland's recovery is largely dependent on growth in exports on key sectors which are heavily dependent on having a healthy operating environment, e.g. agriculture and related food processing industries. Consequently, it is generally accepted that economic and sustainable development are not mutually exclusive. When managed and implemented effectively, they are mutually re-enforcing.

3.4 Our international commitments

Europe 2020, the flagship initiative for a resource-efficient Europe, provides a long-term framework for actions in environmental and other policy areas. Importantly it has set specific targets with regard to Carbon Dioxide emission reductions, renewable energy and reduction in energy consumption. The setting of these targets for Ireland has, in part, been influenced by relevant environmental research. Environmental research is an essential tool to ensure that the relevant stakeholders may continue to manage, monitor and implement international obligations in line with international good practice.

3.5 Conclusions

Funding under the STRIVE programme facilitates research for the public good that otherwise would probably not take place. This gap existed when STRIVE was established and the need to continue to address that gap is still of relevance today.

The core purpose of the STRIVE programme is to inform, support and implement environmental policy formulation and implementation of relevant environmental legislation. Climate change, water and sustainable development are areas which span a broad number of sectors and, therefore, do not have a natural champion outside of the EPA. Effective research in these areas is dependent on further cooperation and collaboration with other agencies that have a specific sector focus, such as Teagasc, Fáilte Ireland and the Marine Institute. STRIVE plays an important role in providing the knowledge, data and evidence to inform and support national policy formulation and implementation.

In addition to the formulation and implementation of national policy, the EU and other bodies continue to establish environmental policies and Directives at international level, which must be implemented at a national level. The continued need to reach our international targets mean that there is an ongoing requirement for environmental research to provide information, data and evidence to inform and support achievement of those goals. Without STRIVE, it is unlikely that the necessary data would be consistently available. Therefore, the requirement for research related to negotiating obtainable environmental targets therefore needs to continue.

While the new economic reality does not dilute the need for environmental research, it may influence the future strategic direction of some elements of research. For example, there may be a greater emphasis placed on demonstrating the economic impact of the research being undertaken, such as the role of funded research in helping Ireland to avoid EU penalties. Future and on-going focus areas will certainly have to be aligned with the outputs of the research prioritisation exercise.

4 Assessing STRIVE Inputs and Outputs

This section provides an overview of funding inputs and outputs of research funded under the STRIVE programme. We review the nature of the funding inputs, provide an overview of the activities and outputs across the STRIVE portfolio. We also assess the project management of the STRIVE programme 2007-2013. This will provide a platform for then considering the wider outcomes and impacts from the funded interventions, which will form the focus of our analysis in subsequent chapters.

4.1 STRIVE Inputs

Programme inputs relate to the original funding invested in the STRIVE programme as well as any additional inputs invested in the programme. The review of the STRIVE funding inputs, highlights three categories of inputs to be analysed:

- Commitments made under the STRIVE programme;
- Payments made since the STRIVE Programme was launched;
- Project overheads.

Our analysis in this section focuses on the projects funded under the STRIVE research programme between 2007 and 2011. There is, however, some overlap with the predecessor research programme, the ERTDI (Environmental Research, Technology, Development and Innovation), 2000-2006 that should be taken into consideration.

Firstly, in relation to commitments, there are a number of projects that were originally funded under ERTDI, which then received subsequent funding commitments under STRIVE. For these projects, we include the total research funding for the project as the outputs, outcomes and impacts analysed will relate to the whole project. This relates to 12 research projects with a combined value of €1.0M, including the original funding and additional funding committed (listed in Appendix C).

Secondly, in relation to payments, projects that were originally funded under ERTDI will have had their advance payment made out of the ERTDI envelope. However, some of the subsequent payments for a number of the projects will have fallen into the STRIVE programme period. Therefore, those payments will be included as part of the payment analysis. Payments of €17.3M were made under the STRIVE programme on ERTDI projects.

The following sections provide an overview of the three input categories highlighted above.

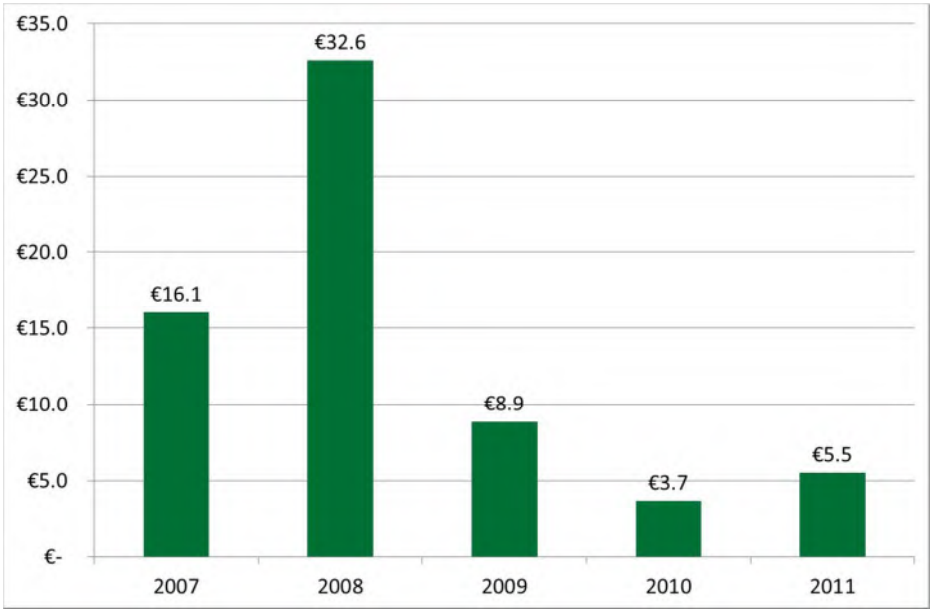
4.1.1 STRIVE Commitments

Commitments (value): A total of €67.8M in research funding has been committed to fund 405 STRIVE projects. Figure 4.1 shows an overview of research funding commitments under the STRIVE programme. The majority of those commitments were made between 2007 and 2011, with the exception of 12 projects that were originally funded under ERTDI in 2005 and 2006 and that received additional funding subsequently under STRIVE. For those 12 projects, the total funding committed to the projects is included in the figures shown. The figures used include the original EPA grant aid committed, co-funding committed and additional EPA grant aid committed (including additional 4th year fees approved).

Of the €67.8M committed to-date, €32.6M (48%) relates to projects for which the original commitment was made in 2008. €31.1M of that funding was committed in 2008 and additional funding of €1.5M

was committed subsequently in later years. Since 2008, the amount of funding committed per annum has reduced significantly. Figure 4.1 shows the breakdown of funding by year between 2007 and 2011. A total of €66.9M was committed between 2007 and 2011. The outstanding €0.9M was committed in 2005 and 2006 for projects that subsequently received additional funding under STRIVE.

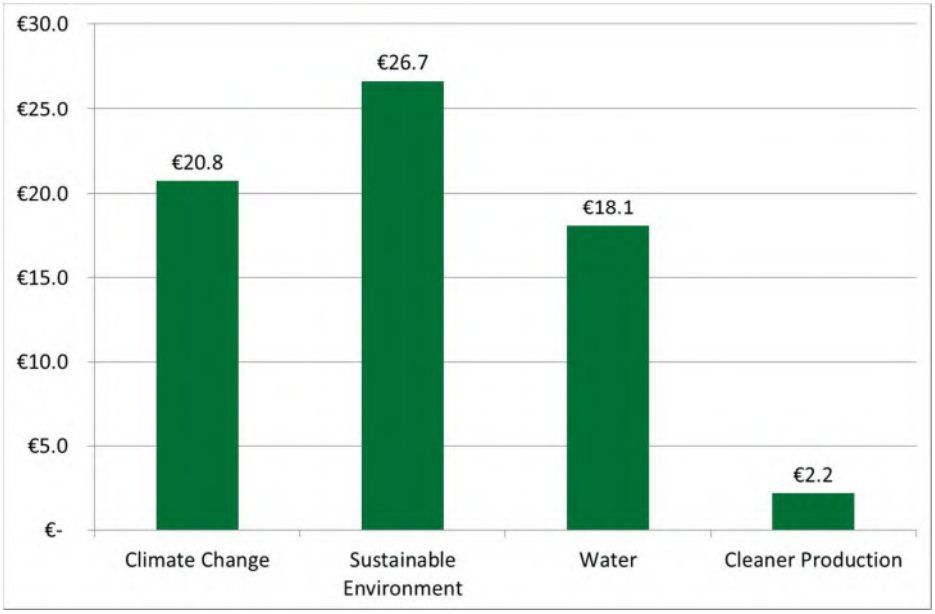
Figure 4.1 STRIVE commitments by year 2007-2011 (€M)



Focus: Over the course of the STRIVE programme, funding has been invested across three pillars of research; climate change; water; and sustainable environment. This three pillar structure has evolved during the programme. Originally, there was a more complex programme structure as outlined in Section 1. In addition to the three research pillars under STRIVE, funding was also committed to cleaner production projects. For the purpose of analysis, we have included the cleaner production figures to ensure that all programme funding is accounted for in Figure 4.2. Management of the cleaner production programme has since been transferred to the National Waste Prevention Programme, although it continues to be co-funded by STRIVE funding.

Distribution (Focus / Recipients): The distribution of funding between pillars has been well-balanced across the three existing STRIVE pillars, sustainable environment, climate change and water. The sustainable environment pillar has received the highest level of funding to-date (€26.7M or 39% of the total commitments).

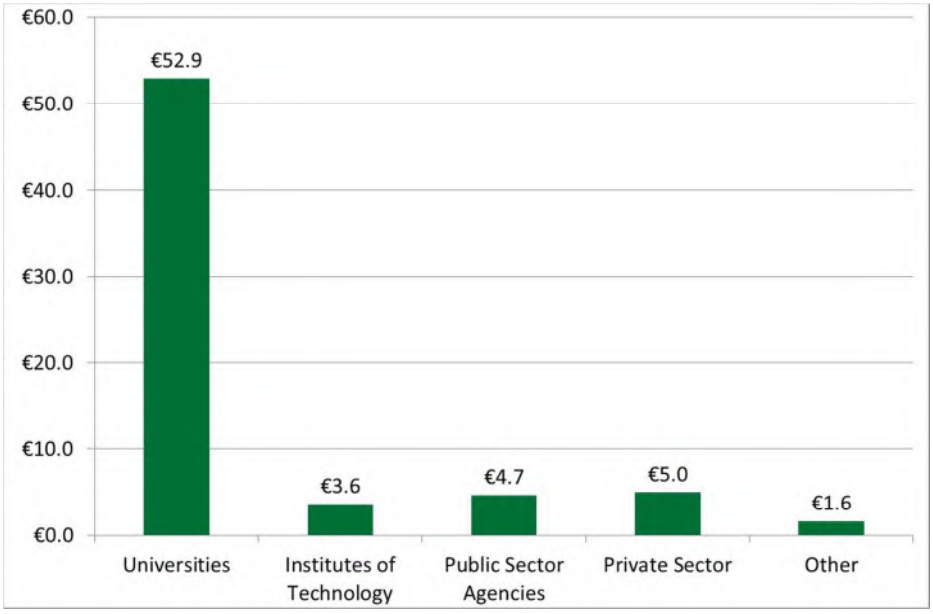
Figure 4.2 STRIVE commitments by pillar 2007-2011 (€M)



STRIVE funding has been invested in universities, institutes of technology, public sector agencies, private sector companies and 'other' organisations, including NGOs, lobby groups, etc. Appendix D shows a breakdown of the organisations included in each organisation category.

Universities have received the significant majority of funding to-date; 78% of funding committed to-date has been allocated to the universities. UCC, UCD, TCD and NUIG have been significant beneficiaries of STRIVE funding, each having received in excess of €8M each to-date. DCU, NUIM, QUB and UL have also been successful in accessing STRIVE funding, each has accessed between €2M and €5M under the programme.

Figure 4.3 STRIVE commitments by type of Organisation 2007-2011 (€M)



STRIVE funding has been well dispersed across the university sector, with a number of centres of excellence providing critical mass in terms of research capacity in some universities.

