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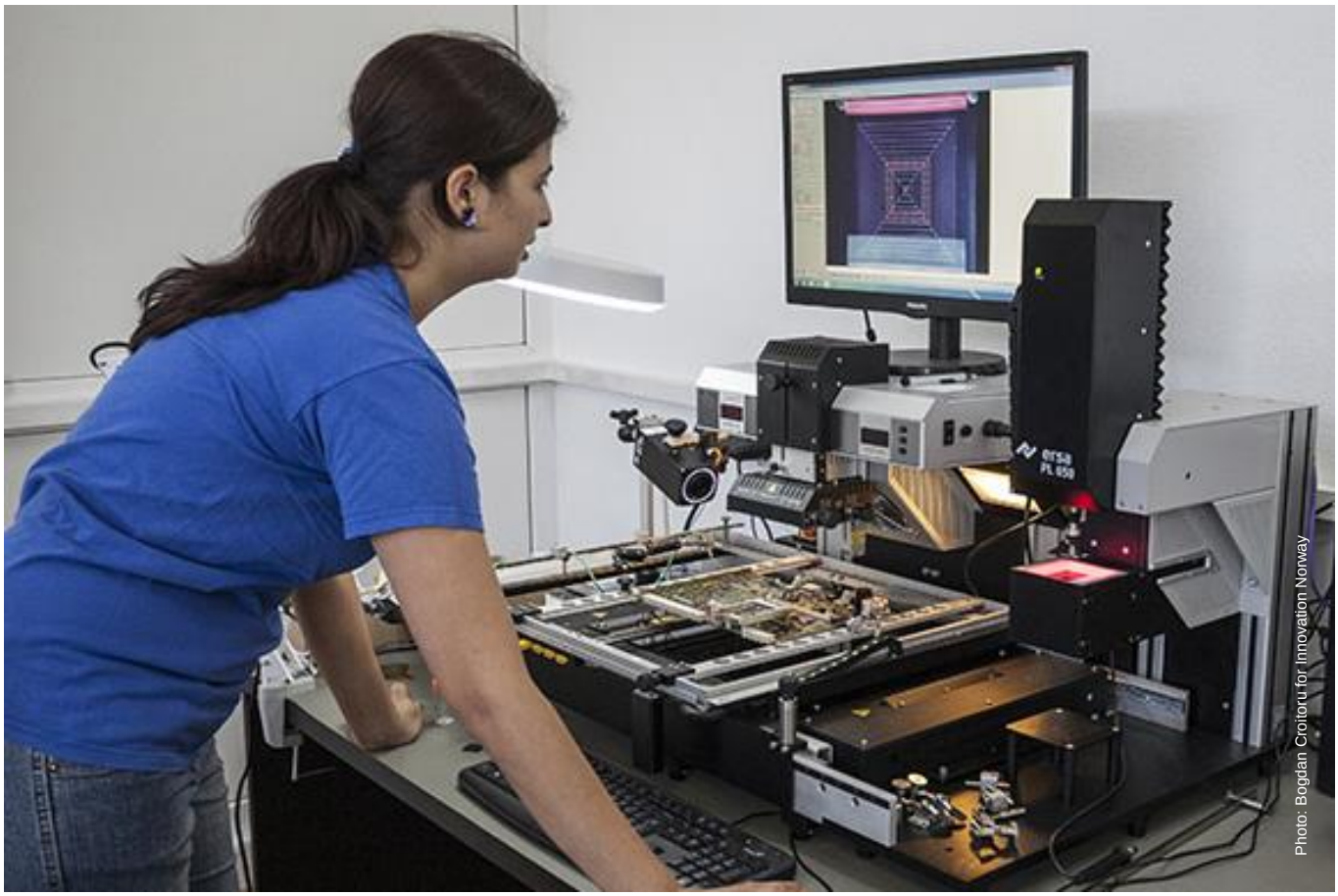
New Technologies supported by the EEA and Norway Grants 2009-2014 (Rapid Assessment)

Final Report



November 2019

Centre for Strategy & Evaluation Services

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List of abbreviations

CCS	Carbon capture and storage
CO_2	Carbon Dioxide
DPP	Donor Programme Partner
EEA	European Economic Area
ERDF	European Regional Development Fund
EU	European Union
FM	Fund Mechanism
FMO	Financial Mechanism Office
FO	Fund Operator
GHG	Greenhouse gases
HBV	Hepatitis B virus
HCV	Hepatitis C virus
IPR	Intellectual Property Rights
MoU	Memorandum of Understanding
Mwh	Megawatt hour
NFP	National Focal Point
PA	Programme Area
PO	Programme Operator
PP	Project Promoter
SME	Small or medium-sized enterprise
ToR	Terms of Reference
UAV	Unmanned aerial vehicle

Executive Summary

Context for the Rapid Assessment

During the 2009-14, period, the EEA/Norway Grants supported projects promoting the development, application, exploitation or commercialisation of new technologies. Support was offered in particular to the priority sectors of green industry innovation, research, public health, climate change and renewable energy, carbon capture and storage and environmental protection and management.

Purpose of the Rapid Assessment

The purpose of this Rapid Assessment of New Technologies has been to:

- Document and assess the direct and indirect impacts of the development, commercialisation and application of new technologies supported by the EEA and Norway Grants during 2009-2014;
- Identify the main groups of direct and indirect beneficiaries of those new technologies;
- Provide recommendations for improving the effectiveness of Grant support for new technologies in 2014-21, in particular for those programmes where technology development/commercialisation will be supported.

The assessment focused on the EEA/Norway Grants priority sectors of Green Industry Innovation, Research and scholarships, Public Health, Climate Change, Renewable Energy, Carbon Capture and Storage, and Environment Protection and Management. It focused in particular on Bulgaria, Czech Republic, Hungary, Poland and Romania. Some projects from other countries were also considered.

Key results

1. A wide variety of new technologies have been successfully developed, commercialised or applied across several beneficiary countries and diverse sectors, as a result of EEA and Norway Grants support. These include new green technologies developed or used by supported businesses, new technology for generating or using renewable energy and new medical equipment.
2. SMEs and other companies have benefitted from increased competitiveness, increased revenue and new job creation as a result of having developed and exploited green technology innovations. In some cases, these new technologies have opened up entirely new markets for project promoters and partners.
3. Positive environmental benefits were generated, such as reduced CO_2 emissions, better air and water quality, and more waste recycling. In addition, policymakers and decision-makers have obtained better access to data, e.g. regarding the state of the environment or the potential to use renewable energy sources.
4. Direct benefits to citizens such as lower energy costs, more reliable and lower cost provision of clean water, better access to healthcare services and improved quality of healthcare provision.
5. Submission of successful patent applications, particularly within the Environmental and Climate Change-Related Research and Technology and Green Industry Innovation programme areas.

Green Industry Innovation

The Norway Grants supported programmes to increase the competitiveness of green enterprises, including through the greening of existing industries, fostering green innovation and promoting green

fuels, technologies and entrepreneurship, especially amongst SMEs. Some projects developed new technologies to sort or recycle waste, reduce emissions or monitor energy consumption. Others developed new green products to sell or software platforms to make their business processes greener.

Support for new technologies has enhanced the competitiveness of companies, leading to increases in jobs, turnover, growth and exports, including into new markets. Some projects applied for patents, particularly within the categories of 'energy innovation' and 'energy efficiency in buildings, greening business operations'. Some other projects focused on the greening of business and business processes through the adjusting of existing new technology or applying existing technology in new ways, rather than developing new technologies. Many projects involved cooperation with research institutions or private companies in Norway, which facilitated the transfer of knowledge to SMEs in the beneficiary states, the development of new lines of research and expansion of access to markets.

Research and Scholarships

This priority sector supported the development of research-based knowledge, human capital and cooperation between donor states and beneficiary states. Since the projects were focused on primary research, they have not fully exploited the new technologies but have developed the potential for future exploitation. One project created a new tool for assessing biodegradation potential of contaminated sites and new techniques for more accurate risk analysis in the remediation process. This should reduce environmental risks and lead to the application of more efficient biodegradation techniques. Another project demonstrated that plants are a viable technological platform for production of Hepatitis B/C virus antigens at low cost and that a plant-based vaccine can cause a sufficiently good immune response.

The projects developed new technology allowing for an expansion of scientific knowledge. One project facilitated the study of the impact of climate change on the Antarctic ecosystem and biodiversity through the development of UAVs that collect data and images. Another project developed technology to analyse and predict avalanches or flash floods due to snowmelt and the effect of snowmelt on groundwater. Data from the system is being used by bodies responsible for weather forecasting, production of hydro-electricity and mountain rescue. Bilateral co-operation is often continuing through the current EEA/Norway Grants programmes or the EU's Horizon 2020 programme.

Public health

Programmes in this priority sector have contributed to fostering dynamic health systems and reducing health inequalities by enabling the beneficiary countries to develop national strategies for effective disease prevention, strengthen public health monitoring, improve access to healthcare for vulnerable groups such as Roma, and improve health surveillance and information systems. Projects have mostly applied existing technologies.

Investments in technologies have included mobile medical equipment for neonatal and paediatric health services, particularly for Roma; hi-tech diagnostic and therapeutic equipment for the chronically ill and elderly; diagnostic and therapeutic or treatment equipment for neonatal care and for diseases; diagnosis, treatment and rehabilitation equipment for children suffering from cerebral palsy and other conditions (e.g. autism, somatic impairment); and equipment to test for rare diseases.

Investments in new equipment have enabled better quality services to be provided. This includes earlier and more accurate diagnosis of conditions such as eye defects, congenital heart defects, heart rhythm disorders, pathological conditions in the brain and abdominal cavity, as well as rare diseases. Rehabilitation services have been improved by new robot-assisted equipment and mobile lifts.

There has been an increase in the volume of patients served due to the investments in new medical equipment. This includes, for example, more gynaecological and paediatric examinations, more vaccinations, increased diagnosis of rare diseases at an early stage and more rehabilitation treatments for elderly, dependent and chronically ill patients and for children with cerebral palsy. Projects have widened access to health services through investments in technologies. This includes enabling the provision of more diagnosis and treatment to take place in patients' homes or in out-patient departments, thus reducing the need for travel and hospital stays. Treatments are now more accessible in rural areas that were poorly served previously.

Climate Change and Renewable energy

Support under these priority sectors had three main objectives: to reduce emissions of greenhouse gases (GHG) and air pollutants, promote the use of renewable energy and facilitate adaptation to climate change.

The main effects of the projects considered by this study have been a reduction in CO_2 emissions, increased production of (cheaper) renewable energy, and a corresponding cost savings through the installation of photovoltaic panels, more effective techniques for testing the potential for carbon capture and storage, and new data, analysis and impact assessments on climate change. Bilateral co-operation within the carbon capture and storage project enabled the project promoter and partners to gain know-how, experience and knowledge related to new techniques. However, most projects related to climate change and renewable energy did not include a donor project partner.

Environmental Protection and Management

This priority sector addressed a range of environmental challenges, including the poor status of marine and inland waters in some areas, loss of biodiversity, the need for improved compliance with environmental legislation and the prevention of injury and adverse environmental effects caused by chemicals and hazardous waste. A key objective was to inform policy-making through better monitoring of the environment.

Most of the selected projects introduced new technologies to improve environmental monitoring, including technology for monitoring the quality of air, surface water, groundwater or the marine environment, and for monitoring hazardous substances in the ground and in the air, antibiotics and antimicrobial resistance, as well as a smart water management system. The bilateral co-operation positively influenced the results arising from the development or application of new technology. In most projects, the new technology was adopted and sustained by the project partners, offering the potential for long-term benefits and cost savings. However, securing funding to sustain the use of technologies can prove a challenge, in part because the benefits tended to consist of better environmental data rather than immediate savings.

Overall findings

What have been the most significant effects of the development, commercialisation and application of technologies?

- A diversity of new technologies is being used, including new technologies to sort or recycle waste, reduce emissions or monitor energy consumption, new technology for generating or using renewable energy, new technologies for carbon capture and storage, technology for monitoring the quality of the environment, and medical diagnostic and therapeutic equipment.
- Policymakers and decision-makers have better access to data, e.g. regarding the state of the environment or the potential to use renewable energy sources.

- Users of new technologies are enjoying cost savings, including through reductions in energy costs or reduced cost of health provision due to earlier and better diagnosis of diseases.
- Citizens are gaining benefits, such as lower energy costs, more reliable and lower cost provision of clean water and better access to healthcare services.
- SMEs and other companies have benefitted from increased competitiveness as a result of developing and exploiting green industry innovations, where new technologies developed have opened up entire new markets for the project promoters and partners.
- Environmental benefits, such as reduced CO_2 emissions, better air quality, better water quality and less contamination.
- Improved provision of healthcare services, primarily through the application of existing technologies in new contexts. In this way, the Grants are addressing problems of poor healthcare provision due to outdated or inadequate equipment and poor access for certain communities (e.g. Roma), for those living in certain areas (e.g. rural) or those requiring care at home.
- Submission of successful patent applications, particularly within the Environmental and Climate Change-Related Research and Technology and Green Industry Innovation programme areas.

How sustainable are the new technologies, once grant funding ended?

- New equipment is often owned and operated by the project promoter, which can offer costs savings in some cases (e.g. due to lower energy bills).
- In some Public Health projects, additional costs are incurred beyond the life of projects in terms of operating and maintaining new equipment.
- In Environmental Protection and Management, the maintenance of new technologies was a particular issue, since some of the monitoring equipment used for managing and protecting environments is expensive to maintain.
- In contrast, some Public Health projects in Bulgaria have benefitted from an overall increase in national funding for health, with priority given to investments in new technologies.
- In some cases, further action is required to apply new technologies, particularly in Research & Scholarship projects that have featured basic research.
- Some projects are developing their activities (and thus sustaining their new technologies) with EU funding from the Cohesion Fund and Regional Development Fund or Horizon 2020.