A total of €5M has been provided to the private sector companies and €4.7M to public sector agencies. Teagasc were the primary public sector agency recipient of STRIVE funding, receiving a total of €4.2M of STRIVE funding for five research projects. This represents 89% of funding committed to public sector agencies. The majority of that funding has been allocated towards one of the main flagship projects of the programme, a digital soil mapping exercise, to which €3.6M has been committed.

Of the €5M invested in the private sector, APEnvEcon received €1.8M for two projects. €1.4M was committed to a climate change project to develop an integrated assessment modelling system for Ireland in 2007. In 2011, €374,360 was committed to build on the earlier Integrated Modelling Project. In total, 33 other private sector companies were funded under the programme, representing total funding of €3M or an average grant size of €114,425.

Funding among public sector agencies and private sector companies has been focussed in particular pockets, whereby one recipient has received a significant proportion of the funding committed to that particular sector.

Average grant size: Table 4.1 shows a comparison of the average grant size by type of organisation. The comparison suggests that the average grant size for public sector agencies was significantly larger than the grants committed to other organisation types. However, the €3.6M grant awarded to Teagasc for one project is the largest ever grant committed and this distorts the average grant size. If we discount the one exceptionally high grant to Teagasc, the average grant size for public sector agencies is €92,545. This grant size is in line with the other organisation types, except for the universities. The average grant size for universities is €191,024, reflecting the increased capacity of universities to manage large research projects.

Table 4.1 Average grant size by type of organisation

Type of Organisation	Total funding committed (€M)	Number of projects supported	Average grant size (€)
Universities	52.9	288	183,044
Institutes of Technology	3.6	39	92,307
Public sector agencies	4.7	12	391,667
Private sector companies	5.0	38	131,578
Other	1.6	28	53,571
Total	67.8	406	166,748

Researcher / Project based awards: As explained in Section 1, STRIVE supports both researcher-based projects as well as project-based awards. €44.6M has been allocated for project-based awards and €23.2 has been allocated for researcher-based awards. Medium-scale projects (up to €350,000 and between 24 and 36 months) have received €20.5M for 72 projects. Capability development projects have received circa €10.9M for six projects. Thus, the average project size for project-based awards varies significantly across the programme.

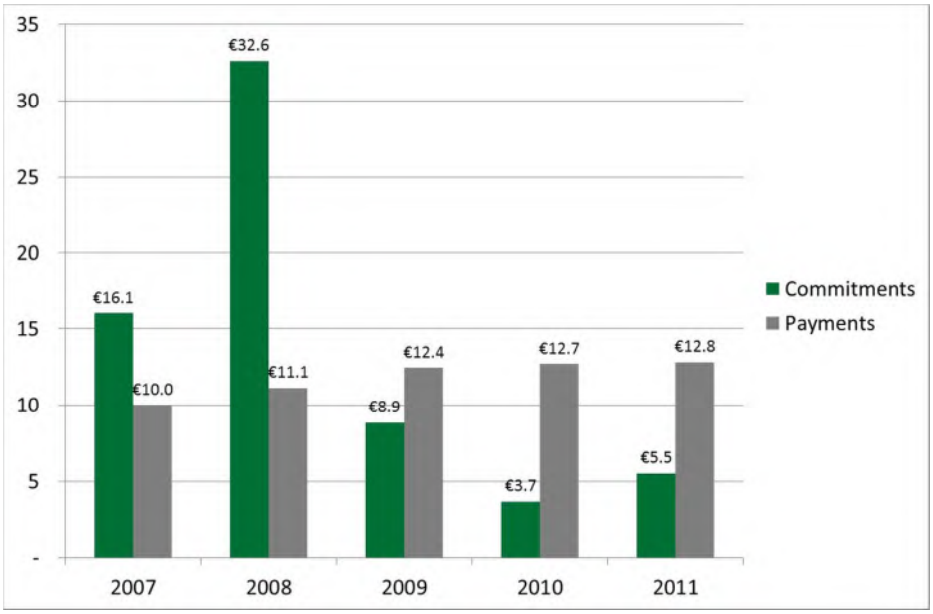
Co-funding: Co-funding has not been a common feature of STRIVE funded projects to-date. The EPA has been the only funder of the majority of STRIVE projects. There are just 18 projects that were co-funded throughout the programme, which provided total co-funding of €1.8m. Although co-funding of research projects is more complex in terms of representing the interests of different funding agencies, co-funding that supports synergies between research funding agencies will be increasingly important, in the current economic climate.

De-commitments: A total of €2M has been de-committed across 57 projects over the first five years of the programme. There were 46 project de-commitments between €1,000 and €350,000 in value. These arose as a result of project under-spend and represent examples of effective project management.[2] Therefore, de-commitment of funding is not an issue of concern for the management of the STRIVE programme. Project budgets have been well-managed and implemented.

4.1.2 STRIVE Payments

A total of €59M of payments have been made under the STRIVE programme since 2007. This largely aligns with the commitments made under STRIVE and ERTDI for which payments were due to be made from 2007 onwards. The difference of €8.7M relates to the natural time lag between the initial commitment and final payments, which are made after project completion.

Figure 4.4 STRIVE commitments and payments by year, 2007-2011 (€m)



The profile of payments is much more evenly spread across the duration of the programme, compared to commitments which had a sharp peak in 2008. Between €10M and €13M has been paid each year of the programme.

4.1.3 Programme Overheads

Finding 1: The costs of managing and implementing the EPA programmes are appropriate and efficient relative to the programme budget.

In order to give an overview of the costs of managing the STRIVE programme, we have used 2010 figures to provide a snap-shot view of programme management costs. This is the latest year for which full year costs are available. The total direct costs of running the EPA research programme, including salaries, overheads and travel and subsistence was 7% of the total research budget for that year.

This indicative cost includes costs of staff for who STRIVE and CCRP are a significant component of work. Other EPA staff also make important contributions to the delivery of the programme, such as participation on steering groups, formulating calls, evaluating proposals, etc. However, if STRIVE is

[2] There was just one project, where there was a significant de-commitment of €999,481. The funding was de-committed for this project due to a query over whether or not co-funding would be provided. The funding was subsequently re-committed.

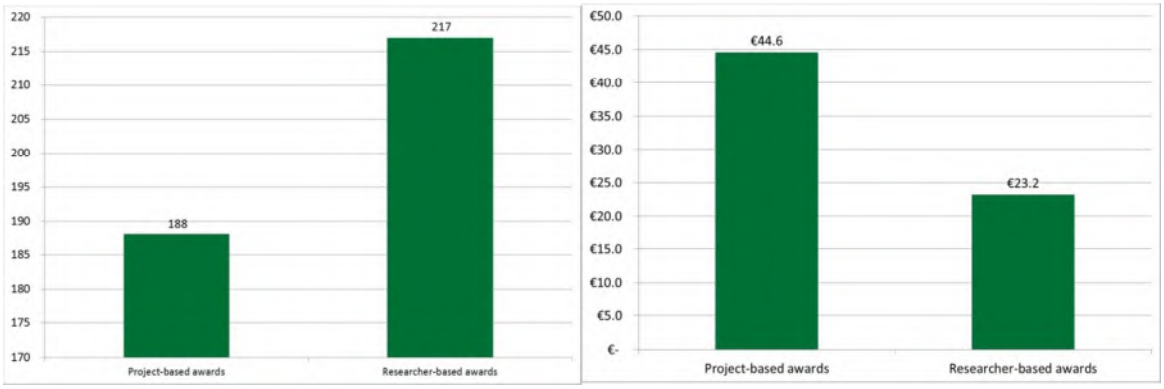
not a core component of their work, their costs are not included in this assessment. While it is important to acknowledge the wider contribution made by other members of EPA staff, the cost implications would not be expected to impact significantly on the 7% of total programme costs.

4.2 STRIVE Outputs

Project type: The STRIVE programme outputs are the project-based awards and researcher-based awards funded under the programme. Project-based awards are based on a particular thematic area, such as air quality, climate change, environmental technologies, etc. They may comprise of a number of linked sub-projects that are managed by one lead organisation. Researcher-based awards are based on a more specific subject area and are awarded to an individual researcher as a Masters or Doctoral scholarship or a Research Fellowship.

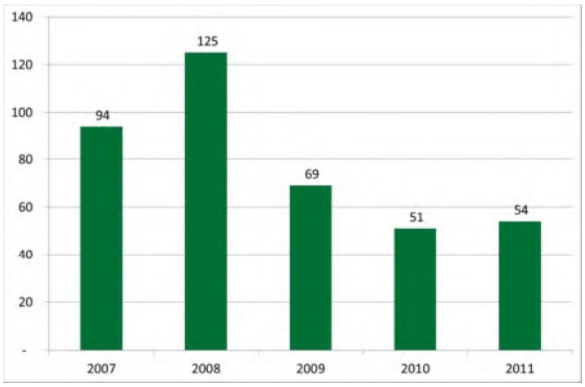
In total, €44.6M has been committed for 188 project-based awards and €23.2M has been committed for 218 researcher-based awards under the STRIVE programme.

Figure 4.5 STRIVE funding by project type (€M) and number of projects by project type



The sustainable environment pillar had the highest number of projects funded, 177 projects were funded under that pillar. 100 projects were funded under the water pillar and 92 were funded under the climate change pillar. This reflects the re-organisation of the STRIVE pillars, where the scope of the sustainable environment pillar is somewhat broader than the other two pillars. It has become a 'catch-all' for research that fell outside the other two pillars.

Figure 4.6 Number of projects funded by year



Output trends: Figure 4.6 shows the number of projects funded between 2007 and 2011. The figures shown in Figure 4.6 do not include the 12 ERTDI projects that were originally funded in 2005 and 2006 which received a small amount of supplementary support under STRIVE. The number of projects funded peaked in 2008. This would be expected from the significant increase in commitments in that year. However, the extent of the difference in 2008 is much more pronounced in relation to funding committed than for the number of projects funded.

The three largest projects ever funded under STRIVE were committed in 2008, hence the sharp increase in commitments in that year.

Funding for projects in excess of €1M was spread across the three pillars of STRIVE in terms of number of projects funded; one within water and two each under the sustainable environment and climate change pillars. Similarly for projects between €500K and €1M, there is an even dispersal across the three pillars. There were significantly more projects with a value of less than €500K funded under the sustainable environment pillar compared to the other two pillars. 181 sustainable environment projects with a value of less than €500K. This compares to 85 climate change projects and 95 water projects with a value of less than €500K. Again, this reflects 'catch-all' nature of the sustainable environment pillar.

4.3 Programme Management

In this section, we look at the project management structures, tools, and governance arrangements used to manage the STRIVE programme across the three programme pillars. This section includes a review of the pillar research coordination groups; the SmartSimple system; governance arrangements (particularly around the call process); and project management structures.

4.3.1 Pillar Research Coordination Groups

Finding 2: The importance of cooperation and partnerships are recognised and supported through the newly established pillar research coordination groups.

The introduction of three pillar research coordination groups, to manage research activities under each of the three pillars of the STRIVE programme (climate change; water and sustainable environment) is viewed as a welcome structure for the Programme. The purpose of the steering groups is to provide a forum to discuss and decide on research priorities at pillar level, supporting interaction between researchers, policy makers and other relevant stakeholders. Members of the steering groups generally include representatives of the STRIVE team, EPA technical experts, the Department of Environment, other relevant departments (where appropriate) relevant agencies, and where appropriate relevant international experts.

The climate change steering group was the first to be established as a pillar research coordination group. At the outset of the STRIVE programme, climate change was managed under a separate programme structure that included pillar research coordination groups. Therefore the climate change pillar research coordination group is more mature than the other two pillar research coordination groups. The positive lessons from the climate change steering group pillar have been transferred to the other two pillars. However, they are less mature as they were only established in late 2010. This example of transferring best practice between pillars is a very positive finding in terms of programme management of STRIVE and the transfer of similar positive lessons and experience that will improve programme management should be continued.

Thus, the climate change pillar is now well-established and provides a useful means of managing research under the pillar at a strategic level. The water pillar was the second pillar to be established and although it is not as advanced as the climate change steering group, progress has been made

and the steering group is working to develop the water research agenda. The sustainable pillar is still in its infancy and more work is required to maximise the impact of this pillar research coordination group in line with the other two pillars.

The review highlighted the lack of ongoing interaction between relevant stakeholders, particularly policy makers and researchers (discussed in more detail later in the chapter). While pillar research coordination groups provide an important forum to support strategic interaction between relevant stakeholders and offer an opportunity to support improved engagement between stakeholders, there is a need to ensure this is firmly set out in the remit for these groups.

4.3.2 SmartSimple

Finding 3: SmartSimple provides a very useful project management tool that supports effective project management for the EPA and for research teams. However, some concerns were raised in terms of the user-friendliness of the system.

A key aspect of managing the STRIVE Programme is conducted through SmartSimple, EPA's online grant application and project management system. Introduced at the beginning of 2010 to support the administration of the Programme, all grant applications are now made via the SmartSimple system.

The system provides a comprehensive reporting function and it allows STRIVE researchers and EPA staff to issue, store, record and retrieve all documents and correspondence relating to a project. It provides a single point of access for all project activities, which supports effective project management, ensures accountability and facilitates information sharing among project teams as well as between project teams and the EPA. The portal is particularly useful for projects that include multiple partners.

Researchers find it useful to have 'one website that stores all project relevant information in a structured way'. 70% of respondents to the STRIVE survey found that SmartSimple made reporting and project management more efficient and effective. 75% of respondents found the system either 'excellent' or 'good' in terms of the user experience. The remaining 25% found the system either fair ('quite difficult to use') or poor ('difficult to use') in terms of its user-friendliness. Some users find the system difficult to use, 'less than intuitive', and overly complex for certain functions. There may be scope to simplify the system in certain areas. Concerns were raised about:

- Some users experienced difficulties when uploading reports;
- Researchers found the interface being very busy and not very clear.

A more targeted and specific review of the SmartSimple is required to understand the specific issues of concern and how these can be addressed appropriately.

4.3.3 The Call process

Finding 4: While stakeholders were broadly content with the end-to-end process for designing, developing and managing calls, ways of enhancing the process further were identified.

The Call process refers to all activities involved in the design, development, issuing, management and selection process for research calls.

Call design and development: Increasingly, the EPA has adopted a consultative approach to designing and developing defined research calls, which involves engagement with EPA staff, the Department of Environment Community and Local Government, other relevant agencies and researchers. Qualitative feedback received on the consultative approach adopted highlights a perceived lack of consistency in the process for designing the calls, who should be involved in the consultation process and how the final decision is made in terms of what should be included in the call.

A number of consultees expressed concern about a lack of transparency and consistency in the call design process. The fact that they were invited to comment on some calls and not others raised questions as there didn't appear to be any clear reason for why they would be invited to contribute towards a particular call and not towards others. While the open approach adopted by the EPA to designing and developing defined calls provides a strong, robust approach to the call design process, it is important to ensure a clear, transparent and consistent process is designed, documented and communicated with relevant stakeholders so that the call design and development processes are absolutely clear to all interested parties.

Issuing call: Calls for EPA research funding are issued through a number of channels, including:

- The national press;
- The EPA website;
- Research offices in the universities and other funded institutions;
- Direct mail shots to researchers who have previously been funded under STRIVE.

This would appear to offer a very comprehensive approach to raising awareness of research opportunities among the environmental research community as well as the broader research community, relevant other stakeholders and the general public. However, feedback from the survey highlights a number of concerns in this regard:

- 46% of respondents first heard about the EPA call through the EPA website. Circulations via the institutions and word of mouth were also effective ways of communicating with the research community;
- 25% of respondents had missed a call for a proposal, which they would have responded to if they were aware of the call;
- 31% of respondents found out later than they would have liked about a call for proposal.

Therefore, there is room for improvement of the publication of the call process to ensure that all prospective applicants are aware of the call and are allowed sufficient time to develop a strong response to that call.

Call management and selection: The technical description document is easily accessible and clear. 95% of survey respondents said that the technical description document very clearly or reasonably clearly described the technical and content requirements for the call. The award criteria were generally regarded as clear and transparent and applicants were notified of the outcome of their application in a timely and efficient manner. 39% of respondents said that the project award criteria were described 'very clearly'. 47% said that it was described 'reasonably clearly'. The remaining 14% found that the award criteria were not clearly presented.

Call efficiency: The EPA has used a pre-proposal stage Expression of Interest approach for a number of specific research calls, such as CGPP4. This process worked well as it provided an effective and efficient approach to short-listing relevant applicants. Incorporation of an expressions of interest (with a limited number of pages) stage into the call process would allow an initial testing phase for both researchers and the EPA, potentially reducing the need for some researchers to invest significant time and effort in developing a lengthy, detailed proposal that they may not be applicable for. It also provides the EPA with a more targeted approach and saves the time and effort involved in evaluating a large volume of lengthy, detailed proposals that are not always relevant.

A comprehensive call process should also include the provision of meaningful feedback to applicants that would allow them to improve future applications. The survey suggests that applicants (particularly unsuccessful applicants) would benefit from receiving more and better quality feedback on proposals submitted under the STRIVE programme.

Thus, the design, development and issuing of research calls could be strengthened in terms of its clarity, consistency and efficiency.

4.3.4 Project Management

Finding 5: The project steering group has provided a very effective structure to support and guide successful delivery of research projects.

Project steering groups: The review highlighted that the effectiveness of the project steering groups was very good. The majority of survey respondents (90%) who had a steering group for their project found them useful in providing external guidance to review and direct their research.

All STRIVE projects have a single lead organisation with a defined principal investigator and a dedicated EPA STRIVE officer assigned to it. The Principal Investigator is responsible for coordinating the research and driving the overall objectives of the research among the research team. The STRIVE officer is responsible for managing the project on behalf of the EPA.

A project steering group is established for most STRIVE projects (except for scholarships), in order to provide advice to the research team and the EPA on the overall direction and approach of the project and to provide an external view of the project. The composition of a project steering group depends on the project being funded, the size of the project and the area of research, although they usually include a mix of people with appropriate expertise and experience, including an EPA technical officer, a representative from the Department of the Environment, representatives from other relevant agencies, a national / international expert and where possible a representative 'end user'.

Projects that have had an end user on the project steering committee have benefited significantly from their input and advice. The end user may be somebody from the policy-making community or an industry representative, etc.

Finding 6: In general, research projects are well-managed. However, there is a missed opportunity to leverage the benefits of managing research projects as a portfolio and long delays in finalising projects still arise.

Project efficiencies: As we have highlighted throughout this section of the report, STRIVE projects are managed very effectively through the pillar research coordination groups, project steering groups and the SmartSimple system. However, the review highlighted a lack of inter-project cooperation and awareness across the STRIVE programme. Researchers reported not being aware of related projects in other universities and research centres, where there may be potential for synergies or sharing of lessons. While the onus for inter-project, inter-institutional and inter-disciplinary learning across the STRIVE programme is a shared responsibility between researchers, research offices and STRIVE programme managers, improved facilities to share information at programme level would provide synergies and support shared working and cooperation among researchers who traditionally often operate on their own in a culture where networking is not embedded in the system.

50% of survey respondents think that research outputs are captured effectively.18% do not think that outputs are being captured effectively and 32% 'don't know'. The fact that 32% of respondents 'don't know' if research outputs are captured effectively is surprising, highlighting the question of how research outputs are shared among STRIVE researchers.

All final reports are peer-reviewed and comments are provided for revision by the project team. Concerns were raised about the long delays that arise in relation to feedback being provided to research teams. Such delays lead to problems for revision, re-work and finalisation of the report, particularly if the research team have moved on to new projects in different research centres. While

there have been some improvements in the average length of time taken to finalise reports, significant delays are still arising in some areas.

Finding 7: STRIVE financial and technical reporting requirements of direct project outputs are proportionate and appropriate for the programme. However, a more robust approach to the collection, collation and reporting of outcome indicators is required, particularly the number or peer reviewed papers published.

Reporting requirements: Researchers funded under STRIVE are required to submit technical progress reports and financial reports every 6 months, apart from Doctoral scholarships and Masters scholarships reporting requirements which are on an annual basis. Bi-annual reporting of technical and financial progress under research projects is proportionate, appropriate and in-line with best practice. 75% of respondents to the STRIVE survey found that the reporting requirements, in terms of frequency and details required, were reasonable and manageable.

The research outputs produced under the STRIVE programme are captured and stored on the SmartSimple system. Researchers are required to submit a final report to describe the objectives, methodologies, outcomes, etc. of the research. For reports that are longer than 75 pages, a synthesis report is also required to provide an overview of the work done. Researchers are also required to provide a short abstract to describe the final report. The reporting requirements for STRIVE are, therefore, proportionate and appropriate for the programme.

While the financial and technical reporting requirements described for managing project finances and overseeing project outputs are robust and appropriate, there was a shortage of data around programme outcomes, particularly peer-reviewed publications produced by STRIVE funded projects.

Availability of accurate and up-to-date data on publications is fraught with difficulties given that firstly, papers are generally written and published towards the end of the project and often papers are published after the project has been completed and the researcher no longer has reporting responsibilities relating to the STRIVE project. Secondly, where researchers are funded by a number of different sources, it is extremely difficult to make a direct link between the funding source and papers published. Thirdly, data available relies on researchers providing the necessary data and there are some questions about the consistency of data provided.

In addition to the issues listed, an additional issue relating specifically to the STRIVE programme, is the timing of the introduction of SmartSimple system. The SmartSimple system was introduced during the STRIVE programme in 2010. Therefore, accurate data on project outcomes was not available for the 2007-2010 period. The process involved in submitting, tracking and reporting peer reviewed publications has improved through the introduction of SmartSimple system. However, further efforts are required to ensure that researchers provide data on project outcomes, including data on papers after the project has closed, where relevant.

4.3.5 Dissemination of research findings

Finding 8: All STRIVE research outputs are available on the EPA website. However, the policy-research interface could better support more effective, proactive and systematic dissemination of STRIVE research findings among the target end users.

Access: All STRIVE reports are available on the EPA website. Datasets, files and reports are stored on the SAFER Data website, which is accessible to the general public. An official launch is held for a small number of major research projects**.** While policy makers and the general public have access to all STRIVE resources through the EPA website, the EPA has not systematically adopted a proactive approach to disseminating STRIVE research outputs to target end users and to the general public.

The survey found that 36% of respondents think that research outputs are being disseminated effectively to the relevant stakeholders. 22% do not think that outputs are effectively disseminated and

41% don't know whether or not research outputs reach relevant stakeholders. The proportion of respondents that 'don't know' whether their research outputs are reaching the target audience shows that researchers are not engaged with policy makers to disseminate the research findings effectively. They do not appear to regard the dissemination phase of the process as within the remit of their activities.

Proactive dissemination: Our assessment shows that researchers and policy makers would welcome improved interaction and engagement between researchers and policy makers. All STRIVE research reports are published on the EPA website. Thus, everyone has access to the research outputs of STRIVE funded projects. While this open approach to providing access to STRIVE research is welcome, a more proactive and targeted approach would ensure that the research outputs reach the appropriate target audience consistently. A proactive, targeted approach is required to:

- **Improve awareness of the research carried out:** A more targeted approach to research dissemination is required to raise awareness of the research carried out so that policy makers know that a relevant research project has been funded and has produced interesting outputs that are relevant to policy development or implementation. Currently, there is no effective ongoing dialogue between researchers, policy-makers and the EPA to make the appropriate links between relevant stakeholders that would ensure that research outputs have the desired impact;
- **Improve the effectiveness of the communication of research outputs:** Effective communication requires ensuring appropriate channels of communication as well as providing the research outputs in a form that is clear and easily understood by policy makers. STRIVE projects are required to draft a synthesis report of the research outputs. This is a positive step in supporting effective communications. However, the reports should be written in non-technical language that policy makers can read, understand and use;
- **Support continuity of research:** To maximise the impact of environmental research, it needs to be applied and used in a way that is practical and beneficial for policy makers and any other relevant users. A report of research findings in isolation does not support effective adoption of the research findings into practical applications. The value of ongoing interaction between the researchers and relevant teams is a much more effective means of maximising the impact of research.