Which unintended impacts (positive or negative) did the programmes contribute to?

- Most of the positive impacts were intended rather than unintended, since the programme objectives and expected outcomes are quite broad.
- The research identified few instances of negative impacts per se, except that in some projects, more action is needed to apply or commercialise the technologies developed.
- Whilst some technology allows cost savings to be made, in other cases, additional costs are incurred beyond the life of projects in terms of operating and maintaining new equipment.

What were the major factors influencing the achievement or non-achievement of the results? How could the negative factors be avoided in the future?

- Bilateral co-operation can play a crucial role in development, application and commercialisation of new technologies, particularly where donor project partners have high level technical expertise and experience.
- Some project promoters or partners do not have either the resources or the technical skills or sufficient time within the life of the project to file patents.

- National, legal and regulatory contexts can be crucial to the success of projects involving new technologies, particularly when it comes to commercialisation of new technologies and submission of patent applications.
- Development and exploitation of new technologies is generally most effective when it forms part of a wider national strategy. In such an environment, projects are more likely to secure long-term funding to operate and maintain new technologies. They can also gain from a higher profile with sector stakeholders and the general public.
- Development of new technologies is most effective when supported by a wider set of complementary activities. In many cases, the development of technology has been accompanied by training, modernisation of facilities or information campaigns.

Recommendations

1. The development, commercialisation and application of technologies should be promoted in the context of wider national strategies rather than as "isolated" activities. Where the national legal and regulatory context proves unsupportive of the development and exploitation of new technologies (particularly commercialisation), the POs/FOs (perhaps supported by the FMO) should seek to engage the relevant public authorities in their countries to explore whether solutions are possible and/or how to support projects. Consideration should be given as to how to gain support for the programmes and projects from a wider set of national stakeholders.
2. The FMO and POs should consider dedicated calls for applications related to the development, commercialisation and application of technology that cover several priority sectors. Where the commercialisation of new technologies is a specific programme aim, it should perhaps be compulsory for applicants to include a private company in the project.
3. The sustainability of new technologies could be enhanced by dedicated calls for applications from projects that have made progress in developing new technologies (including, but not only, through basic research) but have not yet realised the full benefits of applying such technologies.
4. Bilateral co-operation should (continue to) be prioritised in programmes and calls that focus on the development and exploitation of new technologies.
5. In relevant programmes, Programme/Fund Operators should inform projects (via workshops, publications, etc.) about the possibilities and practicalities of submitting patent applications and systematically collect information about applications submitted.
6. Within the programme area of Research, there is a need for projects to have the necessary competence to deal with a patent application and know about possible support schemes, e.g. start-up incubators.
7. Within Public Health, there should (continue to) be recognition that improved prevention and reduced inequalities in health will primarily require the application of existing technologies in new contexts.
8. Within Environment, Energy, Climate Change and Low Carbon Economy, there may be a need to give a more explicit focus to the development and exploitation of new technologies.

1. Introduction

1.1 Purpose of the rapid assessment

This report presents findings from the Rapid Assessment of New Technologies supported by the EEA and Norway Grants 2009-2014. The review was undertaken during 2019 on behalf of the Financial Mechanism Office (FMO) for the EEA and Norway Grants.

This assessment was summative in nature and its objectives were to:

- Document and assess the direct and indirect impacts of the development, commercialisation and application of new technologies;
- Identify the main groups of beneficiaries (direct and indirect) of the new technologies which were developed, commercialised or otherwise applied by the supported programmes/projects;
- Provide recommendations for improving the effectiveness of Grant support for new technologies in the FM14-21, in particular for those programmes where technology development/commercialisation will be supported.

New technologies in this rapid assessment have included technologies developed from scratch and technologies newly applied in a particular context for the first time or in a new or innovative way.

Overall, it is worth highlighting that the assessment focused on the achievements of selected projects. On that basis, this report presents a summary of the activities and effects of projects that included a focus on new technologies and that were broadly successful, rather than a representative summary of activity across the EEA and Norway Grants. In that way, the findings presented here show what has worked and what has been possible in respect to supporting new technologies in individual projects and specific contexts.

1.2 Context for the rapid assessment

With the signing of the EEA agreement in 1992, two financial mechanisms were established so that three of the European Economic Area (EEA) States – Norway, Iceland and Liechtenstein – could contribute to the strengthened cohesion in the EEA. During the 2009-14 period, the EEA Grants and Norway Grants aimed to reduce economic and social disparities in the EEA and to strengthen bilateral relations with 16 countries: Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia and Spain.[1] The EEA Grants for the years 2009-14 were jointly financed by Iceland (3%), Liechtenstein (1.2%) and Norway (95.8%) following negotiations between those countries and the European Union (EU) and were formulated in a Decision of the Council of the European Union. They were implemented under the terms of a Regulation adopted by the EEA Financial Mechanism Committee.[6] The Norway Grants were financed entirely by Norway and were implemented under the terms of a Regulation adopted by the Norwegian Ministry of Foreign Affairs.[2]

[1] These are EU Member States whose Gross National Income (GNI) per inhabitant is less than 90% of the EU average.
[2] Regulation on the implementation of the Norwegian Financial Mechanism 2009-2014.

In contributing to social and economic cohesion in the EEA, and to the Europe 2020 Strategy for smart, sustainable, inclusive growth,[3] the Grants target a wide range of areas in which beneficiary Member States are in need of support, such as innovation, environmental protection and climate change, civil society, children and health, cultural heritage, research and scholarships, decent work and justice and home affairs.[4] Decisions on which areas to prioritise in each Beneficiary State are taken via bilateral negotiations, resulting in a Memorandum of Understanding (MoU) between the Donor States and each Beneficiary State.

During the 2009-14 period, the EEA and Norway Grants offered support to projects promoting the development, application, exploitation or commercialisation of new technologies. Support was particularly offered in the priority sectors of environmental protection and management, climate change and renewable energy, carbon capture and storage, green industry innovation, public health and research.

1.3 Scope

This review mainly focused on 32 programmes which supported new technologies, drawn from the following Priority Sectors:

- Green Industry Innovation (which includes blue growth, may include prototypes, development of apps, development of new materials);
- Research and scholarships (including practical application of new technologies such as medical related technologies, environmental related technologies, or development of new materials such as new plastics);
- Public Health (including new equipment applications);
- Climate Change, Renewable Energy and Carbon Capture and Storage;
- Environment Protection and Management.

The research was particularly focused on five countries, namely, Bulgaria, Czech Republic, Hungary, Poland and Romania. These countries were chosen as they had the greatest concentration of projects relating to new technologies during the 2009-14 period. In addition, a number of projects were also considered from Estonia, Greece, Latvia, Lithuania, Portugal, Slovakia and Spain.

1.4 Research undertaken

The rapid assessment was completed through the following research activities:

- Inception: client meeting, development of research tools and finalisation of methodology
- Selection of projects for assessment: on the basis of consultations of EU and national stakeholders, a thorough trawl of the FMO's database of projects and a review of programme and project documentation;
- Rapid assessment of documentation for selected projects;
- Interviews of the FMO, POs, FOs and DPPs to help select projects, identify new technologies and explore effects;
- Interviews of project promoters to explore in detail the activities and effects of projects;

[3] COM(2010) 2020 final, Communication from the Commission: Europe 2020 - A strategy for smart, sustainable and inclusive growth.

[4] For a list of supported programme areas, see: https://eeagrants.org/resources/eea-and-norway-grants-2009-2014-blue-book-overview-supported-programme-areas.

- Interviews of end beneficiaries to explore the effects of projects;
- Final reporting and project stories.

1.5 Project Selection

The rapid assessment was based on the in-depth analysis of a selection of projects. These were selected as follows:

- Confirmation of selection criteria with the FMO.
- A longlist of 263 projects was initially chosen from the full list of 1,278 projects from the relevant programmes. Using the criteria agreed with the FMO, the projects were selected according to whether they were within the relevant programme areas, whether they were completed, highlighted as best practice and had a project grant of more than €30,000.
- After selecting projects according to these criteria, a list of 263 projects were left. This list was then reduced to 178 projects through an analysis of the project descriptions and whether they fell under the category of 'new technologies,' either because they discussed new innovations, upgrades to existing technologies, transfer of knowledge based on new systems or procedures or contained any mention of the recipient country being provided with access to technologies they did not previously have.
- The longlist was compared to a pre-selection list produced by the FMO; any projects on both lists were included on the shortlist. Some projects were added in order to get a balance across the five main countries and the priority sectors and in terms of donor project partners. A few promising projects were added from other countries.

In total, 50 projects were considered. The table below shows the distribution by country and sector.

Table 1 Distribution of projects considered by the study

Countries	Priority Sectors
• Bulgaria: 6 • Czech Republic: 5 • Estonia: 6 • Hungary: 2 • Latvia: 1 • Lithuania: 3 • Poland: 8 • Romania: 11 • Spain: 5	• Green Industry Innovation: 26 • Research and Scholarships: 4 • Public Health: 9 • Climate Change and Renewable Energy: 3 • Environmental Protection and Management: 8

In total interviews were conducted for 27 projects, of which 18 were developed into project stories. The report also included evidence from other projects on the basis of desk research or consultations with Programme Operators (POs) and Donor Programme Partners (DPPs).

2. Green Industry Innovation

2.1 Introduction

The Europe 2020 Strategy emphasises the need for greener and more innovative economies. Green innovations have the potential to reduce emissions and energy whilst also improving the competitiveness of enterprises in the beneficiary states. There is a particular need for green innovations to be commercialised, so that they are taken up more widely.

To respond to this need, the Norway Grants supported programmes within the Green Industry Innovation priority area (PA21) to increase the competitiveness of green enterprises, including 'greening' of existing industries, green innovation, the promotion of green fuels, technologies and entrepreneurship, especially amongst SMEs. During 2009-14, the Grants supported dedicated programmes in eight countries (BG, EE, HU, LT, LV, PL, RO, SK). The programmes provided grants of €108m to 270 projects, an average of €400,000 per project.

Following the ToR, the programmes relevant to this study were BG10, EE07, HU09, LV06, LT09, PL18, RO17, ES02 and SK07.[5] Within these programmes, the analysis found that approximately 50 projects involved new green technology being either implemented or developed as part of the project. Of these 50 projects, at least 26 projects either were in the process of commercialisation or had already been brought to the market. The projects are listed in Table 2 below.

Table 2 Green Industry Innovation projects involving new and commercialised technologies

Number	Title	Project Grant
BG10-0018	Improvement of the current operational process by implementation of new line for pellet production	€ 381,980
BG10-0020	Green Biomass Energy	€ 300,000
BG10-0027	Improvement of production processes in Plast Commerce - 93 for more sustainable behaviour	€ 198,938
EE07-0040	The Energy Data Feed Platform	€ 285,488
EE07-0041	Development of an Oil Spill Detection System based on information and laser remote sensing technology	€ 539,278
EE07-0044	PublicTicket	€ 245,204
EE07-0045	Fully Integrated Information and Communication Technology Platform for Operational Management of Ultracapacitors	€ 588,545
EE07-0052	Electronic Energy Manager	€ 260,123
EE07-0054	Environment friendly IT Solutions for E-Receipts	€ 466,827

[5] The Spanish programme (ES02) related to PA09 Environmental and climate change-related research and technology. However, since the projects related to green industry technologies they are included in this chapter.

Number	Title	Project Grant
ES02-0011	Ado Demonstration - Experimental Demonstration and Certification of the Self-Buoyant Precast Concrete Telescopic Tower and Foundation Technology	€ 53,678
ES02-0014	Study, Analysis and Development of New Engine Technologies for Electric and Hybrid Waste Management Truck	€ 151,622
ES02-0026	New Technology Based Hydraulic Load-Sensing and Constant Power Constraint, for Tuna Vessels	€ 89,172
ES02-0108	Use of functional components with a renewable origin in the Improvement of antifouling efficiency	€ 25,655
ES02-0180	Smart Meter for Remote Reading and Electricity Consumption Optimization	€ 63,256
HU09-0021	Manufacturing of innovative world-class environmentally friendly aluminium foam and development of the recycling technology	€1,109,009
LT09-0001	Green Packaging, Palletizing and Technological Process Innovations in Akvavita	€ 1,127,863
LT09-0005	The increase of the competitiveness of the company UAB Veika by placing on the market the innovative environmental technology GREENCOVER in the field of wallpaper production	€ 849,998
LT09-0006	Paper packaging technology development in Birštono mineraliniai vandenys	€999,641
LV06-0025	Baltic 3D printing technology centre for small-scale production of plastic products	€192,610
PL18-0006	Innovative technology for plastic waste recycling	€ 817,500
PL18-0013	Implementation of energy saving production processes and development of green chimneys	€ 462,500
PL18-0024	Innovative production process for high quality green products based on recycled tires	€ 1,380,000
PL18-0026	Implementation of innovative, environmentally friendly technology for recovery of metals	€ 1,315,000
RO17-0001	Green innovation in professional laundry services	€ 1,208,533
RO17-0024	Ecosystem services from High Nature Value farmland	€ 150,076
RO17-0034	Development of new green product for Romanian market: green roof adapted for local resources and climate conditions – donor partnership project	€ 173,101

2.2 Development and commercialisation of new technologies

The programmes had several goals under the overarching objective of fostering the development or application of new green technology. Some projects therefore sought to foster solutions to protect the environment, improve energy efficiency or reduce emissions. Some projects, for example in Spain, also contributed to fighting climate change via mitigation or adaptation technologies. Another goal of some projects was to improve industrial waste management and recycling. Some Programme Operators (POs), such as those for Bulgaria and Romania, emphasised other goals they intended to meet through this programme such as the greening of business operations. Similarly, the PO for Poland noted the goal of greening manufacturing practices of the business involved. The PO for Poland also mentioned the goal of increasing SME confidence.