The EPA has held events with research groups in the past (waste, air, climate change) and is currently looking at options to raise the profile of research more effectively through hosting workshops with relevant stakeholders to highlight the outputs of the research carried out and their relevance to the target audience. Workshops provide a forum for researchers to raise awareness of the work that they have undertaken and the value of that work to a particular target audience. At the same time, researchers and policy makers have an opportunity to discuss developments in their respective areas, share ideas and explore where there may be demand for particular research projects.

5 STRIVE Outcomes and Impacts

This section of the report looks at the original objectives of the STRIVE programme to assess how the programme has performed against those objectives. We then look in detail at the key outcomes and impacts of the programme.

5.1 Overview of Programme Outcomes and Impacts

The STRIVE programme set eight clear objectives as described in Section 1 of this report. While all objectives clearly guide the direction and operation of the Programme, it is noted that not all objectives are equal in terms of the ability of the EPA to deliver against those objectives in isolation from other organisations.

At a high level, four of the eight objectives are entirely within the control of the EPA STRIVE team to deliver. Furthermore, there is robust evidence detailed throughout the remainder of this chapter to demonstrate that while three of these four objectives (outlined below) are very clearly being achieved the fourth, dissemination of research findings, needs to be improved as discussed in the previous section:

1. Contribute to a better environment by delivering applicable and relevant Science, Technology, Research and Innovation data, information and knowledge, based on high quality science and technology;
2. Develop new techniques, methods and systems for measuring, recording and predicting the quality of the environment;
3. Ensure that emerging international, EU and national environmental and research plans, policies and legislation are supported and implemented within the research programme;
4. Disseminate the findings of the individual research projects and the overall programme to the widest possible audience in a coherent and timely manner.

The other four objectives (highlighted below) are shared objectives where the STRIVE Programme plays a significant role, along with others, in their achievement. The nature of those objectives is such that they require cooperation and collaboration with other stakeholders, particularly the Department of Environment, Community and Local Government and other state agencies:

5. Develop practical methods for the integration of environmental considerations into policies and programmes of the main economic sectors;
6. Collaborate and assist other agencies / organisations in their environmental decision making by providing high quality, relevant, responsive and timely scientific information and research results;
7. Provide knowledge to support the mainstreaming of environmental decision making by providing high quality, relevant, responsive and timely scientific information and research results;
8. Develop and integrate the environmental component of the knowledge economy, and ensure that environment is a key issue for research priorities at a national level.

While there are examples of progress against these additional objectives, progress in their implementation is less clear and systematic than progress made against the first four objectives listed.

5.2 Analysis of STRIVE Programme Outcomes

The outcomes of investment in a research programme looks at what the research projects (outputs) funded by the programme produced. In order for outcomes assessment to be meaningful, our analysis of programme outcomes is not just a count of the number of reports and presentations produced. Instead, we take a deeper and more insightful approach to assessing what those outputs actually mean. The primary outcomes addressed in this section are:

- Improved research capacity and capability;
- National and international policy and legislation implemented effectively;
- Met international obligations based on knowledge, evidence and data gathered under the programme;
- Progress made towards mainstreaming of environmental research across economic sectors.

5.2.1 Building capacity and capability for environmental research in Ireland

Finding 9: The capacity and capability of environmental research has been improved as a result of STRIVE research programme.

The STRIVE programme has supported building capacity and capability of environmental researchers in Ireland through the provision of targeted environmental research funding that is ring-fenced from other exchequer research funding. The STRIVE survey found that 66% of respondents regarded the programme's success in building and maintaining an environmental research capability in Ireland was a key impact of the STRIVE programme.

Both the researcher-based funding and the project-based funding support capacity building and the Doctoral scholarship scheme and Developing Environmental Research Potential (DERP) scheme have been particularly important in building and developing environmental research capacity in Ireland. The doctoral scholarship scheme was established to:

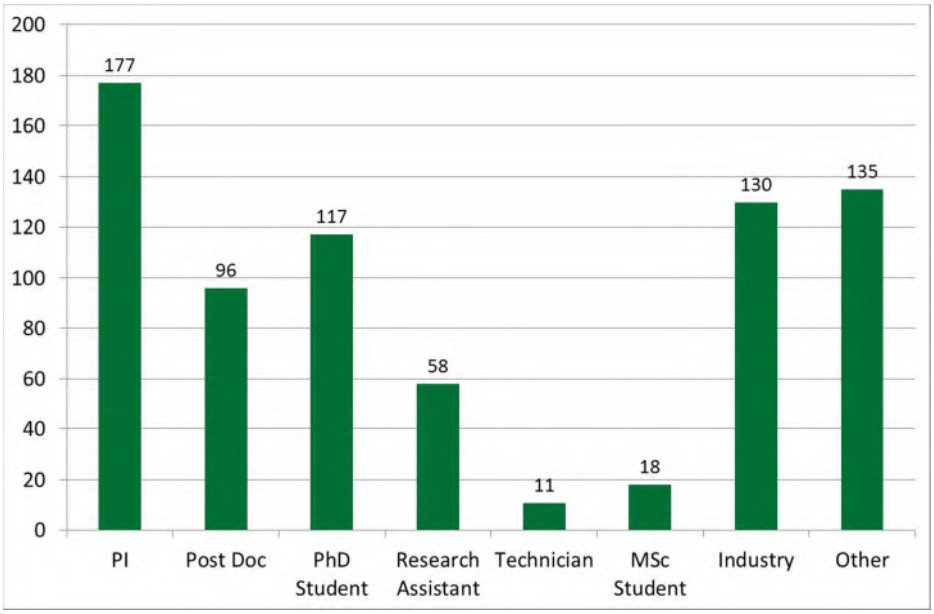
- Promote and support training and professional development of environmental researchers;
- Support high quality novel and innovative research in environmental science and related disciplines;
- Provide the research personnel needed to sustain environmental research and development in Ireland;
- Disseminate the findings of ingoing environmental research at an international level.

Calls are issued periodically based on thematic areas of research, such as environment and health, environmental economics, biodiversity, urban environment.

The Developing Environmental Research Potential (DERP) scheme was launched under the STRIVE programme in 2007. The programme was established to support excellent researchers in their career development, to develop Irish researchers into international team leaders and to foster inter-institutional collaboration across Irish environmental research centres. The programme provided an important support to build research capacity among environmental researchers in Ireland and provided a platform to support participation and competition for international research funding.

The STRIVE programme funded a total of 742 research and related staff, including principal investigators, post-docs, PhD students, research assistants, etc. Figure 5.1 shows an overview of the different types of personnel funded under STRIVE projects. These figures include part-time and full-time researchers.

Figure 5.1 Personnel funded under the STRIVE Programme, 2007-2011



Due to the nature of research funding, where researchers are often funded by a number of different funders at the same time, it is difficult to collate clear and precise information about the number of researchers funded. However, based on the data available, the STRIVE programme has funded a total of 177 principal investigators (including full and part-time PIs), more than any other researcher category.

Thus, the facilities have been put in place to build research capacity and increase linkages and networking within thematic areas. There are good examples of linkages between universities, with international university / research partners, with the private sector and with government partners, such as:

- The Chipsensor low-cost battery-powered Carbon Dioxide and toxic-gas detector system established a number of linkages between researchers and industry and built strong linkages with University College London, where Chipsensor have recently sponsored a post-doc student to plan and build on the strong relationship that was developed;
- The UCC project on compressed biomethane established strong linkages with a number of private sector organisations, such as BGE, Kedco and Celtic Bioenergy;
- The University of Ulster Flow-Pro project established linkages with Teagasc, the Department of Agriculture, Food and the Marine and the Department of the Environment, Community and Local Government;
- The DCU DEPLOY project works with sensor companies, such as IBM, Intel and YSI Chelsea Instruments as well as with other universities and IoTs, including NUIM, UCC and DKIT.

Supporting a collaborative approach to funding research across universities, public sector and private sector researchers is increasingly important given the cross-cutting nature of environmental research. This has been further emphasised through the recent research prioritisation exercise.

Given the concerns already raised about the difficulties with collecting precise data about researchers funded, table 5.1 illustrates the data available on STRIVE-funded researchers by pillar and the number of projects that this data relates to. The breakdown of STRIVE-funded personnel by pillar shows that a total of 283 personnel were funded across 177 projects under the sustainable environment pillar while 104 personnel were funded across 92 projects under the climate change pillar.

Table 5.1 Personnel funded by pillar

	Climate Change	Sustainable Environment	Water	Cleaner Production	Total
Number of Projects funded	92	177	100	24	393
Number of personnel funded	104	283	175	180	742
These figures include part-time and full-time researchers.					

As well as building capacity and capability across the universities, institutes of technology, agencies and the private sector, the EPA has a dedicated in-house Environmental Research Centre (ERC). The focus of the ERC's work is on developing information and related systems as a key environmental component of the knowledge economy. The ERC houses the SAFER-Data facility, a web-based interface to the EPA's Environmental Research Data Archive.

Given the difficulty with data collection already described in detail in Section 4.3 around the timeframes involved in reporting the number of peer-reviewed publications produced, the complications with multiple funders being involved, etc., the data available on these outcomes needs to be interpreted with caution. There was some concern expressed that the data available does not provide an accurate reflection of the total number of peer-reviewed publications produced by STRIVE funded projects. The data available shows that.

- **Climate Change:** 24 climate change projects reported publication of at least one peer-reviewed publication. Between those 24 projects, a total of 130 peer reviewed articles and journal papers were published;
- **Sustainable environment:** Under the sustainable environment pillar, 46 projects produced at least one peer-reviewed publication and 128 papers were published by those 46 projects;
- **Water:** Under the water pillar, 15 projects reported publication of at least one peer reviewed paper and 42 peer reviewed publications were produced by those 15 projects.

In total, for the 85 projects reported publication of at least one peer-reviewed paper and a total of 300 papers were published by those 85 projects.

5.2.2 Supporting design and implementation of environmental policy and legislation

Finding 10: The STRIVE programme has had a significant impact on translating environmental policy and legislation into action.

The STRIVE programme has provided a tool to support design and implementation of national and EU policy and legislation on the ground. Many STRIVE projects identified a particular environmental challenge, investigated the causes of those problems in Ireland and designed a range of policy options in response. Thus, the data, information and knowledge developed by STRIVE projects have provided the tools and mechanisms to translate policy and legislation into action. STRIVE projects that have focussed on informing, shaping and implementing environmental policy include:

- The CONSENSUS project is a cross-border analysis of consumption, environment and sustainability in Ireland that examines how household consumption can be measured, how sustainable behaviours and incentives are being developed, the links between consumption, health and well-being and how matters of household consumption are being governed. The data collected under this project provides evidence to support waste policy formulation;

- The Carbon-Restore project report highlights the very definite financial benefits accruing from restoration of Irish peatlands. Project outputs were a direct input into the new methodologies that were developed for the restoration and re-wetting of peatlands by the IPCC;
- The quantification and tracking of industrial solvents to estimate VOC emissions to air compares Ireland's performance in terms of emissions of Non-Methane Volatile Organic Compounds with two other countries, the Netherlands and the UK.

Example: The on-site waste water treatment project highlights how a particular problem was identified (the impact of on-site waste water treatment systems in one-off houses), a STRIVE research project carried out the research to investigate the nature and extent of the problem and a code of practice was developed in response.[3]

5.2.3 Providing a robust evidence base to support implementation of Ireland's international environmental obligations

Finding 11: The research has provided a robust evidence base to support negotiation, monitoring and implementation of Ireland's international environmental commitments.

Many of the projects funded under the STRIVE programme were established to provide the data and evidence required to support implementation of Ireland's international environmental obligations. STRIVE projects were funded to design new data collection methods, use those methods to collect, record and analyse suitable environmental indicators, and report the data nationally and internationally as required. The EPA's 'SAFER-Data' facility , held by the EPA Environmental Research Centre, is a web-based interface where all environmental datasets are stored together in one location and which is publicly accessible.

The data collected was used to record, monitor and support Ireland in meeting its international environmental obligations, including:

- Ireland is required to report on national levels of greenhouse gas emissions under the United Nations Framework Convention on Climate Change. Under the Convention, and its Kyoto protocol, Ireland is obliged to submit annual national greenhouse gas inventory reports;
- The Drinking Water Monitoring project provided a dataset of drinking water results and water supply details reported annually to the EPA by local authorities (as required by the Drinking Water Regulations).