Some programmes primarily led to the development and commercialisation of technology whilst others had more projects that involved greening businesses in other ways. The PO for Bulgaria and Romania and the PO for Poland noted that most of the projects in these countries did not involve developing new technologies but rather the exploitation of existing new technology to make them more environmentally friendly or making changes to the internal procedures of companies to make it more environmentally friendly. The PO for Bulgaria and Romania also noted that there was not so much commercialisation of this new technology. The cases contrast for example with the projects implemented in Spain which the PO noted had led to many new technologies being developed and commercialised. Notable examples from the research (expanded upon below) are ES02-0180 which created a new smart meter and ES02-0108 which created new eco-friendly paint for vessels. As with other programmes, if companies were involved in the project partnership, commercialisation of the new technology was more likely to occur.

The analysis identified several main categories of projects leading to new technology involving green industry innovation that were commercialised, as follows:

2.2.1 Energy innovation

Several of the projects implemented in Bulgaria, Poland and Spain led to the development and commercialisation of new technology that involved finding innovative solutions that would promote the use of alternative or renewable energy or provide for energy efficiency. Three projects involved developing technology that would allow for the recycling of waste materials to be used as alternative sources of fuel. In Bulgaria, BG10-0020 involved the processing of waste wood materials to create biomass fuel and in Poland, PL18-0024 involved recycling tires to produce alternative fuels. Another innovation in energy generation was developed as part of ES02-0011 in Spain, which created a new offshore wind floating platform that allowed for crane-free installation of towers and turbines.

There were other projects in Spain which involved developing new green technologies to make vehicles more energy efficient. In Spain, for example, ES02-0014 involved the development of electric-hybrid urban vehicles for waste collection and ES02-0026 developed “variable displacement” technology for vessels which allowed for energy systems to be put on “stand by” when energy is not needed.

One project in Spain and another in Estonia sought to develop smart meters for more accurate monitoring of energy usage. These were ES02-0180 which created a smart meter employing broadband PLC communication technology for more accurate meter readings and EE07-0040 which developed a software platform to monitor energy loss and optimise heat consumption.

Beneficiaries

The projects involving smart meters had a wide range of beneficiaries. The ES02-0180 project promoter highlighted that the goal of the project was to help countries to meet the requirements of

the European directive requiring improved smart meters to measure electricity.[6] He cited the European Commission's statements indicating that they believed that such new technology would benefit not only electrical companies but also businesses and consumers as they could more accurately measure their own electricity usage.

The beneficiaries of these energy innovation projects were mostly the companies that could make use of the new eco-friendly products. In the case of the new smart meter developed in Spain, beneficiaries included households who could adjust their usage using more accurate readings and their electricity companies who could more accurately optimize demand. In the project creating biomass fuel out of waste wood material (BG10-0020), there were additional beneficiaries as the project contributed to the growth of the local economy and job creation for local populations. The project has 25-27 people working on site but twice as many people have passed through the plant allowing them to develop skills and obtain qualifications to work in other similar business activities. This includes one former employee who has set up his own plant.

Commercialisation

The commercialisation of energy innovations took various forms. For BG10-0020 and PL18-0024, the commercialisation was not of the technology itself. In this case, commercialisation involved the use of the new technology for commercial purposes; the company would take scrap materials from other companies and sell the processed material as biofuel.

The commercialisation in projects ES02-0014 and ES02-0180 was more comprehensive and expansive. In these cases, the projects sought to support the companies' efforts in reaching international markets. The project promoter for ES02-0180 highlighted that the new technology developed as part of the project was in the process of being commercialised. They were in communication with an Argentinian company to sell the technology in Latin America and had already bought the license to sell in the region. The company is also part of a consortium (Prime Alliance) with other European companies allowing it to export to the rest of Europe. Additionally, they have been in meetings in Germany with other companies to see if they can start piloting new projects based on the technology they created. International commercialisation was similarly seen as a goal for the project BG10 0020 whose main markets were in Bulgaria, but which also targeted Greece.

2.2.2 Waste management including recycling

Most of the new technologies in this category involved the recovery of reusable material from several sources of waste. Two projects commercialised involved recovering metal materials for recycling. These were PL18-0026 which involved the developing of new post-shredder waste sorting technologies that allowed for metal recovery from residues of old car shredding and HU09-0021 which involved new technologies that created a new type of environmentally friendly aluminium foam and allowed for its alternate composite bulking, heat treatment and recycling. The aluminium foam technology had already been the subject of a successful patent application, so the aim of the project was to standardise the production process, so that the product could be manufactured at scale and made more widely available. Another project involved the recycling of plastic. PL18-0006 involved implementing new technologies of segregation of re-usable material such as PET during the waste sorting process.

Finally, two projects involved making packaging more environmentally friendly and recyclable. LT09-0006 developed new paper packaging for liquids which is recyclable and ensures 12 month shelf life which would mitigate the use of plastic packaging material. LT09-0001 developed new green

[6] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC

packaging, palletizing and manufacturing technologies that will allow for greater cost and energy efficiency, and recycling of plastic materials used for packaging.

Commercialisation and other commercial benefits

The commercialisation activities within these four projects did not involve placing the new technologies themselves on the market, but rather the selling of products created or materials recycled/recovered with the use of new technologies. In the case of the recycling projects, similar to projects obtaining biofuels, this involved selling the recovered materials to companies that could make use of them. PL18-0026 could recover a variety of different materials including Fe, Cu, Al, Pb, Zn, stainless steel, electric wires, and rare metals from printed circuit boards that could be then sold back to the manufacturing industry. In the case of the new packaging materials, the projects aimed to have organic stores and other specialised markets adopt the packaging for their own products.

A successful case of commercialisation is that of HU09-0021 where there was little market knowledge of the product, despite the fact that a patent had already been secured. Designers and architects to whom the new aluminium foam was destined towards had not heard about the product or the technology before. With the project enabling the product to be produced at scale, through the introduction of a standardised manufacturing process, the priority was then to promote the product and make end beneficiaries aware of its benefits and potential usages. In parallel to the project, the company presented the product at industry shows and organised workshops for architects and designers. Such efforts were successful, and the company has expanded its client base and increased sales. The project promoter for HU09-0021 noted that the aluminium foam panels are now being installed in different types of buildings including a Croatian power plant. In addition to Hungary, they now have distributors of their product in the Netherlands and Germany. Additionally, having obtained fire safety certifications, the product can now be installed in public buildings in several countries requiring such certification.

2.2.3 Upgrading manufacturing plants for greater energy efficiency

Projects in Bulgaria, Estonia, Hungary, Romania, Spain sought to make manufacturing more environmentally friendly by upgrading the plants that were involved in manufacturing products. The two projects that involved commercialization were found in Bulgaria. Project promoters for these projects highlighted that while certain types of manufacturing activities are concentrated there, the production plants are often not up to date which can cause excessive emissions. Project BG10-0018 upgraded the manufacturing plant to increase pellet production at lower environmental impact. Another project (BG10-0027) brought about investment in new technology (extrusion and compounding lines) to increase quality and quantity of its production of polyvinyl chloride through recycling waste materials. Both included the goal of increasing production efficiency to lower energy use and consequently lower emissions.

Commercial benefits

As a result of the investments made by the projects, the promoters have been able to sell products that were more environmentally friendly, create new local green jobs and facilitate the involvement of employees and the local community in training/awareness raising activities.

2.2.4 Software platform

In Estonia, there were numerous projects with a commercial dimension that involved developing software platforms to create solutions for a greener economy. This included EE07-0044 which developed a software called PublicTicket that integrated many sources of public transportation (buses, trains, trolleys etc.) and created an online ticket service. One goal of this project was to enhance the environmental impact that public transportation can have. Another project (EE07-0052) created an internet platform that monitors energy consumption, fills gaps and links providers of energy-related

services to clients. The other project was EE07-0054 which sought to develop a unified electronic receipts system using new IT infrastructure and cloud-based databases which would reduce environmental footprint by printing less paper.

There were several beneficiaries of these software platforms. In the case of EE07-0044, beneficiaries included passengers who benefit from improved route planning and easier ticket purchasing. For companies that provided public transportation, the software provided them with a singular marketing and sales platform on top of other services. Similarly, for the internet platform developed for EE07-0052, clients, energy consultants, financiers and technology providers all benefited from being connected in one platform. An important effect of the monitoring system is that it can identify deviations in energy usage and connect users to energy auditors who can identify if there is a problem. This allows for possible solutions that can eliminate unnecessary upsurges in energy usage.

Commercial benefits

For EE07-0044 and EE07-0054, collaboration with international partners has subsequently allowed for the possibilities of extending market reach beyond Estonia and thus exploit the investments made by the projects. Following the end of the PublicTicket project (EE07-0044), one Norwegian company that was involved in the project has gone on to sign an investment agreement with one of Norway's biggest transport operators, which will allow PublicTicket to be adopted in Norway. Collaboration with Finnish and Norwegian partners within the E-Receipts project (EE07-0054) has enabled the development of an Estonian standard on digital receipts, which enables an effective interface between retail software at the point of sale and wallets within consumers' mobile devices.

2.2.5 Energy efficiency in buildings, greening business operations

Several projects involved the development of new green products that could be placed on the market. These included two that created new products for the construction sector. The first was RO17-0034, which developed a new green roof adapted for Romanian resources and climate conditions (e.g. the choice of plants is tailored for these conditions). The second was PL18-0013, a project which supported a polish company, JAWAR Sp. z o. o., to develop a new "green chimney" which had a heat recuperation system and reduce emissions. These chimneys are now one of the key products sold by Jawar, both at the Polish market as well as abroad in Lithuania, Latvia, Estonia, Norway, Sweden, and Croatia. The product has also received special certificates proving its quality and conformity with the legal regulation, e.g. at the Norwegian market.

Another project leading to a new green product was RO17-0001 which developed innovative Radio-Frequency Identification technology to improve operational efficiency of professional laundry services. This technology would allow for tracing and identify textiles across the laundry industry and upgrading of laundry capacity to meet market demand. This solution provided energy and water use efficiency, reduced use of chemicals, and reduced production of wastewater. For this project, customers were a clear beneficiary as customers got better service and their textiles lasted longer. The project promoter noted that there was ongoing efforts to commercialise this technology as they were working to develop software to improve the technology so other international companies could use the application.

Project EE07-0045 enabled the project promoter, OÜ Skeleton Technologies, to develop multiple products to be sold on the market. The project involved the development of an ICT platform base for ultracapacitors, component and module management for use in various energy saving applications. As a result, the promoter has been able to place new products on the market that involve lower fuel consumption and reduced CO_2 emissions.

One project in Latvia (LV06-0025) created a 3D printing technology centre that can be used by companies to develop advanced plastic products in small amounts. It was noted by project promoters that this system was more environmentally friendly than other traditional manufacturing methods.

The 3D printer would be used to test aerospace, electronics and manufacturing products. It also produced products for the health sector including prosthetics. The research and ultimate establishment of the 3D printing centre meant that companies in the area could now access 3D printers at a lower cost than before. As well as commercial companies, the centre is also used by local universities and schools. The company managing the centre allows students and academics to print their own designs free of charge. This allows students to develop useful skills and contributes to academic research. Research with this company has allowed a university in Latvia to build their own 3D printing lab. The research performed at this centre also developed knowledge on additional possible applications of the technology which consequently resulted in new products being developed and thus further commercialisation.

An issue initially for this project was that there was no market for 3D printed materials in Latvia and other Baltic states. Project stakeholders had to explain to other companies how they could use their services. These exchanges have become the main source of business for this company. In any case, the project allowed them reach new markets by producing advanced materials unavailable on the market, such as 3D printed prosthetics.

2.2.6 Environment and ecosystem protection

Beyond reducing emissions and tackling climate change, the programmes under Green Industry Innovation also included projects that sought to decrease and prevent damage to the environment and ecosystem. Two of these projects involved developing new paint for naval vessels that would leach fewer damaging chemicals into the ocean (biocide in ES02-0108 and plasticised polyvinyl chloride in LT09-0005). Another project commercialised which involved protecting the ocean's ecosystem was EE07-0041 which developed a novel oil spill detection system which uses laser sensing technology. The other project in this category was RO17-0024 which sought to create a more sustainable method of grassland management using new equipment including innovative mowing equipment.

Commercial benefits

In these particular projects, a significant part of the cooperation with Norwegian partners focused on either helping project promoters and partners to access broader markets or improve upon their business model. For RO17-0024, farmers were also given micro-enterprise training, providing them with lessons on food processing, packaging and marketing as part of the project. Similarly, for EE07-0041, the Norwegian counterparts provided market intelligence and client networks to whom the innovative paint could be sold.

2.3 Effects

2.3.1 Effects on enterprises' size and competitiveness

One of the principal effects of the projects was enhanced competitiveness of the companies that received support from the grants. Our analysis found that of the approximately 50 projects that involved new technology, at least 13 allowed the company receiving grants to become more competitive.[7] This was frequently manifested in increases in turnover growth and exports, including into new markets. The PO for Spain, for example, noted that in their survey of supported companies, 65% of respondents reported an increase in revenue turnover two years after project completion as a result of participation in the project. 49% reported an increase in their exports. The PO in Latvia also noted reports of improved revenue turnover and the creation of new jobs among supported enterprises.