Example: The large biodiversity project 'Ag-Biota' has identified suitable bio-indicators for the environmental impacts of agriculture. Outputs from the Ag-Biota project represent a significant input to Ireland's obligations under the United Nations (UN) Convention on Biological Diversity (CBD) and will assist in the national aspiration to halt and reverse the decline in biodiversity within the Irish countryside.

[3] STRIVE report no 28. Gill et al.

5.2.4 Mainstreaming environmental policy across economic sectors

Finding 12: A consistent approach to mainstreaming environmental policy across economic sectors has not been achieved to-date and this cross-sector integration of environmental policy will be increasingly important under the new research prioritisation approach.

While some progress has been made in integrating environmental considerations into policies and programmes of the main economic sectors, this has not been achieved systematically across the board. The most direct economic impact of EPA research on the main economic sectors is primarily through the Cleaner Greener Production Programme. The Cleaner Greener Production Programme is co-funded by the STRIVE research programme, although it is now managed separately under the National Waste Prevention Programme. The agri-food and tourism sectors are two primary economic sectors for which environmental policy research is particularly important. STRIVE has funded a number of projects across these sectors, including:

- STRIVE funding has supported projects in the food sector, such as the Supermac's project to investigate the use of biodegradable / compostable product packaging and overall improvement in environmental performance across Supermac's restaurants; BIM, Rosderra Meats, Dawn Meats, Connaught Gold, Cuthberts Bakery and Green Isle Foods;
- The UCC Climate Change Impacts and Adaptation project was set up to support mainstreaming of decision-making by developing structures and systems for communication of information on climate impacts and on adapting planning options, based on research findings and outputs. The aim of the project was to support integration of climate change considerations into sectoral planning;
- The DIT Sustainable Tourism Development project devised a model of indicators for sustainable tourism. The aim was to improve methods for the implementation of sustainable tourism management by using capacity indicators at a destination level to inform policy makers and tourism business managers' decisions.

While agencies and organisations have access to research funded by STRIVE and while there are some good examples of EPA research to support mainstreaming of environment decision making across economic sectors, it is not systematically integrated across agencies, departments, industry bodies and the private sector. A clear, coherent and systematic approach has not been adopted to engage with a broad range of agencies and organisations to support strong and consistent mainstreaming of environmental decision making. Although the nature of health research differs in some ways to environmental research, the Health Research Board has developed a comprehensive model to involving a variety of stakeholders in the 'evidence-based healthcare cycle' as outlined in the HRB's Corporate Strategy 2010-2014. The key steps involved in the cycle are:[4]

- Creation of knowledge and synthesis of existing research and information;
- Commissioning of research where reliable information is not available;
- Transfer of knowledge to people who need to use it;
- Brokering of knowledge between the people who have the new knowledge and the practitioners who use it in policy or practice to deliver better health outcomes.

[4] Health research Board, HRB Strategic Business Plan 2010-2014The future of Irish Health research, 2009

5.3 Analysis of STRIVE Impacts

Analysis of the programme impacts of STRIVE involves assessing the high-level policy, legislative, environmental, economic, commercial and quality of life impacts of the STRIVE programme.

5.3.1 Policy and Legislation Impacts

Finding 13: The programme has had a strong impact on supporting policy development along the policy pathway from design to implementation. However, a coordinated and strategic approach across the EPA, the Department of the Environment, Community and Local Government and other relevant stakeholders is not currently in place, to ensure that environmental research carried out under the STRIVE programme supports the wider national policy agenda.

The STRIVE research programme is a policy supporting research programme at its core. The objectives of the programme are centred on supporting the design, formulation and implementation of national, EU and international policy through the provision of robust research projects to support environmental management and improvement. The programme has had a strong impact on supporting policy development along the policy pathway from design to implementation and, throughout this report, examples are provided of how the programme has supported and informed national and EU policy.

Example: A state-of-the-art experimental waste-water treatment facility at Tuam, Co. Galway has been established through cooperation between Galway County Council and the National University of Ireland Galway (NUIG) to advance the development and testing of novel environmental technologies to facilitate practice-based education and training and ultimately to support policy makers.[5]

The programme offers excellent examples of supporting the policy process across the three STRIVE pillars and along the policy journey. However, the 'big picture' view of future challenges and opportunities, environmental forecasting and horizon scanning would play an important role in informing and shaping the research agenda. It would provide a shared strategic view of the national and international priorities across relevant stakeholders and would, therefore, support the design and development of cutting-edge environmental research that is directly related to national priorities under the programme.

The EPA, the Department of the Environment and other relevant stakeholders have not engaged effectively in wider horizon scanning to identify and assess challenges and opportunities for the future of environment research.

Example: Before the end of 2011, fracking was not on the policy radar and the level of understanding about the process, its risks and benefits was very low. Although a small scale study report on fracking was commissioned by the EPA, a horizon scanning exercise carried out before fracking was identified as an important issue may have identified the need for further research in this area, improved the knowledge and understand of environmental researchers and relevant policy experts on the issue and therefore would have facilitated a more pro-active response, informed by detailed research and analysis.

The recent Research Prioritisation Exercise establishes environmental research as an important cross-cutting research theme that is relevant to many of the 14 priority research areas identified.

[5] STRIVE Report no. 78, O'Reilly and Clifford

Therefore, environmental research has a clear role in the national research strategy. Implementation of that role is not straight-forward due to its cross-cutting nature. It is now important to ensure that clear structures and mechanisms are established to ensure that effective environmental research is embedded across the knowledge economy. The EPA is involved in a number of the implementation committees and it is essential that EPA representatives on those committees ensure that the environmental dimension of research is core to the implementation of the 14 priority research areas.

5.3.2 Environmental impacts

Finding 14: Through the data, information and knowledge provided, the STRIVE programme has supported improved environmental management and protection in Ireland.

The overarching goal of the research carried out under the STRIVE programme is to improve the quality of the environment. Environmental research is fundamental to environmental protection by providing information, statistics and evidence needed to inform effective and targeted environmental policy that is aligned with national and international needs. We have detailed throughout this report how the research carried out under STRIVE has improved environmental research capacity and capability, informed policy formulation and implementation at national and international levels and supported achievement of international environmental commitments.

The research carried out provides the data and information to support policy formulation and implementation, which drives the behaviours that will support a coordinated approach to improving the quality of the environment.

Figure 5.2 The role of research in supporting environmental quality

The outcomes generated, along with other measures and interventions used at individual, household, community, department and international level, all contribute towards improving the quality of the Irish environment. Environmental research carried out under STRIVE is one piece of the environmental jig-saw, which makes a very important contribution to providing the data, information and knowledge required to ensure that the environment is effectively managed.

The data, information and knowledge have been instrumental to ensuring that Ireland has met its commitments to improving the quality of the environment across a number of challenging areas, specifically:

- **Water quality:** The objective of the Water Framework Directive is to protect national waters, prevent further deterioration of our waters and to restore degraded surface and ground waters by 2015. The STRIVE programme has funded a number of projects relating to implementation of the Water Framework Directive. The research carried out has supported the EPA, as environmental regulator to monitor, manage and improve the quality of Irish water. Examples of research carried out in this area include:
    - Water Framework Directive – Integration, Negotiation and Communication of Optimal Measures with Stakeholders (2010);
    - Water Framework Directive: Marine Ecological Tools for Reference, Intercalibration and Classification (METRIC) (2008);
    - Water Framework Directive - A reference-based typology and ecological assessment system for Irish lakes (2007).

- **Air quality:** One of the key issues for Ireland in terms of air quality is to reduce emissions of transboundary air pollutants in line with international commitments under the National Emissions Ceilings and the Air Quality Framework Directive. The STRIVE programme has funded a number of projects on air quality, including a project on 'New Transboundary Air Pollution Monitoring Capacity for Ireland which addressed air quality monitoring issues that had been identified.
- **Biodiversity:** Significant progress has been made in the designation of protected areas and research carried out under the STRIVE programme has supported that progress through a range of projects. The Ag-biota project has made a significant contribution towards Ireland's obligations under the Convention of Biological Diversity and subsequent agreement by EU member states to halt the loss of biodiversity. The results will also help to guide the development of agri-environmental policy.
- **Waste management:** There has been significant change in the approach to waste management in Ireland over the last decade. The regulation, management and accountability in the waste industry have yielded significant and measurable improvements in environmental protection as a result. A number of STRIVE projects have been funded to examine domestic waste collection charges in Ireland and to examine the impact of a pay-by-use model to maximising waste reduction behaviour in Ireland.
- **Land use and soil:** A limited amount of information is known about Irish soils. The largest STRIVE project funded to-date, which is co-funded by Teagasc, a digital indicative soil map of Ireland will be developed through the use of sophisticated computed and satellite technology.

Example: The Urban Environment Project in UCD received €1M of STRIVE funding to produce decision support tools for managing the urban environment. The publication of the Green City Guidelines under this project provided practical ways in which local authorities, planners and property developers can protect and enhance biodiversity while developing medium- to high-density urban schemes.

A recent report by Germanwatch and Climate Action Network (CAN) Europe ranked Ireland 17th among 58 countries in the annual Climate Change Performance Index. There are obviously a variety of factors contributing towards this positive performance, including a positive side-effect of the economic down-turn. Also, specifically in relation to water, Ireland ranked 1st of 27 countries in WFD reporting. Ireland's strong performance in this regard is owed largely to the research carried out under STRIVE. These indicators show positive progress in the right direction and environmental research carried out in Ireland has been instrumental in achieving that progress.

Example: Peatlands cover over 20.6% of the land area of Ireland (), and represent important habitats including many Special Protection Areas (SPAs) and Special Areas of Conservation (SACs). The BOGLAND project reviewed knowledge on social, economic, environmental and institutional aspects of peatland utilisation and management to develop a protocol for the sustainable management of peatlands in Ireland. This has been recognised nationally and internationally as a crucial piece of work and recommendations from the peatlands project have already been incorporated into the new birds and habitats regulations (November 2011).

5.3.3 Economic Impacts

Finding 15: The STRIVE programme has resulted in direct and indirect benefits for the Irish economy, including savings on international fines that would otherwise have been incurred, additional funding leveraged and supporting the attraction of foreign direct investment.

The STRIVE programme has resulted in direct and indirect benefits for the Irish economy. The economic benefits of investment in the STRIVE programme are described in Table 5.2.

Table 5.2 Economic benefits of STRIVE

Economic benefit	Description
Savings gained / expected savings	Research carried out under the STRIVE programme has allowed Ireland to manage, monitor and report against our international environmental commitments. Significant fines are charged to countries who do not meet their international commitments. Research carried out under STRIVE has provided the data necessary to report accurately and this has resulted in significant savings to the Irish economy: • A STRIVE project to review landfill management practices and methane capture and utilisation at landfill facilities has resulted in a significant downward revision of methane emissions to the atmosphere from landfills in Ireland. This has been estimated to provide savings of approximately €50M to the State over the Kyoto Protocol period. • The findings of a project to estimate Greenhouse Gas emissions from agriculture and strategies for their reduction are now being used systematically to calculate the national inventory of greenhouse gases. If Ireland was not in a position to report greenhouse gas emissions accurately, a default value would be assigned, which could result in inaccurate or misleading results.
Additional funding leveraged	Additional funding leveraged from international funders, for example: • Multimedia Computer Systems Ltd's iameco project developed a prototype of guaranteed Irish zero waste personal computer, which uses only reusable components, is energy efficient and free of hazardous materials. The support received. • The APEnvco Integrated Modelling Project was co-funded by the company. • Additional funding was provided to the Carbon-Restore project by Bord na Mona. • The DCU project on nanotechnology (Nanotechnology: Engaging with the public on health, environmental and social issues) has leveraged additional funding from FP7 networks, Enterprise Ireland and internal DCU research funding. • Over €12.5M in research funds (national and international sources) in the water & waste research areas following an initial EPA investment of €4.7M. The wider economic benefits associated with this success include the development of the perception of Ireland as an international centre of excellence and the associated investment that stems from building that reputation. For example, IBM has established a water management research and development group in Dublin. A number of other projects are in the process of developing proposals, in partnership with other universities nationally and internationally, for FP7 funding. On the back of the Zero Carbon Emission project in UCC, researchers are working with CIDITEC Energy Technology research centre in Barcelona to build a project consortium to respond to an FP7 nanotechnologies, materials and new production technologies (NMP) call. The EPA has set up a working group for FP-7 Environment to identify priority research

Economic benefit	Description
	from a national perspective that the Irish research community would be in a strong position to compete for, foster collaborative linkages between Irish organisations encourage a national platform for environmental research. The working group comprises a representative from each university, a representative of the institutes of technology and a SME representative.
Foreign Direct Investment	While it is difficult to quantify the specific impact of a high quality environment on attracting foreign direct investment to Ireland, it is widely accepted that the quality of the environment is one of the key criteria that internationally mobile companies consider when deciding where they will locate their business. Despite the economic downturn and uncertainty regarding the Irish economy in recent years, Ireland has continued to be successful in attracting and maintaining major international companies, such as PayPal, Intel, Google, etc. The environment is one of a number of factors considered, including availability of quality of the workforce, transport infrastructure, fiscal policy, etc. Therefore, it is difficult to quantify the precise impact of the environment in Ireland's success in this regard. However, Ireland's ability to maintain a good, clean environment has made a significant contribution to Ireland's international reputation, which is essential to attracting and maintaining foreign direct investment to Ireland.
Avoided fines	Non-compliance with environmental legislation carries the risk of significant fines and the fines imposed by the European court for non-compliance with directives are substantial. For example, the European Commission is currently taking Ireland to court for a second time for failing to comply with directives relating to septic tanks which impacts on ground water quality. It has asked the European Court of Justice to impose a fine of €2.7M and daily penalties of more than €26,000 until the legislation is in place. Following another recent court action, Belgium faces a fine of €15 million, and a daily fine of €62,000 for not complying with a court ruling in 2004 regarding wastewater treatment.

5.3.4 Commercial impact

Finding 16: STRIVE research projects have the potential to develop commercial opportunities, while maintaining a policy focus. It is important to ensure that the commercial potential of research projects funded under the programme is enabled and that appropriate structures are established to support commercial development through the correct channels.

Understandably, due to the overarching focus on supporting policy research, the STRIVE programme has not had a strong focus on driving and delivering strong commercial benefits. The Cleaner Greener Production (CGPP), which was originally part of the STRIVE programme, is the research programme of most direct relevance to generating direct commercial benefits to the private sector. However, as explained earlier in the report (Section 4), this programme has been transferred to the National Waste Prevention Programme for the purpose of clarity and consistency.

The STRIVE programme has generated a number of specific commercial benefits through the research carried out. STRIVE projects resulted in the development of new operating practices to provide reductions in emissions and waste and energy savings. The type of commercial benefit across the STRIVE programme included direct savings, patent applications, spin-out companies and commercial acquisitions.

Table 5.3 Commercial Impact of STRIVE

Project	Commercial Impact
Spin-outs	
Bip-plastech Ltd.	• Bio-plastech is a spin-out company established by a UCD research team that have patented technology for the conversion of plastic bottles into biodegradable plastic (polyhydroxyalkanoate (PHA)). • Enterprise Ireland is supporting the research team, originally funded under STRIVE, in commercialising the research, by providing proof of concept funding and to investigate the scalability of the concept.
Patents	
UL recycling LCD displays	The technology for a high through-put recycling machine designed to meet the WEEE directive requirements and greatly increase recycling rates for flat screen displays was patented by UL Technology Transfer Office and licensed to ALR Innovations.
UL recycling LCD displays	A campus spin-out company, ALR Innovations, was also started form the UL Innovative Process for recycling LCD displays. ALR Innovations was recognised at the Intertrade Ireland annual all-island seed-corn business competition, where it won the best high growth company award.
Savings	
Connaught Gold waste reduction programme	• €210,000 worth of milk powder product was saved annually by eliminating product losses and improving efficiencies • Reduction in heavy oil use resulted in savings of€196,000 • Energy reduction provided savings of €118,652
Dawn Meats	• €25,000 reduction in oil consumption, due to water re-use, and conservation and heat recovery
Tech Group Europe Reduce and Reuse	• Significant savings as a result of energy savings, printing efficiencies and humidity control
Supermac's super-sustainable	• Development of new operating procedures to generate significant cost and energy savings
Green Isle Greening Green	• Packaging savings in excess of €266,000pa • Waste reduction savings in excess of €240,000pa • Energy efficiencies in excess of €248,000pa
Other	
Chipsensor	Chipsensor was acquired by Silicon Laboratories. Silicon Laboratories has committed to the gas sensor development programme and are providing additional investment to: – Move to a new and bigger premises – Equip a world class gas sensor characterisation laboratory

Project	Commercial Impact
	– Support ongoing collaboration with university researchers – Hire new employees (Estimate 3, based on growth strategy)

It is particularly important for a programme that is so clear and specific in its focus to build mechanisms into the programme that capture other types of outputs, outcomes and impacts as well as the policy outputs. There must then be a clear process to channel those opportunities appropriately. For example, if a STRIVE research project identifies a potential commercial opportunity from the research carried out, the researchers responsible for that project should be linked in to Enterprise Ireland to ensure that they get the appropriate support to maximise that opportunity. This lateral thinking is required to ensure that the STRIVE programme does not miss opportunities which, although not the central focus of STRIVE, offer important potential economic, commercial and environmental benefits for Ireland, the wider research community and the researcher. Liaison with research offices, technology transfer offices, other agencies (such as Enterprise Ireland), etc. are key to ensuring that opportunities from the STRIVE research carried out are maximised.

5.3.5 Quality of Life Impacts

The specific impact of the STRIVE programme on the quality of life and health of Irish people cannot be measured in isolation. However, it is important to recognise and acknowledge that STRIVE research has made an important contribution to the quality of life of people living in Ireland. We have already discussed the environmental impact of the programme, which has a direct effect on peoples' quality of life. The other important area that the programme has had a positive impact is as a result of the health research carried out under the programme. A number of important health research projects were funded under STRIVE, including:

- Nanotechnology: public engagement with health, environmental and social issues (DCU) - Given the many social implications that nanotechnology will have, public engagement on the matter is very important. The project report offers a menu of dialogue models for policy makers to address communications around nanotechnology to support public discourse on the environmental, social and health implications of nanotechnology. This proactive approach to supporting public policy engagement on major issues of environmental, health and social interest supports more informed and engaged public debate.
- Understanding the Links between the Environment, Human Health and Well-Being (UL) - This project looked at the links between environmental and health research and the importance of a collaborative approach between partners involved in health and environmental research. Partnership between the EPA, the HSE and the Institute of Public Health (IPH) are essential to supporting a coordinated approach to addressing environment and health research towards improving the quality of life of people living in Ireland.

6 Findings and Recommendations

Section 6 provides a summary of the key findings highlighted throughout this report and suggests a series of recommendations based on these findings. In line with the specific terms of reference for the review, this section also presents a review of progress made by the EPA with regard to the recommendations of the CIRCA report and progress made in relation to the initial targets set for the STRIVE programme. The section concludes with an options appraisal for the continuation of the STRIVE programme.

6.1 Progress made in relation to CIRCA recommendations

The terms of reference for the review required that we undertake a review of the progress made towards the implementation of the findings of the CIRCA report "Benchmarking of the ERTDI Programme for the period 2000 - 2006". Our findings in this regard are outlined in Table 6.1 below.

Table 6.1 Progress made on the CIRCA report

CIRCA Recommendation	Progress
Overarching Recommendation: The funding programme should continue broadly as it is over the period of the new National Development Plan.	The STRIVE funding programme was originally shaped in line with its predecessor, ERTDI. However, the programme has evolved and has been re-structured to provide a clearer, more stream-lined approach to the management of environmental research funding.
Build research capability: • Research teams should be informed well in advance of the completion of their projects of the EPA's preliminary views about the success of the project and of opportunities for future funding which could enable research group to continue in existence. • EPA should consider funding a position of Principal Investigator for large research projects, with the aim of building research capability and increasing linkages and networking within thematic areas.	• Researchers are encouraged to seek funding from other sources nationally and internationally. The EPA has established a FP7 National Advisory Group (NAG) to alert researchers of potential research opportunities. • The EPA also influences FP7 calls by providing submissions and Irish projects have been successful in responding to those calls. • An Annual FP7 information day is normally held and in 2011 there were six regional workshops held. • Since the beginning of the STRIVE Programme the EPA has encouraged larger projects to assign a project manager and a lead Principal Investigator. • A New scheme entitled Developing Environmental Research Potential (DERP) Scheme was launched in 2007. It was intended to enable outstanding early career researchers develop into team leaders of international standing and to prove their ability as independent principal investigators (PIs).
Value for Money: • The VfM approach to assessing projects is an innovative approach and should be continued.	The EPA continues to implement a VfM approach to assess the value for money achieved by particular projects during a specified time period. This approach is not rolled out routinely across all pillars on an on-going basis.
Management Processes: • Adopt the use of two-stage calls for proposals for larger projects. • Introduce an internet-based process for submission of applications and for evaluation.	• Following careful consideration, a two-stage call process is not generally used. It has only been used in exceptional circumstances. • Reporting is now managed through a central online grant

CIRCA Recommendation	Progress
• Simplify the financial eligibility rules, guidance documentation and reporting requirements for projects to reduce the administrative burden on research performers. • Examine how to introduce greater speed and flexibility into the financial reporting process without compromising its integrity. • Review the causes of excessive delays between completion of a project and publication of the report.	management system, SmartSimple. • Financial eligibility rules, guidance documents and reporting templates have been simplified significantly in order to reduce the administrative burden on project delivery. • SmartSimple has facilitated submission of reports. The survey of researchers carried out found that 75% of respondents found reporting requirements either 'very' or 'quite' reasonable and manageable. • The SmartSimple system has introduced greater speed and efficiency into financial reporting 70% of survey respondents to the STRIVE survey found that SmartSimple makes reporting more efficient and effective. • Significant delays between completion of a project and publication of the report still do arise. This issue needs to be addressed in the interest of efficiency.
A more strategic approach to Research: • The EPA should focus on developing a strategic plan for research in each of the thematic areas. • The National Platform for Biodoversity Research is a good example of how to operate strategically in a research area and the EPA should ensure that it is revitalised.	The EPA has developed a strategic plan for research in each of the thematic areas identified and this is outlined in the programme document STRIVE Science Technology Research and Innovation for the Environment Environmental Protection Agency 2007-2013. (The plan set out in that document is based on the original programme structure). The programme structure has been revised to focus on three pillars; climate change sustainable environment and water.
Dissemination of research findings: • All major research should be launched via press release and, if appropriate, a press conference. • New mechanisms should be explored for disseminating the research findings to end users.	• All research reports are published on the EPA website. • The EPA does an official launch for a small number of major research projects in consultation with Media professionals. • The EPA is looking at an option to raise the profile of research appropriately through hosting a workshop with relevant stakeholders to highlight the relevance of the research to a target audience and to support effective dissemination.

A number of the findings highlighted in the table above are closely linked to our overall evaluation findings, which are outlined in detail in Section 5 and summarised in Section 6.3 below.

6.2 Progress made in relation to Initial Phase targets

A series of initial phase targets were set for the STRIVE programme. This section provides an overview of progress made against the initial phase targets set for the STRIVE programme and refers to the section of the report that provides further details of progress made.