[7] BG10-0008, BG10-0018, BG10-0027, EE07-0044, ES02-0014, ES02-0031, ES02-0180, HU09-0011 , HU09-0021, LT09-0005, LV06-0025, PL18-0006, RO17-0042

Moreover, many of the project promoters noted that the development of new technologies allowed them entry into markets that were hard to penetrate. For example, one project promoter (ES02-0180) highlighted that the project had helped the company (an SME) to sell its product (a new electricity meter solution to improve the energy efficiency of domestic and industrial installations) in new international markets that had been previously been dominated by large firms. The PO in Spain also highlighted the results of its survey, which found that the grants provided important financial help that allowed projects to develop costly advanced technologies. Some 97% of respondents expressed satisfaction with the programme and that they would apply for similar grant programmes in the future. In particular, the survey found that the programme met companies' needs for financing of research that was necessary for innovation and product development and that would support future competitiveness and increase environmental performance but that might not yield an immediate financial return.

Some project promoters pointed out that their competitiveness was enhanced because the support allowed them to develop particularly advanced technology. The project promoter of EE07-0045, for example, noted that the solutions developed would allow the company to sell products at higher levels of the value chain. In our interview with the project promoter of LV06-0025, it was highlighted that the support and resulting technology allowed the company to become a market leader in 3D printing as the centre allowed them to create products that are unique in the market. The programme was important for this achievement because they did not have the resources to do the required research on 3D printing. The company is now seeking EU grants to build a larger manufacturing plant tailored to the aerospace industry with the intention of establishing a new industry in Latvia. Similarly, the project promoter for HU09-0021 highlighted that the technological developments involving aluminium foam made them market leaders with only one competitor, a Canadian firm that has a slightly different product.

The programmes also contributed to expanding the companies that received support. The PO in Poland noted that supported companies quickly expanded as they were able to produce new products and consequently bring in new clients.

2.3.2 New Green Jobs

As a result of the investments by projects, POs reported that project promoters and partners had been able to create new green jobs. Table 6 below highlights that most of the programmes in the countries covered by the study created more green jobs than expected.

Table 6 Green Jobs created

Country	Expected Green Jobs	Green jobs created
Bulgaria (BG 10)	80	139
Hungary (HU09)	13	97
Latvia (LV06)	60	126
Poland (PL18)	30	85
Romania (RO17)	30	357
Spain (ES02)	No data	134
Slovakia (SK07)	180	80

*No information for Estonia and Lithuania

2.3.3 Effects of bilateral collaboration

Many of the projects analysed involved co-operation between the project promoters and a research institution in Norway. POs stressed that the transfer of knowledge between SMEs and Norwegian research organisations was an important result of the programmes. The PO for Spain, for example, highlighted that 71% of respondents to their survey claimed that new research lines were established. 66% had noted that they were able to obtain new knowledge through such relationships. 46% reported that they developed a new technological cooperation relationship with universities or research institutions and that these relationships were maintained. Other frequent relationships involved collaborations with Norwegian private companies.

Expertise knowledge transfer and training

An important effect of these collaborations was that companies and local stakeholders obtained expertise, knowledge and, through training provided by the Norwegian partner, new skills. The PO for Bulgaria and Romania noted that the Norwegian research institutions often provided companies with up-to-date knowledge. Examples can be found in RO17-0001, where additional expertise was required to rewrite the software code for the Radio-Frequency Identification technology which could not be provided by the local university. In BG10-0018, the Norwegian partner provided knowledge and advice on the certification of new pellets and assistance to improve the quality of the new product. In BG10-0027, the Norwegian partner provided energy audits and training on energy savings.

Another effect of collaborations with Norwegian partners was that Bulgarian and Romanian business gained experience and learned about the benefits of cooperating with other businesses. In these countries, contrary to in Norway where consortiums are common, collaborations are not common.

Business consulting and research

Another important effect of these collaborations was that SMEs involved obtained consulting and expertise on how to make their business operations more efficient. In Latvia and Poland, POs and project promoters noted that Norwegian experts and entrepreneurs provided consulting on how to overcome certain issues SMEs were facing and how to meet sustainability and environmental goals, as well as other corporate social responsibilities. Additionally, as was the case with the project EE07-0041, the Norwegian partner helped in commercialising the oil spill detection system by engaging in market intelligence gathering and providing access to client networks. Similarly, such relationships helped SMEs access international markets. Norwegian experts consulted SMEs in Latvia and Poland on how to access the Norwegian markets. For BG10-0020, Norwegian partners engaged in market research for entry into Austria, Germany, Italy, and Greece, and developed a marketing strategy.

Testing

An additional effect of collaborations with research institutions in the Donor States was that they provided a site for many of the projects' SMEs to test their products. In the project ES02-0180, for example, piloting and testing of the technologies occurred within the Technical Institute of Energy in Spain (ITE) and the Spanish research institution Tecnalia.

The project BG10-0020 provided an interesting effect for Hiteck Ltd., the SME involved. As a result of the successful partnership with Norwegian partners, they jointly formed the "Cluster for Green Energy and Innovative Wood Processing" in 2016. This company has become part of the Norwegian-Bulgarian Business Group which supports and protects the economic interests of its members and assists them with knowledge acquisition, networking and other consulting.

2.3.4 Outcome of patent applications

Some of the projects led to project promoters applying for patents. These were mostly found in projects under the categories of 'energy innovation' and 'energy efficiency in buildings, greening

business operations'. For example, one of the Romanian projects (RO17-0001) was applying for patents related to specific components that would help making professional laundry services greener: one was a transponder for harsh environments, whilst the other was a transponder coupled with antennas. A report by Spain's NFP found that within the Spanish climate change technology programme (ES02), 42 patent applications had been made and 18 other types of intellectual property rights protection measures pursued. At least three other Green Industry Innovation projects had also submitted at least one patent (ES02-0011, ES02-0180, PL18-0013).

However, the new technologies developed or applied within some GII projects did not lend themselves to patent applications. For example, the PO for Bulgaria and Romania noted that for the development of new technologies, patents were only solicited within the laundry project (RO17-0001). The PO indicated that this was largely because the other projects mostly involved the adoption or adaptation of existing technologies or the application of existing technologies in new ways, rather than the development of new technologies. The PO further noted that many companies in these countries were generally not using new technologies so there was little expectation that these projects would involve developing new technology. The promoter of one of the Latvian projects (LV06-0025) reported that they could not afford to cover the legal and technical costs to apply for patents. The project promoter nonetheless noted that the business can be expanded by continuing to create innovative market leading products, as they did with the 3D prosthetics printer, rather than through patents. In order to protect the project's intellectual property, the promoter was instead using non-disclosure agreements, which they believed were more affordable and more appropriate to the technology in question. In one of the Hungarian projects (HU09-0021), the project was exploiting a technology for aluminium foam production that had already been the subject of a successful patent application.

2.4 Factors influencing results

Influence of local context: Several POs highlighted the difficult **legal context** of their countries. Bulgaria and Romania, for example, were reported to have **unpredictable business environments**, as legislation can change suddenly without warning. This is notably the case when they implement existing EU legislation that had not been nationally transposed. The PO noted that this disincentivises long-term planning and means developing new technologies can be risky. The PO in Poland highlighted legal regulations that may postpone the implementation of some projects. They highlighted that one company reported difficulties in selling its renewable energy products as national regulations in Poland do not allow certain energy sources to be sold on the market. They also noted the issue of **administrative burden.** To protect against corruption, there are a lot of controls and permissions that need to be acquired before certain elements of projects can go ahead and public procurement processes can also hinder the development and exploitation of new green technologies. Additional issues that were reported, for example, in Bulgaria were the **small workforce in remote areas** and logistics problems due to an **underdeveloped transport infrastructure**.

Political and economic risk factors: In Spain for example, the Programme Agreement was delayed due to issues in the Spanish Government following the **2008 financial crisis**. For projects in Hungary, there were concerns that the **political situation** may create constraints for the businesses. There were concerns that diplomatic concerns would hamper cross border collaboration but ultimately businesses were nonetheless able to cooperate. There were also delays in the implementation of projects when EEA and Norway Grants were suspended in Hungary due to concerns about government interference in the spending of the grants and clampdowns on civil society.[8]

[8] https://www.reuters.com/article/us-norway-hungary-funding-idUSKBN0TT1YR20151210

3. Research and Scholarships

3.1 Introduction

The research and scholarships priority sector had 13 programmes that covered the priority areas PA18, PA19, PA23 and PA24. These programmes operated in twelve countries (BG, CZ, EE, ES, GR, HU, LV, LT, PL, RO, SI, SK) to develop research-based knowledge, human capital and enhance cooperation between donor states and beneficiary states. The EEA and Norway Grants provided €148m of support to 1,326 projects, an average of €111,000 per project.

Activities in this priority sector were more targeted at individuals and in effect supported many of the other priority sectors, depending on what research and scholarships were funded. Bilateral cooperation was a core feature of these scholarships and research grants

Following the ToR, the programmes considered by the rapid assessment were: RO14, CZ09, PL12. Within the countries covered by this study, the research focused on 4 projects that had used new technologies to further their objectives. Of these, one was in the Czech Republic, one in Poland, and two in Romania.

Table 3 Research and Scholarship projects involving new technologies

Number	Title	Project Grant
CZ09-0024	Utilisation of long term (passive) sampling methods combined with in situ microcosms for assessment of (bio)degradation potential	€ 636,208
PL12-0075	A novel approach to monitoring the impact of climate change on Antarctic ecosystems	€ 884,356
RO14-0011	Remote sensing model and in-situ data fusion for snowpack parameters and related hazards in a climate change perspective (SnowBall)	€1,163,635
RO14-0013	Development of a Cost Effective Romania-Norway Joint Plant-Based Technology Platform for Production of Vaccines Against Human Hepatitis Viruses B (HBV) and C (HCV)	€1,069,699

3.2 New Technologies

The four selected projects featured the development and application of very different technologies. This reflects the fact that the programmes were open to any discipline with the national level not pushing them in any particular direction.

New environmental monitoring technology for decontamination of sites (CZ090-0024): this project aimed to develop new technology to improve techniques for the decontamination of polluted sites. The most common decontamination techniques are applied ex situ, i.e. the soil is excavated or water pumped up off the site, cleaned up somewhere else or dumped at the safety landfill and (in case of soil) returned or replaced by clean soil. However, there is potential for in situ techniques to be cheaper and more effective. To promote such techniques, the project developed new technology in the form of techniques, monitoring and analytical processes and their use for assessment of biodegradation potential, remediation planning at the contaminated sites and monitoring of remediation and its results. This technology can also serve the purpose of "tailor-made" cleansing of contaminated soil, underground water and underground air at contaminated sites. The project also applied an existing

technology in a new way. A "passive sampler" of the chemical properties of underground environments was adapted so that it can be used for passive sampling of in situ microcosms and their biological and genetic characteristics, structures and dynamics.

New types of unmanned aerial vehicles (UAVs) for monitoring ecosystems (PL12-0075): the project developed prototypes of two UAVs (also known as "drones") specifically to undertake photogrammetric missions in Antarctica: PW-Penguin MONICA (tailless configuration) and PW-ZOOM (classic configuration but with a novel design to reduce the probability of damage to the propeller and wings during landing in a rough terrain). Additional necessary equipment was also developed, including catapults for PW-Penguin MONICA, a special launching catapult for PW-ZOOM and transpiration equipment like special metal light-weight transportation boxes for the planes and the toboggan for local transportation in Antarctica.

Prior to the Antarctic mission, different versions of autopilots were tested during test-flights in Poland. Pre-tests of photogrammetric systems and training the pilots and UAV team took place on King George Island before photogrammetric missions. The concepts and information systems serving the extension of telemetry communications between the plane and the ground-station was developed. Photogrammetric missions on King George Island over Antarctic Specially Protected Areas as well as the aerial monitoring of Chabrier Rock and Penguin took place in Antarctic summer seasons 2014, 2015 and 2016. The PW-ZOOM planes flew 3641km over Antarctica and delivered 27,069 orthophotos. Those images were used by for biological investigations, e.g. regarding changes in bird populations.

New technology for monitoring snow (RO14-0011): this project developed a prototype snow monitoring system that combined daily satellite data with in-situ weather stations observations and state-of-the art snowpack and climate modelling. The new system enables hydrological modelling, snow-melt induced flash flood warning and snow avalanche warning. Key features of the technology include the increased spatial scale and spatial resolution offered by the satellite data. The system uses a multi-sensor/multi-temporal algorithm for snow wetness based on the combined use of optical and radar satellite data. It has been applied in the Făgăraş Massif in Romania, which is known for its frequent avalanches. Various professionals have been trained to use the equipment, including researchers within the project partnerships, weather station staff and mountain rescue teams.

Plant-based technology platform for production of vaccines against hepatitis viruses (RO14-0013): this project sought to overcome the difficulties arising from side-effects associated with existing hepatitis therapies, as well as the development of resistance to antiviral inhibitors. The objective of the project was to design new hepatitis C (HCV and hepatitis B (HBV) antigens with superior immunologic properties and produce them in plants for potential vaccine development at reduced cost. To do this, the project developed a cost-effective and safe plant-based production system for hepatitis C (HCV and hepatitis B (HBV) vaccines. The project also demonstrated the possibilities for oral administration of vaccines. Support for PhD research was also offered.

3.3 Effects

In respect of new technologies, the four selected projects can be seen to have generated two main effects.[9] They are as follows.

Potential for future exploitation of technology (albeit not yet realised): since the projects were mostly focused on primary research, they have not exploited new technology but have created the

[9] It should be noted that the projects generated much wider effects than those described here, which relate solely to new technologies.

potential for exploitation in the future, for example, through future projects supported by the EEA/Norway Grants.

- The Czech decontamination project (CZ09-0024) has not fully applied the results of its research. However, it has created a new tool for assessing biodegradation potential of contaminated sites and a new set of techniques for more accurate risk analysis in all stages of the remediation process. This should reduce environmental risks and lead to more the application of more efficient biodegradation techniques. Once the technology is fully commercialised, it stands to benefit all types of organisation involved in the decontamination process, including private companies and public bodies.
- The hepatitis project in Romania (RO14-0013) involved basic research which has demonstrated that, in principle, it is possible that the proposed antigens are better than the antigen that currently exists in the HBV vaccine, and that the plant-based vaccine causes a sufficiently good immune response. Moreover, the results obtained in the project have clearly demonstrated that plants are a viable technological platform for production of HBV/HCV antigens at low cost. However, a follow-up project is required to fully exploit the new technology by testing whether the results of the first project are reproducible. Such a project is currently being implemented by the Institute of Biochemistry of the Romanian Academy with €1.5m support from the current Romanian Research Programme supported by the EEA/Norway Grants.[10] The intention is to develop solutions and undertake experiments to develop substances that go into vaccines to make it cheaper, reduce animal testing and make vaccines into pills instead of injections, which makes it easier to reach people. Bilateral co-operation is continuing with the Norwegian Institute of Bioeconomy Research.

New technology allowing increase in scientific knowledge:

- The Polish drone project (PL12-0075) was not specifically intended to lead to the commercialisation of the new technology, in part because the very specialised nature of the technology does not offer widespread commercial possibilities. Instead, the purpose was to facilitate the study of the impact of climate change on the Antarctic ecosystem and biodiversity. The development and use of the UAVs, through the collection of data and images, has greatly increased the scientific knowledge available and provided the basis for further co-operation in Arctic and Antarctic research. Data and images are being used by the project partners, namely the Institute of Biochemistry and Biophysics at the Polish Academy of Sciences, the Institute of Aeronautics and Applied Mechanics at the Warsaw University of Technology and the Northern Research Institute, Tromsø.
- The Snowball project offers the potential to analyse and predict avalanches, flash floods due to snowmelt and the effect of snowmelt on groundwater. Romania's National Meteorological Administration (Administrația Națională de Meteorologie) is benefitting from improved assessment of snow cover and better avalanche detection and monitoring, as the new system replaces the previous approach which involved digging into snow. The National Hydrological Forecasting Centre (Institutul National de Hidrologie si Gospodarire a Apelor) is benefitting from more accurate forecasts/warnings assimilating the snow products in snowmelt runoff models. Aside from the project partners, data from the system is being used by National Administration "Romanian Waters" (Administrația Națională Apele Române), the Institute of Geography of the Romanian Academy, the state-owned hydroelectric company (Hidroelectrica) and mountain rescue teams. The system is being sustained by the project partners. For example, the National Meteorological Administration is maintaining the snow stations.

[10] EEA-RO-NO2018-0078: Next Generation Viral Hepatitis B and C vaccine development in plants and algae using advanced biotechnological tools.

Patent applications: none of the four selected projects had developed patent applications and few other projects had done so within the programmes. The expectation of the Donor Programme Partner (Research Council Norway) was that most projects would develop at least one patent and commercialise their results, although in the selection of projects greater weight was given to research excellence rather than impacts such as patents. However, since some were basic research projects, it was not expected that all would obtain patents. In general, any discussion of patents and commercialisation came towards the end of the implementation period and in light of the discussion of the new programme period (2014-21). It was reported that several patents were submitted within Poland, but that the majority of these were from individual projects under the small grants scheme, which were dedicated to supporting women in the technical sciences. These were more focused on projects closer to the marketplace, but there were very few instances of commercialisation within these projects. Although the PO was aware of patent applications having been submitted, the project monitoring and reporting process did not extend to receiving updates on the outcome of those applications (which might arise some time after the completion of the report). In Romania, it was reported that the intention was for the applied research projects to commercialise the research projects and many patents applications were filed, e.g. six relating to food safety and three to renewable energy.

3.4 Factors influencing results

Across the programmes (RO14, CZ09, PL12) considered by this study (not only the projects described above), a number of factors were identified that influenced the development, application and exploitation of new technology.

Experience and expertise of project promoters and project partners: most of the promoters and partners involved in projects were research organisations, universities or similar bodies. Whilst they were required to demonstrate research expertise in order to be successful in their project applications, the POs and DPP reported that there was wide variation in those organisations' expertise in developing, applying and exploiting new technologies. Some were strong, established institutions with traditions of research development. Others were new organisations or centres established by universities to do things in new ways, often European Structural and Investment Funds with new equipment in new laboratories. Some organisations were very specialised, technical research institutes, whilst others were more general. Overall, there was considerable diversity in experience in dealing with patent applications, exploitation of intellectual property rights (IPR), etc.

Focus of programmes: the programmes (RO14, CZ09, PL12) considered by this study were primarily focused on basic research rather than applied research. As a result, they tended not to prioritise the development of new technologies, although this was certainly possible within the parameters of the project selection criteria. For example, within the Polish programme (PL12) many projects related to understanding the impact of climate change in Poland, but these tended to focus on understanding the natural processes (typically using existing technologies and processes) rather than on new technologies. In contrast, the current period features a stand-alone Polish applied research programme specifically focused on the development of new technologies by encouraging projects close to the marketplace. Selected projects will involve the application of new technologies and involve a company within the project partnership. This will make projects more focused on the possibilities for practical implementation and commercialisation of new technologies. Similarly, within the Czech programme (CZ09), the expectation was that projects would provide connections between science and research for basic research, rather than develop new technologies. As in Poland, the Czech Republic has a stand-alone applied research programme within the current period, which features an intermediate body focused on applied research. All six current research programmes include "number of jointly registered applications for intellectual property protection" as an indicator, with an

aggregate target of 88. The current Portuguese innovation programme also includes "number of new products/technologies or services developed" as an indicator, with a target of 7.

Bilateral co-operation: the high level of competition for funding meant that the quality of research projects was very high. This tended to make the projects very attractive to scientific organisations that could serve as donor project partners. Such partners typically had experience in bringing research ideas to commercialisation, for example through their experience of collaborating with industry and in developing and exploiting IPR. However, given that the focus of the programmes was not primarily on the commercialisation of new technologies, the main benefits of bilateral co-operation (e.g. as reported by the POs and the DPP) tended to be the enhanced expertise of researchers (within the beneficiary states and the donor states), improved access to modern equipment and facilities and exposure to new research methods. For example, within one of the Czech projects (CZ09-0024), the Norwegian partner possessed the necessary technology which was adopted by the project, as well as analytical capacity and experience which allowed faster and more accurate analysis. Similarly, the Snowball project (RO14-0011) benefitted from the advanced equipment operated by the donor project partner, the Norwegian Computing Center, such as devices for measuring snow wetness or spectral radiometers. These allowed better time-series measurements to be made. The Norwegian partner applied the equipment to the project and also trained the staff of the Romanian partners in its use.

Bilateral co-operation is very often continuing either in the context of the current EEA/Norway Grants programmes (which place greater emphasis on exploiting new technologies) or in the context of the EU's Horizon 2020 programme. Bilateral co-operation at programme level also helped promote awareness of the possibilities for supporting technology development. For example, the Research Council Norway hosted a study visit on technology transfer for its Polish counterparts.

Limited involvement of companies: the programmes considered by this study (RO14, CZ09, PL12) prioritised research excellence and thus did not particularly prioritise the involvement of companies, which tended to limit the possibilities for commercial exploitation of new technologies. For example, the Polish programme prioritised the participation of research organisations (who might have the form of a company) rather than companies per se. In Poland and Romania, where the participation of companies was encouraged, this tended to be for SMEs rather than companies in general. It was also reported that the Estonian programme did not prioritise the involvement of SMEs, as these were targeted by the Green Industry Innovation programme. However, the current programmes offer more possibilities for involving companies, given their greater focus on applied research and technology transfer.

National policy and regulatory context: the literature on innovation (e.g. Hellsmark & Söderholm, 2016) suggests that the relationships between research, development and diffusion of new innovations are complex and that it can take some time before innovations are exploited commercially. In this context, the legislative and institutional context may favour actors with existing technology and there may be a need for reform if new technologies are to be diffused more widely.[11] For that reason, the successful development and application of new technologies within the EEA/Norway Grants programmes will very much depend on the extent to which the national policy and regulatory context is supportive. Whilst all the Beneficiary States highlight the importance of support for innovation and commercialisation of new technologies, there is some difference in the extent to which the national policy and regulatory contexts are supportive. In particular, certain regulations can facilitate or hinder the registration of patents or the exploitation of research results. For example, the regulatory context of the Czech Republic was reported to be quite restrictive and

[11] Hellsmark, H. & Söderholm, P. (2016), Innovation policies for advanced biorefinery development: key considerations and lessons from Sweden: Innovation Policies for Advanced Biorefinery Development. Biofuels, Bioproducts and Biorefining, November 2016.

overly detailed and prescriptive, leaving limited room for manoeuvre. The context of Romania was also reported to be complicated, although in Poland, it was reported that progress had been made in recent year to reduce barriers to the development and exploitation of technology. Estonia was reported to have the most supportive regulatory framework for research and exploitation of results. Very often, the organisations involved in projects can lack the necessary expertise in dealing with the national regulatory framework, which could perhaps be addressed in the current programme.

4. Public Health

4.1 Introduction

Gaps in healthcare provision in Europe are significant. The economic crisis and ensuing cuts in public health expenditure have compounded inequalities. A rise in lifestyle-related diseases and ageing populations present particular healthcare challenges. More than half the population in Europe is overweight, one in ten EU citizens suffers from mental health disorders, and the maximum gap in life expectancy at birth between EU countries was 11.8 years for males and 7.5 years for females in 2013. PA13 and PA27 contribute to fostering dynamic health systems and reducing health inequalities by enabling the beneficiary countries to develop national strategies for effective disease prevention, strengthen public health monitoring, improve access to healthcare for vulnerable groups such as Roma and improve health surveillance and information systems.

The EEA and Norway Grants have funded programmes in pursuit of these objectives in ten countries across two programme areas (PAs):

- Public Health (PA13): the EEA Grants co-financed dedicated programmes in 3 countries (BG, PL, PT); benefitting 57 projects. These programmes provided grants of €30m to 57 projects, an average of €528,000 per project. All but four projects were selected via open calls.
- Public Health (PA27): the Norway Grants co-financed 706 projects in 9 countries (BG, CY, CZ, EE, HU, LT, PL, RO, SI). Bulgaria and Poland were the only countries receiving funding under both PA13 and PA27. The programmes funded under PA27 provided grants of €134m, an average of €329,000 per project. All but 24 of the projects were selected via open calls.

Within the countries covered by this study, the research focused on 9 projects that had used new technologies to further their objectives. Of these, three were in Bulgaria, three in the Czech Republic, two in Poland, and one in Romania.

Table 4 Health projects involving new technologies

Number	Title	Project Grant
BG07-0072	Improving the quality of health services, including reproductive health and child health through the provision of health services and health education in the homes of pregnant women and children up to 3 years old	€176,723
BG07-0090	Establishing a medical centre utilising high-tech rehabilitation methods to improve the quality of life of children with cerebral palsy	€348,373
CZ11-0002	National Coordinating Centre for Rare Diseases at the Motol University Hospitals	€934,015
CZ11-0017	Increase in the Level of Complex Long-term Monitoring of Neuromotoric Child Development with Perinatal Burden in the Zlín Region	€213,052
CZ11-0018	Prevention of after-effects of illness and health problems during childhood at the University Hospital of Olomouc	€258,728

Number	Title	Project Grant
PL07-0021	Building a complex therapy system for the disabled to let dependent and chronically-ill persons gain more independence – a model project of a non-governmental organisation operating in the health care field	€945,306
PL07-0040	Improving the healthcare system for elderly, dependent and chronically ill patients from Zary, Lubsko and remaining parts of the southern area of Lubuskie Voivodship	€379,397
RO19-0001	Improving the health status of the Romanian population in Romania by increasing Tuberculosis control	€10,598,952
RO19-0008	Improving paediatric oncology and haematology services in Romania through the acquisition of goods, services and specialised works	€5,133,116

4.2 New technologies

The main problems addressed by the programmes targeting public health have been poor healthcare provision due to outdated or inadequate equipment and poor access for certain communities (e.g. Roma), for those living in certain areas (e.g. rural) or those requiring care at home.

Across all the health programmes in the countries covered by the study, the use of new technologies was not promoted as an end in itself but as part of wider activity to improve the provision of health services and widen access. Moreover, none of the projects have involved the development of new technologies. Instead, they have involved the purchasing of existing technologies and the application of those technologies to public health challenges. Some have also drawn on the expertise of bilateral partners in the use and exploitation of technologies.

The main ways in which project have made use of new technologies have been as follows.