Table 6.2 Progress made against initial phase targets

Initial Phase Targets	Progress
The programme will have delivered substantial progress in relation to contributing to a better understanding of the environment and assisted in tackling key environmental problems for Ireland.	The STRIVE programme has made substantial progress in improving the level of understanding of the environment and assisted in tackling key environmental problems for Ireland. We have detailed throughout this report how the research carried out under STRIVE has improved environmental research capacity and capability, informed policy formulation and implementation at national and international levels, supported achievement of international environmental commitments and assisted in tackling key environmental problems for Ireland, E.g. WFD reporting.
The programme will be recognised by policy makers, other stakeholders and funding agencies as being a leading activity supporting environmental research in Ireland on the basis of project and financial management, dissemination and evaluation.	The key stakeholders in terms of project and financial management are the researchers funded under the programme. Our review of the programme has found that it is well-managed with some scope for improvement. Section 4.3 of this report assesses the project management structures, tools, and governance arrangements used to manage the STRIVE programme. In terms of dissemination of research findings, examined in Section 4.3.5 , the key finding in is that the policy-research interface could better support more effective, proactive and systematic dissemination of STRIVE research findings among target end users.
The programme will have attracted new researchers from science, engineering, socio-economics and related disciplines.	The programme has successfully attracted new researchers, who had not previously been funded under ERTDI. Based on analysis carried out of 273 STRIVE projects with a value in excess of €40,000, 54% of researchers funded had not previously been funded under ERTDI. The value of awards to those researchers was €31.7M.
Irish environmental researchers will have increased their international standing measured by agreed output and performance indicators such as number of PhDs, peer-reviewed publications / citations and participation in competitive international programmes.	Assessment of Irish environmental researchers' progress in increasing their international standing is a complex issue as suitable reliable and comparable metrics are notoriously difficult to collate. However, section 5.3.3 of this report shows how Ireland's performance across a number of international indices has improved and is particularly strong in WFD reporting. Over €30m has been drawn down to date by Irish environmental researchers across a variety of programmes (Environment, Marie Curie etc.) under the FP7 programme (2007-2011).

Significant progress has been made against the initial phase targets set for the programme and the evidence behind progress made is detailed throughout the report. The following sub-section brings together the key finding and makes a number of recommendations relating to those findings.

6.3 STRIVE review findings and recommendations

Throughout this report, the key findings relating to the analysis carried out is highlighted in red boxes. In this section, we look at each of those key findings and make a series of recommendations in the context of the future operation of the STRIVE programme and, indeed, future environmental research. The findings fall into three categories and the recommendations associated with those categories are tailored accordingly:

- Programme strengths: Continue as is and build on the strong platform developed
- Areas for improvement: Improvement actions required to address particular issues identified
- Opportunities: Use the programme as an opportunity to develop the programme's profile and maximise national strategic environmental impact.

Table 6.3: STRIVE Review Findings and Recommendations

Finding	Recommendation
Programme Strengths **At a high level, the review has highlighted that the STRIVE Programme has made significant progress in achieving the objectives set for it at the outset and as a result the programme has had a significant impact in relation to policy formulation through environmental research. Given this success, a number of programme strengths were highlighted throughout the Review, in particular those listed below. We believe the STRIVE Programme can further build on these strengths to continue its success in supporting the design, formulation and implementation of environmental policy.**	
Finding 1: The costs of managing and implementing the STRIVE programme is appropriate and efficient relative to the programme budget.	**R1:** The existing programme management structure should be continued broadly as is. The current structure represents an efficient, effective and value for money approach to the management and implementation of the STRIVE programme.
Finding 2: The importance of cooperation and partnerships are being recognised through the newly established pillar research coordination groups.	**R2:** Continue to develop the pillar research coordination group structure across all STRIVE pillars, ensuring that: • The water and sustainable environment pillars, particularly, are further enhanced and developed • Appropriate representatives are engaged across each of the pillar research coordination groups • Pillar research coordination groups meet regularly (every 6 months) to discuss progress, strategic priorities and next steps.
Finding 5: The project steering group has provided a very effective structure to support and guide successful delivery of research projects. However, the effectiveness of steering groups has not been consistent across all projects.	**R3:** The project steering group should continue to support project management of STRIVE research, guiding the research projects, ensuring that they deliver against the Terms of Reference and providing insights and expertise based on their own knowledge and experience. • The project steering group should always include a representative end user of the research project • Project steering groups should meet regularly to support active engagement with the project.
Finding 7: STRIVE financial and technical reporting requirements of direct project outputs are proportionate and appropriate for the programme. However, a more robust approach to the collection, collation and reporting of outcome indicators is required, particularly the number or peer reviewed papers published.	**R4:** The financial and technical reporting requirements are appropriate in terms of frequency. The current requirement for 6 monthly financial and technical reports is appropriate and fit for purpose. A more robust approach to the collection of programme outcome data, particularly the number of peer-reviewed publications produced, is required. Researchers funded under the STRIVE programme should be required to provide data on programme outcomes during the life of the project and for 12 months after the project has closed.

Finding	Recommendation
Finding 9: The capacity and capability of environmental research has been improved as a result of STRIVE research programme.	**R5:** The STRIVE programme should continue to develop on the platform established for building research capacity and capability by: • Supporting on-going interaction among the research community to share ideas • ensuring that researchers are made aware of future funding opportunities to support continuity of research teams • Continuing the DERP programme to support excellence in environmental research.
Finding 14: Through the data, information and knowledge provided, the STRIVE programme has supported improved environmental management and protection in Ireland.	**R6**: The programme's focus on providing data, knowledge and information to support evidence-based policy and decision making should continue. However, a more pro-active approach to dissemination of research findings to the target end users would further increase the programme impact (discussed further under recommendation 11).
Finding 15: The STRIVE programme has resulted in direct and indirect benefits for the Irish economy, including savings on international fines that would otherwise have been incurred, additional funding leveraged and supporting the attraction of foreign direct investment.	**R7:** The STRIVE programme should continue to support environmental research that provides a robust evidence base to meet our international commitments, supports leveraging additional national and international research funding and contributes to the attraction of foreign direct investment into the Irish economy.

Finding	Recommendation
Areas for Improvement **While at a high level, the review finds the STRIVE Programme to be effective and efficient in delivering against its objectives, a number of areas were identified where there is scope for further improvement to enhance achievement of the STRIVE programme objectives and to maximise the environmental, policy and economic impact of the programme. The areas of improvement identified for the programme through this Review are listed below.**	
Finding 3: Smart Simple provides a very useful project management tool that supports effective project management for the EPA and for research teams. However, some concerns were raised in terms of the user-friendliness of the system.	**R8:** Carry out a detailed review and consultation process to understand the concerns arising with the Smart Simple system. The review should seek to understand: • where there is scope for simplification • how the interface can be improved • where technical issues are arising • how the system could be further improved to support the grant application and project management process
Finding 4: While broadly stakeholders were content with the end-to-end process for designing, developing and managing calls, ways of enhancing the process further were identified.	**R9:** A clear end-to-end process for designing, developing and managing calls should be mapped, communicated and implemented so that all stakeholders have a clear view of the process involved and the role they play in the process so that they are confident that the call governance arrangements are sound and robust. An enhanced call process would help to maximise the response rate, quality and competitiveness of the calls, the STRIVE team must ensure that all potential respondents hear about research calls and that they have enough time to develop and submit a response to relevant calls.
Finding 6: In general, research projects are well-managed. However, there is a missed opportunity to leverage the benefits of managing research projects as a portfolio and long delays in finalising projects still arise.	**R10:** Establish environmental social network that allows policy makers and researchers to engage in a convenient and accessible way to share ideas, exchange views and discuss research and policy priorities.
Finding 8: Although all STRIVE research outputs are available on the EPA website, the policy-research interface is not well-developed to support effective, proactive and systematic dissemination of STRIVE research findings among the target end users.	**R11:** A more pro-active approach to dissemination of research findings to the target end users and to the general public (where appropriate) is required. The approach used will vary somewhat and should be tailored to what is appropriate, depending on the nature of the research carried out, the target audience for that research, the level of public interest, etc. For very technical, specialised projects, there is often a small, defined target audience and a workshop bringing together the appropriate stakeholders is an appropriate channel for dissemination of research outputs. For projects that have a specific industry or sector appeal, a conference might be a suitable method for disseminating the findings and if projects have wider public interest, a national press release would support effective dissemination of the research findings. Establish an environmental social network to allow policy makers, researchers and other stakeholders to engage in a convenient way to share ideas, exchange views and discuss research and policy priorities.

Finding	Recommendation
Programme Opportunities **While the review finds that the STRIVE Programme has already achieved significant impacts, the programme also provides a platform for inter-agency, inter-departmental and multi-stakeholder cooperation to support environmental research across the wider research agenda. The outputs of the recent Research Prioritisation Exercise require a focussed effort on coordination of environmental research interests across the priority research areas identified. STRIVE is established as the core environmental research programme and therefore is positioned to support, promote and safeguard environmental research interests in the implementation of research prioritisation exercise.**	
Finding 10: The STRIVE programme has had a significant impact on translating environmental policy and legislation into action.	**R12:** The STRIVE programme should continue to support environmental policy decision making and negotiation of international obligations. A horizon scanning exercise would support effective engagement with relevant stakeholders at a strategic level to identify the big environmental challenges and opportunities, assess how research can support a strategic response to those challenges and opportunities and develop an appropriate implementation plan across the EPA, the Department and other stakeholders.
Finding 11: The research has provided a robust evidence base to support negotiation, monitoring and implementation of Ireland's international environmental commitments.	**R12:** The STRIVE programme should continue to support environmental policy decision making and negotiation of international obligations. A horizon scanning exercise would support effective engagement with relevant stakeholders at a strategic level to identify the big environmental challenges and opportunities, assess how research can support a strategic response to those challenges and opportunities and develop an appropriate implementation plan across the EPA, the Department and other stakeholders.
Finding 12: A consistent approach to mainstreaming environmental policy across economic sectors has not been achieved to-date and this cross-sector integration of environmental policy will be increasingly important under the new research prioritisation approach.	**R13:** Coordinate and manage a regular horizon scanning event that includes the EPA, the Department of the Environment, Community and Local Government, representatives from relevant sectors prioritised in the research prioritisation exercise, industry bodies and other relevant stakeholders to support a strategic and comprehensive approach is to the planning, design and implementation of environmental research under STRIVE. A horizon scanning exercise would support effective engagement with relevant stakeholders at a strategic level to identify the big environmental challenges and opportunities, assess how research can support a strategic response to those challenges and opportunities and develop an appropriate implementation plan across the EPA, the Department and other stakeholders.

Finding	Recommendation
Finding 13: A coordinated and strategic approach across the EPA, the Department of the Environment, Community and Local Government and other relevant stakeholders has not been adopted to ensure that environmental research carried out under the STRIVE programme supports the wider national policy agenda. As a result, STRIVE research has been focussed on responding directly to EPA requirements.	**R13:** Coordinate and manage a regular horizon scanning event that includes the EPA, the Department of the Environment, Community and Local Government, representatives from relevant sectors prioritised in the research prioritisation exercise, industry bodies and other relevant stakeholders to support a strategic and comprehensive approach is to the planning, design and implementation of environmental research under STRIVE. A horizon scanning exercise would support effective engagement with relevant stakeholders at a strategic level to identify the big environmental challenges and opportunities, assess how research can support a strategic response to those challenges and opportunities and develop an appropriate implementation plan across the EPA, the Department and other stakeholders.
Finding 16: STRIVE research projects have the potential to develop commercial opportunities. It is important to ensure that the commercial potential of research projects funded under the programme is not lost and that appropriate structures are established to support commercial development through the correct channels.	**R14:** In order to maximise the impact of the STRIVE programme, a structure needs to be embedded into the programme to identify potential commercial opportunities and to ensure that those projects access the most appropriate support channels, such as Enterprise Ireland, Intertrade Ireland, City and County Enterprise Boards etc.