Mobile medical equipment for **neonatal and paediatric health services, particularly for Roma**: (BG07-0072). This project aimed to improve the provision of neonatal and paediatric services for women during pregnancy and children from birth to the age of 3 years, particularly those of Roma origin. Part of the project involved the provision of new mobile medical equipment to be used by teams of the Second Municipal Hospital for Obstruction and Gynaecology Sheynovo Pls and the MHTH Ihtiman EOOD for the improvement of maternal and child health. Equipment has been selected mainly on the basis of portability and functionality and has, in most cases, already been widely in use elsewhere.[12]

Hi-tech diagnostic and therapeutic equipment for the chronically ill and elderly: Two projects in Poland introduced such equipment. The first (PL07-0021) aimed to improve the availability and quality of medical and therapeutic treatments for people with intellectual and other disabilities. New technology was purchased in the context of a wider modernisation of services and refurbishment of care facilities. The target group was people under the age of 25 years with severe and complex disabilities, such as severe communication disorders caused by dysfunctions resulting from mental or physical disability. Such patients require highly specialist therapy forms to sustain or improve their general fitness, social skills and communication abilities. A key part of the project was to introduce

[12] The purchased equipment included: Otoscope ophthalmoscope set, Inhalers, Electrocardiogram machine, Infant hearing screening equipment, Bili-Meter, Vascular doppler, Transport incubator, Saturation monitoring and tracking system, Patient warming system, Resuscitation medical kits, Portable doppler ultrasound machine.

new technologies to diagnose communication difficulties and overcome the difficulties associated with traditional appliances. This was done through piloting an augmentative and alternative communication diagnostic programme, which involved the use of new diagnostic and therapeutic equipment. Together with the refurbishment of a care facility and the training of staff, the introduction of the new equipment was intended to improve the volume and quality of services provided on-site as well as in patients' homes.

The second project (PL07-0040) aimed to improve healthcare for elderly, dependent and chronically-ill patients in small towns and rural areas within the Lubuskie Voivodship, where provision can be limited. New technology was purchased in the context of a wider modernisation of services and refurbishment of care facilities, including long-term care centres and social welfare homes. This wider modernisation featured improvements in long-term care unit and a geriatric ward, training for staff, family members and other care providers, promotional activities and improvements in domestic nursing care. The project purchased new technologies in the form of 33 items of diagnostic and therapeutic medical equipment.

Diagnostic and therapeutic equipment for neonatal care: Two projects in the Czech Republic introduced such equipment. The first (CZ11-0017) focused on developing multidisciplinary dispensary care for babies and young children with perinatal difficulties in the Zlín Region. Healthcare providers had previously lacked equipment or had equipment that was obsolete. As a result, problems related to low birthweight have persisted. The project therefore provided new equipment to improve the quality of diagnostic and therapeutic care related to eye defects, congenital heart defects, heart rhythm disorders, pathological findings in the brain and abdominal cavity. Thirteen new devices were supplied to the neonatal, paediatric and ear, nose and throat departments. This included a sonographic device allowing examination of the brain, heart and urogenital tract, a retina camera and a flexible rhino-laryngo endoscope. The project also provided training for the medical staff to use the equipment.

The second project (CZ11-0018) introduced new treatment processes in the neonatology unit of the University Hospital of Olomouc. These were intended to improve the diagnosis and treatment of conditions suffered by babies born prematurely or with a low birthweight. The project provided new medical devices, including an ultrasonic device, retinal camera, pressure-mapping pad and resuscitation models (life-size new-born). Training was provided for medical staff and for parents, e.g. using the resuscitation models.

Disease diagnosis and treatment equipment: The public health programme in Romania (RO19) prioritised the prevention and reduction of lifestyle-related diseases, amongst other things. In pursuit of this objective one project (RO19-0008) aimed to equip regional healthcare centres with better equipment for diagnosing, treating and monitoring cancer amongst children up to the age of 14 years. Alongside the purchase of equipment, the project also featured the training of specialists in paediatric haematology and oncology, as well as an information campaign. The following equipment was purchased:

- Magnetic resonance imaging (MRI) machines
- Remote monitoring systems
- Anaesthesia devices
- Remote monitoring and anaesthesia system for the radiotherapy device and a Computed Tomography (CT) machine for treatment plan
- Portable electrocardiography monitor
- Portable ultrasound
- 1 Cryogenic vessel for liquid nitrogen supply and storage

- 1 apparatus for dispensing plasma levels
- Osteodensitometer (for measuring bone mineral density)
- 1 toxicological analyser

Another project within the Romanian programme (RO19-0001) provided new equipment to improve diagnosis and treatment of tuberculosis (TB), particularly amongst patients with multi-drug resistant TB or living in poor rural areas, including Roma. Ten laboratories for rapid diagnosis were equipped. Equipment provided by the project included:

- Line probe assay (LPA) equipment
- MGIT 960 equipment (for the detection and recovery of mycobacteria)
- VersaTREK devices (for cultivating and recovering microorganisms)
- GeneXpert devices (for undertaking molecular tests for TB)
- Light Emitting Diode (LED) microscopes.

Testing for rare diseases (CZ11-0002): this project was implemented by the National Coordinating Centre for Rare Diseases at the Motol University Hospital in the Czech Republic. The Centre co-ordinates national efforts to prevent, diagnose and treat rare diseases, i.e. diseases that affect fewer than 5 persons out of 10,000. The rarity of such diseases means that diagnosis can be slow, whilst treatment can be expensive. To address these difficulties, the project aimed to improve care, increase accessibility and increase recognition by the healthcare and health insurance systems. Action included developing more reliable diagnosis methodologies and procedures, training staff, providing audit and advisory assistance to other centres. New technology was introduced primarily to improve the diagnosis of rare diseases. It included:

- Genetic testing (undertaken in partnership with the Norwegian partner) of biology samples and comparison with database of genetic characteristics of rare diseases, which also included a lot of new entries into the database.
- Software Morphome3cs, a cutting-edge technology, was updated during the project in order to increase the set of comparative characteristics. The software is used for comparison of somatic characteristics of individuals with typical somatic characteristics of various rare diseases thus enabling better, sooner and more accurate preliminary identification of possible rare disease/s in case of patients with complicated health difficulties. This is then used to better aim the following tests and focus them on a preselected batch of possible rare diseases.
- Intraoral 3D scanner was provided to establish normal (average) virtual models of upper palate for categories of children and young people.
- 3D facial scanner was provided to systemise phenotype characteristics of various rare diseases and to make phenotype/syndrome examination more “algorithmic” and accessible for general practitioners.

Diagnosis, treatment and rehabilitation equipment for children suffering from cerebral palsy and other conditions (e.g. autism, somatic impairment): two projects in Bulgaria addressed problems related to a lack of trained specialists and inadequate or outdated equipment. The first (BG07-0088) in Burgas provided new rehabilitation equipment related to hydrotherapy, electrotherapy, ergotherapy and kinesitherapy, as well as a mobile life to provide the children with access to an indoor rehabilitation pool. The second project (BG07-0090) in Sofia addressed problems related to a lack of trained specialists and inadequate or outdated equipment, which resulted in children lacking access to high quality treatment and rehabilitation services. The project provided new equipment in the form of robot-assisted upper and lower limb rehabilitation equipment and equipment for passive stretching of the wrist joint, wrists and fingers, knee joint and ankle joint.

4.3 Effects

The effects of investments in new technologies should be considered as part of the overall effects of the relevant projects, given that such investments were part of wider interventions that included refurbishment of facilities, staff training, information campaigns, etc. Nonetheless, the main effects of investments in new technologies within the field of public health have been as follows.

Increase in the quality of services provided, including better diagnosis: a consistent finding across the projects has been that the purchase of new equipment has enabled better quality services to be provided. Previously, poor or late diagnosis had created the risk that conditions went undetected or that the correct treatment was not identified. Examples of improved quality of service include:

- Early diagnosis of conditions such as eye defects, congenital heart defects, heart rhythm disorders, pathological conditions in the brain and abdominal cavity, leading to faster interventions that present the development of diseases in the affected children (CZ11-0017)
- Earlier and more accurate diagnosis of rare diseases (CZ11-0002); moreover, through the activity of this project, including the provision of new equipment, 17 out of 24 expert medical centres in the Czech Republic were able to gain membership of the European Reference Network for rare diseases, whilst the other 7 are expected to apply in the future.
- Provision of new rehabilitation services for children with cerebral palsy using robot-assisted equipment for passive stretching of upper and lower limbs (BG07-0090)
- Possibility for children with limited mobility to access an indoor pool for rehabilitation treatment, using a mobile lift (BG07-0088)

Increase in the volume of patients served: all the projects described above reported a considerable increase in the number of patients served during the life of the project, as a result of their activities (including investments in new technologies).

- Mobile equipment in Bulgaria (BG07-0072) has enabled 500 gynaecological, 2,500 paediatric examinations, 600 screening procedures and 100 vaccinations to take place during the project.
- Equipment for testing for rare diseases (CZ11-0002) has enabled an increase of 50% in the number of patients diagnosed at an early stage, compared to the previous annual average of 100 per year.
- New equipment has enabled +10,500 rehabilitation treatments to be provided for elderly, dependent and chronically ill patients in Lubuskie (PL07-0040).
- Parents of 20 children with cerebral palsy were trained in the use of medical equipment in the home for passive stretching of joints (BG07-0090)

Widening of access to health services: investments in equipment have helped the projects to make health services more accessible to patients. For example:

- The diagnosis of rare diseases is now possible at 17 specialist centres across the Czech Republic (CZ11-0002);
- New equipment, e.g. medical devices, has improved patient services in rural Poland (PL07-0040).
- New equipment has enabled more physiotherapy services to be provided to disabled and chronically-ill persons in their homes (PL07-0021).
- Children with cerebral palsy can receive treatment at home, as their parents have been trained to use new equipment (BG07-09090).
- The supply of new medical devices has created new options for out-patient treatment for children to be provided closer to their home, without the need to travel to distant hospitals (CZ11-0017).

It is worth noting that the programmes have not generally supported research or innovation into the development of new technologies. In general, healthcare problems have often reflected outdated equipment or a lack of equipment. Addressing these problems has mostly required the purchase and application of existing technologies rather than the development of new ones. This reflects, in part, a focus on serving vulnerable groups, including Roma, where the immediate need is for better, more accessible, services making use of existing technologies rather than innovative new technologies. Looking ahead to the current programmes (2014-2021), if the objective is to stimulate the development of entirely new and innovative technologies, it is likely that the design of programmes and projects would need to be quite different to those implemented within the 2009-14 period.

4.4 Factors influencing results

Whilst there is considerable diversity in the projects described above, it is possible to identify some common factors that have influence the achievement of positive results. They are as follows.

Combining the use of new technologies with wider interventions: in nearly all cases, a lack of equipment was not the only problem affecting the healthcare services in question. Other problems included facilities in poor condition and or the need for new methodological approaches to treatment. In this context, the mere purchase of new equipment would not have been sufficient, for example, if such equipment was then installed in outdated or decrepit facilities. Moreover, the provision of new equipment has generally required parallel provision of training for staff in order for them to make best use of such equipment. In some cases, parents of patients have been trained in using new equipment, which contributes to increasing impact.

Capacity of project promoters and other stakeholders to provide sustainable financing for services using new equipment beyond the life of the projects: across the projects, new equipment has generally been owned and operated by the project promoter or the healthcare providers supported by the project. In some cases, additional costs are incurred beyond the life of projects in terms of operating and maintaining new equipment (although improvements in services are tending to reduce the overall cost to national health services). Within Bulgaria, projects have benefitted from ongoing public funding in the context of an overall increase in national funding for public health with priority given to investments in new technologies. Within the Romanian Public Health Programme (RO019), challenges were reported in securing funding to maintain and sustain the use of new technologies, although the necessary funding had eventually been secured. For example, the project to improve paediatric oncology and haematology services (RO19-0008) was to be followed by a project supported by the EEA Grants via Romania's European Public Health Challenges Programme 2014-2021. The long-term sustainability of services enhanced by new equipment within one of the Polish projects (PL07-0021) was uncertain due to a lack of funding; talks were continuing between the project promoter (Polish Association for Persons with Intellectual Disabilities) and the Ministry of Health.

Bilateral co-operation: most public health projects supported by the EEA/Norway Grants did not include a donor project partner. Of the projects considered by this study, two had involved bilateral co-operation. Such co-operation had proved a positive factor influencing the results of the projects:

- The Romanian project focused on control of TB (RO19-0001) had co-operated with LHL International, a Norwegian NGO working to tackle TB globally. Co-operation had included the transfer of knowledge, experience and best practice, particularly with regard to the provision of training and information to patients, vulnerable groups and the public at large.
- The Czech project focused on rare diseases (CZ11-0002) worked with two donor project partners: Norwegian Resource Centre for Rare Diseases, Oslo and the Haukeland University Hospital Bergen. The donor project partners provided expertise in genetic testing, thus increasing the capacity of the project to link rare diseases to genes. They also trained Czech physicians in Norway and shared experience and know-how with them, which was transferred into back into Czech practice.

5. Climate Change and Renewable energy

5.1 Introduction

Within the 2009-14 programming period, two priority sectors contributed progress towards the EU's commitment to reducing the emission of greenhouse gases and facilitating adaptation to climate change:

- "Climate change and Renewable Energy" (PA05, PA06, PA07, PA08, PA09, PA41)
- "Carbon Capture and Storage" (PA20).

Support under these priority sectors had three main objectives: to reduce emissions of greenhouse gases (GHG) and air pollutants, promote the use of renewable energy and facilitate adaptation to climate change.

In total, support of €216m was awarded to 525 projects, an average of €412,000 per project.[13] Poland awarded the largest number of project grants (146) and the largest amount of EEA Grants funding (€122m): more than 56% of the total for this priority sector. Spain implemented the largest number of projects (137) although the average grant award was less than 14% of total project costs; these were all within the programme area of Environmental and Climate Change-related Research and Technology (PA09). Slovakia implemented 66 projects, all of which related to Adaptation to Climate Change (PA07). No projects were funded that focused on reducing greenhouse gases and air pollutants from the Maritime Sector (PA08).