6.4 Options Appraisal

Finally, a requirement of the terms of the reference for the review of the EPA STRIVE Research Programme was to determine the probable outcomes that could result from the discontinuation, reduction or expansion of the programme. Such options were reviewed with stakeholders as part of the extensive consultation process and the following key points were noted:

Reduction of the programme: Many stakeholders pointed to the fact that the current STRIVE Programme already operates on a reduced budget, given reductions required over the past 2 years. In recognition of this point, we asked the possible implications / outcomes if the budget were to be reduced further. The following points were raised:

- A reduction in research outputs and, therefore, outcomes including a reduction in the number of patents and licences;
- A high risk of so-called "brain drain" that would occur if researchers were forced move abroad to secure funding opportunities.
- Possible reduced capacity and success in leveraging international funding, particularly EU funding, as national funding programmes, such as STRIVE provide a platform and critical mass to support applications for large -scale funding opportunities, such as FP7.
- It was not accepted that FP 7 funding could simply replace STRIVE funding. Where it did, the outcome and impacts would vary in that there would be an increased focus on capacity building and little to no focus on policy research.
- General agreement that there would be significant reputational damage to Ireland in the area of the environment and environmental research.
- Reduced ability to integrate environmental research across other state agencies and Government Departments.
- It was suggested that due to the change in focus, projects may become more efficient (due to a need for more of a commercial focus). However, it was felt that projects in general were already becoming more efficient under existing structures.
- Finally, stakeholders continually raised the question of what priority environmental research would continue to hold if STRIVE was reduced even further, given environmental research is currently approximately 1.5% of overall research.[6]

Expansion of the programme: There was widespread acceptance that the current level of funding is the status quo and many stakeholders felt it wasn't feasible to even consider the implications of an expansion to the programme, particularly given the recent reductions required in the STRIVE budget. Notwithstanding this, the following points were raised in relation to expansion of the programme:

- It was felt that the Programme is currently responding to and incorporates all of the key environmental areas identified in the new three pillar approach and, therefore, no expansion was required in terms of focus.
- Questions were raised on whether Ireland had the capacity to respond to a possible expansion of the Programme and views were mixed in this regard. While, capacity may exist in certain areas, it was not felt that there was sufficient capacity across the Programme to respond adequately to Programme expansion. Certainly, there was a belief that additional capacity would need to be brought "back" to Ireland to facilitate a response to an expansion.

[6] Forfas, Research and Development Funding Performance in the State Sector 2009-2020, 2011

- Others were very clearly of the opinion that the STRIVE Programme should be expanded, as this would facilitate Ireland to move from driving policy in Ireland and Europe to actually leading environmental policy.

Discontinuation of the programme: The overwhelming agreement throughout this review has been the absolute need for the STRIVE Research Programme and continued funding for environment research beyond STRIVE through the same or a similar programme. The clear outputs, outcomes and impacts highlighted in earlier chapters clearly highlight what would be lost without such a Programme. The key points highlighted in further consultation with stakeholders included:

- All activity in the area of environmental policy research would cease as it would not be funded from the private sector without a very clear and primary focus on commercial return. The actual cost on the policy impact of discontinuation was so broad in its reach it could not be estimated.
- A significant loss in capacity (grown over the past few years), which would have a knock on effect on Ireland's competitiveness externally.
- Significant economic impacts were highlighted, including the cost to Ireland of failed environmental compliance, possible loss of FDI (less attractive), as well as a negative impact on certain sectors of the economy especially food and tourism.
- Finally, the damage to communications with the public in relation to environmental issues and the impact on human health.

Each of the above options is also considered in the context of the recommendations proposed throughout this report. Table 6.3 highlights which recommendations are possible in the context of the three options outlined above.

As part of the review, we were asked to identify the minimum level of funding necessary to maintain a viable STRIVE research programme. Based on the analysis completed in this report, we conclude that as a minimum the STRIVE Programme requires the current level of funding to ensure it achieves the stated objectives set for it prior to completing the Programme in 2013. The programme is managed efficiently and effectively and any further reductions in the environmental research budget for the STRIVE programme would significantly erode the environmental, policy and economic impact of the programme.

Some of the recommendations made will have a high dependence on funding. Others can be implemented at relatively low cost. Table 6.3 presents a high-level view of the implications of each funding option for the recommendations made. Here, given each scenario (continue as-is, reduction, expansion, discontinuation), which of the recommendations listed in Table 6.1 could be implemented?

Thus, Table 6 gives an overview of the implications of each of the funding options considered for implementation of the recommendations made in this review. Options 1 and 4 allow for full implementation of all recommendations made, while option 3 allows for a more limited implementation of the recommendations. If the programme was dis-continued (option 2), implementation of the recommendations would no longer be relevant.

Table 6.4 Ability to address recommendations based on options appraisal

Recommendation	Option 1: Continue as-is	Option 2: Dis-continuation	Option 3: Reduce funding	Option 4: Increase funding
Programme Strengths				
R1 Continue the existing programme management structure broadly as is	✓			✓
R2 Continue to develop the pillar research coordination group structure	✓			✓
R3 The project steering group should continue to support project management of STRIVE research	✓			✓
R2 Detailed review of SmartSimple	✓		✓	✓
R3 Clarify and improve call process	✓		✓	✓
R4: A more robust approach to the collection of programme outcome data is required	✓		✓	✓
R5: Continue to develop on the platform established for building research capacity and capability	✓			✓
R6: The programme's focus on providing data, knowledge and information to support evidence-based policy and decision making should continue	✓			✓
R7: Continue to support environmental research that provides a robust evidence base	✓			✓
Areas for Improvement				
R8: Carry out a detailed review to understand the concerns arising with the SmartSimple system.	✓			✓
R9: A clear end-to-end process for designing, developing and managing calls should be mapped, communicated and implemented	✓		✓	✓

Recommendation	Option 1: Continue as-is	Option 2: Dis-continuation	Option 3: Reduce funding	Option 4: Increase funding
R10: Establish environmental social network that allows policy makers and researchers to engage in a convenient and accessible way	✓		✓	✓
R11: Adopt a more proactive and targeted approach to research dissemination	✓			✓
Programme Opportunities				
R12: Continue to support environmental policy decision making and negotiation of international obligations	✓			✓
R13: Coordinate and manage a regular horizon scanning event	✓		✓	✓
R14: A structure needs to be embedded into the programme to identify potential commercial opportunities	✓		✓	✓

6.5 Conclusion

The review of the STRIVE Programme set out to conduct a "*review and appraisal of the performance of the STRIVE programme to date, in terms of: the relevance of priority areas to key policies; programme outputs and their input to policy development and; effectiveness and efficiency generally; Providing recommendations regarding future directions, actions and priorities of the EPA Research programme; Assess research programme management."* Outlined throughout this report is a detailed review of the Programme, through an assessment of the key inputs, outputs, outcomes and impacts.

In summary, the report demonstrates that the STRIVE Programme is both effective and efficient in achieving the objectives set for it as a Programme. Furthermore, there is clear evidence which supports that the STRIVE Programme is a well-managed programme, which provides a value for money investment in environmental research across universities, institutes of technology, state agencies and the private sector. As with similar research programmes there are, of course, areas for improvement and opportunities for the Programme to capitalise further on the successful impact the Programme has had to date. Given how the current programme is being managed, and the manner in which the Programme responded to previous recommendations from the CIRCA report, we believe the Programme is fully capable of responding to the recommendations outlined in this report.

The strategic approach to managing environmental research separately from other research funding by a dedicated agency is essential to protecting the public good. The environment is an important public good that needs to be managed carefully. The programme's success to-date in building environmental research capacity, translating environmental policy and legislation into action and providing a robust evidence base to inform policy and ensure that we meet our international commitments has had strong environmental, policy and economic impacts for Ireland.

The three-pillar structure to the programme is clear and this more focussed and tailored approach of investing environmental research funds is sensible, particularly in the current economic climate, where all funders responsible for managing public funds must show a clear and logical rationale, structure and return on investment for the funds that they are managing.

As we have shown throughout the analysis, the programme is well-run and well-managed and the costs associated with running the programme represent an efficient approach. Suggestions have been made as to where improvements could be made and where there are opportunities to use the programme as a platform to support the national and international policy agenda.

The recent Research Prioritisation Exercise, carried out by Forfás, sets the context for research funding in Ireland. Given that environmental research is recognised as an important cross-cutting research activity, it is essential that the EPA and STRIVE team establish clear and robust structures to link with other research areas that are relevant to the environmental research agenda.

Appendix A: List of consultations and workshop attendees

Table A1 Policy stakeholders consulted

Organisation	Consultee
Department of Environment, Community and Local Government	Nuala Bannon
Department of Environment, Community and Local Government	Brendan O'Neil
Department of Environment, Community and Local Government	Darren Byrne
Department of Environment, Community and Local Government	Lorraine O'Donoghue
Department of Environment, Community and Local Government	Colin Byrne
Department of Environment, Community and Local Government	Fiona Quinn
Science Foundation Ireland	Wendy McLoone
Sustainable Energy Authority of Ireland	Matthew Kennedy
The Marine Institute.	Aengus Parsons
HRB	Dr. Maura Hiney
Enterprise Ireland	Paul Butler
Forfas	Catherine MacEnri
Department of Agriculture	Dale Crammond
Teagasc	Frank O'Mara
Teagasc	Rogier Schulte
Coordinator of environmental Pillar of social partnership	Michael Ewing

Table A2 Higher Education Institution stakeholders consulted

Organisation	Consultee
National University of Ireland Galway	Colin Brown
National University of Ireland Galway	Eoghan Clifford
National University of Ireland Galway	Frances Fahy
National University of Ireland Galway	Henrike Rau
National University of Ireland Galway	Dagmar Stengel
National University of Ireland Galway	Liwen Xiao
National University of Ireland Galway	Edmond O'Reily
National University of Ireland Galway	Michael Hartnett
National University of Ireland Galway	Colin O'Dowd
National University of Ireland Galway	Stephen Hynes
University College Cork	Alan Dobson
Dublin City University	Dermot Diamond
Dublin City University	Fiona Regan
University of Limerick	Richard Moles
University College Dublin	Frank Convery
University College Dublin	Edward Casey
National University of Ireland Maynooth	John Sweeney

Table A3 EPA stakeholders consulted

Organisation	Consultee
EPA	Laura Burke
EPA	Brian Donlon
EPA	Micheal O'Cinneide
EPA	Shane Colgan
EPA	Kevin Woods
EPA	Frank McGovern
EPA	Ken Macken
EPA	Michael Lehane
EPA	Martin McGarrigle
EPA	Barbara O'Leary
EPA	Tadhg O'Mahony
EPA	Margaret Keegan
EPA	Darragh Page
EPA	Brendan Wall
EPA	Jonathan Derham
EPA	Mick Henry
EPA	Jim Moriarty
EPA	Gerard O'Leary
EPA	Colman Concannon
EPA	Donal Daly
EPA	Lisa Shields
EPA	Denise Bonass
EPA	David Dodd

Appendix B: Detailed customer survey results

The detailed outputs of the survey are provided as a separate document, supporting this report.

Appendix C: ERTDI Projects

This table lists the ERTDI projects included in the analysis of Commitments

Project Code	Institution	Initial funding committed	Year initial funding committed	Additional funding committed	Year additional funding committed	Total Funding committed
2006-PhD-S-24	University College Cork (UCC)	€ 79,650.00	2006	€ 5,000.00	2009	€ 84,650
2006-PhD-S-22	University College Dublin (UCD)	€ 74,665.00	2006	€ 5,000.00	2010	€ 79,665
2006-PhD-RCA-17	University of Dublin, Trinity College (TCD)	€ 75,000.00	2006	€ 2,988.00	2009	€ 77,988
2006-PhD-ET-7	Dublin City University (DCU)	€ 84,000.00	2006	€ 2,285.00	2010	€ 86,285
2006-PhD-ET-6	National University of Ireland Galway (NUIG)	€ 90,000.00	2006	€ 1,750.00	2009	€ 91,750
2006-PhD-ET-5	University of Dublin, Trinity College (TCD)	€ 90,000.00	2006	€ 2,988.00	2009	€ 92,988
2006-PhD-ET-15	Dublin City University (DCU)	€ 74,900.00	2006	€ 2,285.00	2010	€ 77,185
2006-PhD-ET-14	National University of Ireland	€ 87,800.00	2006	€ 1,600.00	2009	€ 89,400

Project Code	Institution	Initial funding committed	Year initial funding committed	Additional funding committed	Year additional funding committed	Total Funding committed
	Galway (NUIG)					
2006-PhD-ET-13	University of Limerick (UL)	€ 89,510.00	2006	€ 437.00	2009	€ 89,947
2006-PhD-ET-10	University of Limerick (UL)	€ 84,136.00	2006	€ 437.00	2009	€ 84,573
2005-PHD5-SPI-8	National University of Ireland Galway (NUIG)	€ 75,000.00	2005	€ 5,000.00	2008	€ 80,000
2005-PHD5-EH-5		€ 75,000.00	2005	€ 5,000.00	2009	€ 80,000
Total		€97,661		€34,770		€1,014,431

PA offices worldwide

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