Following the ToR, the programmes reviewed in this priority sector were: CZ08, GR03 and HU04.

Within the countries covered by this study, the research focused on 3 projects that had used new technologies to further their objectives: one each in the Czech Republic, Greece and Hungary.

Table 5 Climate Change and Renewable energy projects involving new technologies

Number	Title	Project Grant
CZ08-0003	Preparation of a Research Pilot Project on CO_2 Geological Storage in the Czech Republic (REPP-CO2)	€ 2,281,674
GR03-0009	Installation of photovoltaic systems in municipal water tanks, autonomous operation of water pumps	€ 452,600
HU04-0001	Establishing a National Adaptation Geoinformatic System (NAGiS)	€ 1,501,175

5.2 New Technologies

The programmes considered by the study were quite different in their objectives and activities and thus the selected projects developed different technologies.

Application of renewable energy sources (RES): The Greek programme (GR03) tested innovative approaches that increased the use of RES by public buildings in order to reduce CO_2 emissions, reduce costs and improve the functioning of public services. Within this programme, the selected project

[13] Excluding projects that were terminated without receiving any grant funding.

(GR03-0009) focused on the use of solar energy to pump water in the water supply system operated by the Organisation for the Development of Crete, as the system previously used old pumps that consume a lot of electricity. The new technology consists of photovoltaic (PV) panels which produce 136 kilowatts of power. This technology was innovative as self-driving pumps had never before been driven solely by PV panels at this scale. A number of challenges were involved in the installation process. First, it was required to create a metal frame over the water tanks onto which the PV panels could be installed. Second, to install the panels, it was necessary to empty the water tanks each day but then remove the equipment for the next day to allow the tank to refill, so that the residents could have access to water. This one day-on, one day-off approach took two months. Third, the pumps needed to be very powerful and to fit the same system as the old pumps, which proved to be a technical challenge.

Testing new technologies for carbon capture and storage (CCS): the overall aim of the Czech programme (CZ08) on carbon capture and storage was to mitigate climate change by supporting pilot studies and surveys on CCS technology, which could then inform the uptake of such technology. Within the programme, the flagship project (CZ08-0003) undertook research to raise the country's technology readiness level (TRL) for geological storage of CO_2 from level 4 (technology tested under laboratory conditions) to level 5 (technology tested in the relevant environment). Research was undertaken into the possibility of using as a storage structure a small hydrocarbon field in South-East Moravia, at 900m depth. This involved a dynamic modelling of storage structure behaviour over time and the simulations of CO_2 injection repository. Thus, the new technology developed by the project consisted of processes and techniques of:

- collection, assessment of validity and integration of data from various sources of different quality, reliability and different nature in general; and of
- constructing static and dynamic model of the storage field in order to simulate and likely predict behaviour of the CO_2 in the selected underground field.

Multi-purpose geo-information system: the project in Hungary (HU04-0001) introduced a multipurpose geo-information system (NAGiS) to facilitate policy-making, strategy-building and decision-making processes in relation to the impact assessment of climate change in Hungary. It featured three main parts:

- development of a map-visualisation system (with a resolution of 10×10 km, containing hundreds of layers which show the way different aspects of climate change can affect certain areas of the country);
- development of a database (GeoDat) containing the calculation results based on modelling (exposure, sensitivity, expected impact, adaptive capacity and vulnerability);
- development of a meta-database facilitating navigation through different kinds of information (a sort of "data-map" about what to find and where).

5.3 Effects

The main effects of the renewable energy project in Crete (GR03-0009) have been as follows:

Increase in production of renewable energy: installation of the PV panels in Crete has enabled 191.28 Mwh/year. This serves as a useful contribution to national targets for generating energy from

renewable sources and reducing the use of electricity from Crete's grid network (of which 78% is generated from fossil fuels).[14]

Reductions in CO_2 emissions: the Greek project has achieved reductions of 145.36 tn/year.

Costs savings: enjoyed by the relevant municipalities through the use of cheaper, renewable energy sources. A key factor here is the fact that energy from solar power is produced at time when it is needed most, i.e. during the daytime and in summer (when the demands from tourism and agriculture are at their highest).

The main effects of the CCS project in the Czech Republic (CZ08-0003) have been as follows:

Effective techniques for testing the potential for carbon capture and storage: the new techniques have enabled better collection, assessment and processing of static and dynamic data regarding carbon capture and storage. Using the new 3D model, both static and dynamic simulations can be made in order to assess suitability of sites for underground carbon storage and its risks (of the carbon leakages, changes of the underground environment due to carbon storage, etc..). The research generated a set of data that was stored and made available in a structured geodatabase for use by the Czech Geology Survey (a public body). An assessment report on risks associated with the operation of the repository and final monitoring plan was prepared. The potential for geological storage of CO_2 over the eastern part of the Czech Republic was reappraised in a separate study and plans for further realisation of experimental CO_2 storage on site LBR-1a have been drafted.

As a result, the project has demonstrated that the selected underground site (Bearing LBR-1) is suitable for CO_2 geological storage and that preparations for the implementation of a research pilot project can continue in the future. Ultimately, this will lead to a reduction in emissions of CO_2. The new processes will be beneficial for the Czech Geology Survey, Masaryk University and other research and monitoring organisations which participate in preparing carbon storage sites and monitoring and assessing their risks. The new processes will also benefit owners of abandoned oil fields (such as public bodies or private companies) or other bodies who may seek approval for carbon capture and storage in depleted oil fields.

Potential for future CCS projects: drawing on the experience of the project, the Czech Geology Survey is participating in the "ENabling Onshore CO_2 Storage in Europe" (ENOS) project relating to preparation of carbon storage sites with €12.5m support from the EU's Horizon 2020 programme, though due to size of the project without actual field works at the site.[15] [16] Consequently, another new project is being prepared among various partners which will include fieldwork and particularly drilling works in order to obtain new rock cores for analysis of the site characteristics which will enable more precise dynamic modelling and simulations of the CO_2 interaction in the oil field after it is injected in it.

Data, analysis and impact assessments on climate change: the NAGiS project in Hungary provides users with analysis, impact assessments on the topics of climate change, effects of strategic risk factors like climate change and other issues affecting long-term natural resource management, and the possibilities of adaptation to the changes. The effects for different end beneficiaries are as follows:

- It provides information for central, territorial and local administration and municipalities for sectoral and territorial planning in the fields of climate policy, energy policy, transport and infrastructure, development, agriculture, rural development, forestry, territorial, municipal, regional planning, public service management, tourism, health and life quality, disaster prevention and management. This information includes maps and data on indicators such as groundwater,

[14] Marinos, N. (2018) Energy Strategy of Crete: Potential Expansion of Renewable Systems with Interconnection. University of Strathclyde (http://www.esru.strath.ac.uk/Documents/MSc_2018/Marinos.pdf)
[15] https://ec.europa.eu/inea/en/horizon-2020/projects/h2020-energy/carbon-capture-and-storage/enos
[16] http://www.enos-project.eu

biomass production, land-use and natural habitats.

- National, regional and local policymakers can rely on the data structure as well as the research network for strategy development. The project has also generated further research projects and a common framework for future studies. These have included studies on groundwater, drinking water protection, surface water and natural habitats.
- The general population can also use this system. The maps and the scientific reports are available on the project website nater.gov.hu. free of charge. These are continuously updated and kept up-to-date. By the end of the EEA Grants project, there were 6,631 users of the portal, of which 190 were registered.
- Schools and universities have full access to the system free of charge. For example, one external beneficiary of the project, the University of Debrecen, reported that it had used the maps generated by NAGiS in teaching modules related to climate change as well as in research and external projects. For example, the data in NAGiS has informed studies related to the modernisation of agricultural watering systems.
- Businesses (including SMEs) have greater access to environmental data. It is particularly beneficial for private companies that carry out environmental impact assessments. When such assessments are carried out on behalf of public sector bodies (e.g. relating to public investment projects), the private company can enjoy free access for a limited time period. Companies can also have access when undertaking environmental impact assessments for other private companies, but in those instances, they must pay a fee. However, it can still prove slow and complicated for businesses to access the system. The project team is therefore working with the Ministry and the Chamber of Commerce to develop a solution.

5.4 Factors influencing results

The key factors influencing the positive results of the selected projects included the following.

Bilateral co-operation: the Czech project included one donor project partner, the International Research Institute (IRI) in Stavanger. Co-operation enabled the Czech partners to gain know-how, experience and knowledge. Two specific courses were organised for the Czech researchers at the Institute focused on risk analysis and on geo-mechanical processes in rocks due to changes in stress/pressures in rock forming the site. The IRI contributed to the project with its vast experience and know-how in 3D dynamic modelling and simulation of the stability of the underground reservoirs and it properties. The bilateral co-operation enabled the Czech team to become more familiar with these techniques and to obtain experience with the new set of techniques implemented and partly developed as new ones during the project.

Supportive national policy context: the selected project (GR03-0009) was one of nine projects within Greece's programme, all of which focused on promoting innovative approaches to increasing the use of renewable energy in public buildings and facilities. Overall, the intention was that the projects would contribute to national targets for the overall share of energy from renewable sources in gross final consumption of energy, as required by the EU's Renewable Energy Directive.[17] In this context, the projects were able to gain high visibility amongst researchers, construction companies and citizens in general. This offers the potential for the new technologies to be replicated more widely.

[17] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

Ongoing funding: the NAGiS project is continuing with €1.2m funding from Hungary's Environmental and Energy Efficiency Operational Programme, which is co-financed by the EU's Cohesion Fund and Regional Development Fund. This additional funding will allow further development of the climate vulnerability assessment methodology and implementation of a climate impact assessment of Hungary's most important economic sectors and critical infrastructure.[18] This development will serve as toolbox to support decision-making by national, regional and local policy-makers based on the improvement of existing databases, methodologies and assessment modules of NAGiS. The University of Debrecen, an external beneficiary of the EEA Grants project, is now involved a partner in this follow-on project. The University is bringing an important user perspective to bear on the further development of NAGiS by developing a user manual and presentation for end-users.

[18] https://nater.mbfsz.gov.hu/en/node/93.

6. Environmental Protection and Management

6.1 Introduction

The priority sector "Environmental Protection and Management" addressed a range of environmental challenges facing the beneficiary states, including the poor status of marine and inland waters in some places (PA01), the loss of biodiversity (PA02), the need for improved compliance with environmental legislation (PA03) and the prevention of injury and adverse environmental effects caused by chemicals and hazardous waste (PA04). Whilst the severity and the precise nature of these challenges varies from country to country, they all have a European dimension; failure to address a problem in one country very often results in adverse effects being experienced in other countries. Very often, activity in these programme areas supported the beneficiary states in their implementation of EU strategies and their compliance with EU legislation.

Nearly 300 projects across 13 of the 16 beneficiary states received €132m of EEA Grants funding within these programme areas, an average of €450,00 per project. Of these, more than one quarter included a donor project partner. Most funds were committed in Poland (€33m) and Romania (€23m), followed by Portugal (€17m), Bulgaria (€13m), the Czech Republic (€12m) and Lithuania (€11m). Nearly half the projects were in just two countries – the Czech Republic and Poland – where the average project cost was €365,000. In contrast, Romania funded projects with an average cost exceeding €850,000.

The programmes considered by the assessment were: BG02, GR02, PL03, PT02 and RO04. Within these programmes, the research focused on 8 projects that had used new technologies to further their objectives. Of these, one each in Bulgaria, Greece, Portugal and Poland, and four in Romania.

Table 6 Environmental Protection and Management projects involving new technologies

Number	Title	Project Grant
BG02-0003	Marine litter, eutrophication and noise assessment tools (MARLEN)	€ 557,958
GR02-0013	Design of an intelligent system for sustainable management of water networks: application to Crete	€ 430,388
PL03-0011	Integrated monitoring system of spatial data to improve air quality in Kraków.	€ 668,229
PT02-0005	Preparation of integrated geographic information for marine and coastal water management (SNIMar)	€1,649,193
RO04-0001	Towards a proper aquatic environment (TPAE)	€2,157,168
RO04-0002	Methodological guide for monitoring antibiotic residues and antimicrobial resistance in the environment as a supporting instrument for an enhanced quality management of surface waters and groundwater	€ 977,601
RO04-0004	Pilot Tools for Reducing Hazardous Substances Resulted from the Arms Industry (INSPIRE)	€1,332,536
RO04-0006	Implementation of an integrated system for acquisition & transmission of monitoring data from hazardous substances in Cluj County (SIM-SCP)	€1,426,220

6.2 New Technologies

A key objective of the Environmental Protection and Management priority has been to improve the monitoring of the quality of different aspects of the environment in order to inform better policy-making and actions to protect the environment and halt loss of biodiversity. In that context, most of the selected projects focused on introducing new technologies to improve environmental monitoring. Examples are as follows.

Technology for monitoring quality of the marine environment: two projects introduced such technology, one in Portugal and one in Bulgaria.

The SNIMar project in Portugal (PT02-0005) sought to improve the collection of data about the marine environment in order to facilitate compliance with the EU's INSPIRE Directive, which aims to ensure that the spatial data infrastructures of the Member States are compatible and usable in a Community and transboundary context.[19] Compliance with the Directive had been hindered by the fact that data was previously collected by different public and private bodies using different methodologies and formats. Thus, the data necessary to understand the environment was not harmonised or accessible via a single system. It therefore developed a Marine Spatial Data Infrastructure (MSDI) database to collate and harmonise marine data spread over institutions and connect the data to geographical information, ensuring better coordination and information sharing. This consisted of the National Marine Information System (SNIMar), a geoportal that centralises information of various entities allowing its sharing, search and access (www.snimar.pt). Access to the portal is free of charge. Given the technical nature of the data, the portal is mostly aimed at researchers and other professionals. However, it features information and resources of interest to the general public and to schools and other educational bodies. A user manual is available to help teachers make use of the educational resources.

In Bulgaria, the MARLEN project (BG02-0003) sought to address the substantial data gaps regarding the Bulgarian part of the Black Sea. It did so through building instruments to assess the status of the marine environment through application of new technologies, innovation and best practice in data collection for marine litter, eutrophication of surface waters and underwater noise. This included pilot developments for finding, classification and assessment of marine litter on the beaches, sea surface and seabed, for regular monitoring of the eutrophication of the surface waters and for monitoring underwater noise. The project provided technology which already existed but which was new to Bulgaria. It included:

- FerryBox mobile oceanographic systems for monitoring the surface waters of the Black Sea installed on 4 vessels;
- Stationary hydrophone systems for passive acoustic monitoring of underwater noise; and
- Unmanned aerial vehicle (drone) with multispectral camera for monitoring marine litter on the sea surface and along the beaches.

Technology for monitoring air quality levels: the project in Kraków (PL03-0011) aimed to facilitate improvements in the collection of data on air quality in order to assist spatial planning and overcome the difficulties of poor air circulation arising from the city's geographical location. New technology was introduced in the form of an automatic meteorological station measuring temperature, humidity, radiation, wind speed and direction. The station collects data into a modern spatial information database, obtained through monitoring, control and measurements made using state-of-the-art technologies to support the spatial planning process.

[19] Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE).

Technology for monitoring quality of surface water and groundwater (RO04-0001): this project sought to enhance the monitoring of surface water and groundwater in order to facilitate compliance with EU Directives on water quality. Previously, the National Administration "'Apele Române" had lacked the necessary technical capacity and analytical methods to monitor compliance with the Directives. To address this problem, the project enabled the acquisition of the Standard methods (ISO, EPA) or customised methods for the compounds that will be analysed, the necessary equipment for analysis and sample preparation and consumables.

Technology for monitoring antibiotics and antimicrobial resistance (AMR) (RO04-0002): this project addressed the problems arising from overuse or misuse of antimicrobial agents (antibiotics) leading to increased level of antimicrobial resistance (AMR) in the environment due to pollution with antibiotics, AMR organisms and antimicrobial resistant genes (ARGs). Part of the project involved developing a methodological protocol for the screenings of surface waters and groundwaters for antibiotic residues and antimicrobial resistance organisms and genes. The methodology was a technical innovation based on international literature in the field of biology and medicine. It was based on: creation of a molecular biology infrastructure focused on AMR surveillance in laboratories; application of state-of-the-art equipment to support methodology development and testing; use of bioinformatics; development, testing and standardisation of methods of monitoring surface waters and groundwaters, based on techniques for clinical investigation.

Technology for monitoring hazardous substances in the ground (RO04-0004): the INSPIRE project aimed to reduce the prevalence of hazardous substances in the environment, particularly those resulting from the production of armaments. It addressed problems arising from potentially explosive compounds entering the environment (e.g. through wastewater generated in the production process), through storage or use and thus producing soil, surface water or groundwater contamination. To do this, the project developed new technology in the form of: a methodology for analysing hazardous substances arising from the exploitation and decomposition of explosive materials and risk maps regarding contaminated areas; and a database of information hazardous chemicals.

Technology for monitoring hazardous substances in the air: the SIM-SCP project (RO04-0006) developed an integrated system for collecting and transmitting data on hazardous substances present in the air. It featured the development of wireless sensors using energy harvesting (photovoltaic) techniques. One of the project partners, Control Data Systems SRL (CDS), a technology company started the development of wireless sensors using energy harvesting (photovoltaic) techniques. The combination of open standard (ISA100 and WirelessHART) wireless sensors with energy harvesting techniques is novel in the industrial market and CDS is the first company in the world to use solar energy to power ISA100 sensors. CDS developed a back-end system for data storage and presentation that will be re-used in Industry 4.0 related applications.

Smart water technology: one project in Crete, Greece (GR02-0013) aimed to improve management of inland water resources and thus ensure water quality, meet water demand, minimise water resources losses and reduce operating costs. New technology was introduced in the form of a smart management system based on the detailed geographical and technical topology of the island's water network. The system includes monitoring and control software, a network of sensors and their associated communication structure and appropriate devices to control the network (valves, inverters, etc.). Part of the software can be used as a design tool, since it models the entire hydraulic network on a geographic information system (GIS) infrastructure. The technologies integrate operation software, monitoring network, control elements and decision support systems to form a "smart" water network. This network minimises leakages by regulating pressures and by direct leak detection methods while minimising energy consumption through intelligent control of the pumping stations. Furthermore, the system monitors quality and quantity of water supply and can regulate the distribution of water.

6.3 Effects

The main effects of the selected projects have been as follows.

Improved collection and analysis of data on environmental quality leading to more effective environmental management: this has been the most significant effect of the projects. In several cases, this has facilitated compliance with EU Directives relating to environmental protection and management. Data includes the following:

- **Data on quality of the marine environment**: technology provided by the MARLEN project (BG02-0003) has contributed to improvements of the marine environment by filling data gaps. The establishment of a modern monitoring system helped the Institute for Oceanology and the other partners (e.g. Municipality of Burgas, Basin Directorate for Water Management in the Black Sea Region - Varna) to reactivate their activities and comply with obligations to provide and analyse data and information about the marine environment, in line with the requirements of the EU's Marine Strategy Framework Directive.[20] Similarly, the SNIMar project in Portugal has improved the consistency and accessibility of data on the marine environment. By the end of the project, 2,113 metadata and 283 services were available in the geoportal and more than 5,000 marine historical records were recovered. Metadata sets belonging to nine different bodies had been synchronised within the portal and nearly 3,000 web products were being downloaded each month.
- **Data on air quality**: data collected by the Polish project (PL03-0011) has informed the City of Krakow in its urban planning and efforts to reduce pollution, whilst also increasing the awareness of the population regarding air quality.
- **Data on water quality**: the enhanced data collection and analysis capability provided by the new technology within this project has facilitated Romania's compliance with the relevant EU Directives regarding the monitoring of surface water and groundwater.
- **Data on antibiotics and antimicrobial resistance (AMR)**: the new technology and methodologies developed by the project (RO14-002) have enabled the collection and analysis of thousands of samples from surface water and groundwater, providing information on the antibiotic residues and antimicrobial resistance in Cluj area. This knowledge base is informing the actions of numerous bodies, including universities, hospitals, health institutes, laboratories, health authorities and veterinary authorities.
- **Data on hazardous substances in the ground**: the INSPIRE project (RO04-0004) enabled the identification and quantification of hazardous substances in the soil and water samples analysed. This will allow action to be taken to mitigate or even eradicate negative effects on the environment and the health of the population. Similarly, the development of risk maps allows the application of technologies / methods of biodegradation of hazardous substances in contaminated areas leading to the reduction / elimination of these dangerous substances. The methodological tools developed are being used by other institutions with responsibilities in the field of waste management (e.g. National Agency for the Environment, Romanian Waters, armament industry bodies). These institutions are then providing information to local public authorities on the types and quantities of hazardous substances resulting from ammunition exploitation and the decomposition of explosive materials, from adjacent areas to armaments, ammunition depots, shooting polygons and land containing unexploded munitions.
- **Data on hazardous substances in the air**: data collected by the SIM-SCP project (RO04-0006) has created a platform for future projects to monitor these levels in other areas of Romania or add

[20] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy.

other things to measure. In the case of the sensing technology, the main criteria for selection was the EU legislation relating to measuring the hazardous substance and the new technology has helped to meet mandatory requirements. The databases storing the data from the monitoring of dangerous chemicals can be accessed by representatives of public institutions as well as the general public. The system allows real-time alerting of all authorities involved in environmental management to make decisions such as reducing traffic to protect health and the environment.

Effective management of clean water resources has been enabled by technology introduced by the project in Crete. Through the introduction of the smart water management systems, simulations have shown that energy consumption will be reduced by 15% and leakages by 30%.

Commercialisation of new technologies: has not been widely undertaken, as this did not feature prominently in the overall aims of the programmes. One exception was the SIM-SCP project, which has taken steps to commercialise the Wireless Temperature and Humidity Sensor. The private sector partners has started the exploration of a new market niche in the domain of Wireless Sensor Networks for the pharma and electronic manufacturing industries. The first product to serve this niche, a temperature and humidity sensor targeted at the pharma industry will be launched in 2019 and will be sold in cooperation with an electrical engineering and software company.

6.4 Factors influencing results

On the basis of the projects studied within this priority sector, a number of factors were identified that influenced the development, application and exploitation of new technology.

Bilateral co-operation: of the 8 selected projects, 4 had included a donor project partner. In all four cases, the bilateral co-operation had been a positive factor influencing the results arising from the development and application of new technology.

- RO4-0001: The most beneficial result of bilateral co-operation was the knowledge and technology transfer carried out within the project during the training course on laboratory practice for Priority Substances analysis. The training process involved a learning stage, a training stage, allowing the Romanian specialist to apply the new techniques learned and a checking stage in order to ensure best quality learning of the analytical methods for screening for priority substances in surface water and groundwater. For the most dangerous substances testing was performed by the Norwegian laboratories, ensuring technological transfer afterwards to the National Administration “Apele Române”.
- RO4-0002: Knowledge transfer was possible through the training carried out in Norway and in Romania by Norwegian experts in the field of genomic and metagenomic studies. This was particularly valuable given the novelty of bioinformatics in Romania and the innovative character of the project.
- RO04-0006: The expertise and contribution of SINTEF (an independent research organisation in Norway) during the training sessions resulted in valuable insights regarding the choice of hazardous chemical monitoring equipment, data collection and transmission equipment, methods of analysis and how to implement the entire integrated system. A delegation of 5 people (3 from Environmental Protection Agency Cluj, 1 from TUCN and 1 from CDS) participated in the training program in Oslo, Norway, regarding the installation and testing of the radio and network specific measuring and testing equipment. The interaction with SINTEF helped educate personnel of the private sector partner about gas sensing and environmental monitoring. This newly acquired knowledge combined with the existing expertise in Wireless Sensor Networks has helped to broaden the approach to commercialisation and the search for new partnerships. The Norwegian partner brought expertise in sensing technology and undertook research regarding selecting the equipment to meet legal and project requirements.

- PT02-0005: the Norwegian Mapping Authority and the National Land Survey of Iceland provided training and consulting, including four training sessions in Portugal. The SNIMar project team also visited the donor states for technical meetings. In December 2014, several Norwegian public institutions that work on Spatial Data Infrastructures (SDI) were visited, and in June 2016 a project presentation was held for marine-related Icelandic institutions. This provided necessary expertise in using the open source technology, which would otherwise have been much more challenging.

Provision of training related to new technologies: training provided by donor project partners has been a key factor in generating positive effects, as just described. Other training has also proved important. For example, the TPAE project (RO4-0001) provided a training course on laboratory practice for Priority Substances analysis – on samples from different matrixes (water, sediment and biota) aiming at updated the knowledge of Romanian specialist on sampling, treatment and analysis for the new priority substances. The training included topics on the sample treatment of biota samples (mainly fish) and water samples, including the optimal preparation scheme that includes the extraction and cleaning procedures of the crude extracts to selective separation of the main analytes from the various biota samples (liver, muscle tissue) and the removal of the major interferences in case of organic micropollutants analysis (proteins, fats etc.).

Sustainability of funding: in most of the selected projects, the new technology was adopted and sustained by the project partners, offering the potential for long-term benefits and cost savings. However, continued funding can prove a challenge to sustaining new technologies. In the case of the SIM-SCP project (RO04-0006), the ongoing operation of the system is hampered by a lack of funding for consumables, such as filters that require to be replaced at intervals.

Focus of programmes: in many or most programmes in this priority sector, it was not the primary aim to develop, exploit and commercialise new technology and many projects have therefore not done so.

7. Conclusions and Recommendations

7.1 Conclusions

This section presents the conclusions of the rapid assessment based on the results described in sections 2 to 6. The conclusions address the three main questions considered by the assessment.

What have been the most significant effects of the development, commercialisation and application of technologies?

1. **The EEA and Norway Grants have effectively supported the development, application, exploitation and commercialisation of a diversity of new technologies**. These include new technologies to sort or recycle waste, reduce emissions or monitor energy consumption, new technology for generating or using renewable energy, new technologies for carbon capture and storage, technology for monitoring the quality of the environment, and medical diagnostic and therapeutic equipment.

2. **A wide range of end beneficiaries, including policymakers and citizens, have been served by new technologies developed or applied by projects**. Policymakers and decision-makers have better access to data, e.g. regarding the state of the environment or the potential to use renewable energy sources. Users of new technologies are enjoying cost savings, including through reductions in energy costs or due to earlier and better diagnosis of diseases. Citizens are gaining benefits, such as lower energy costs, more reliable and lower cost provision of clean water and better access to healthcare services. Such users have mostly consisted of public sector bodies or universities and research organisations. SMEs and other companies have benefitted from increased competitiveness as a result of developing and exploiting green industry innovations, where new technologies developed have opened up entire new markets for the project promoters and partners. Some businesses have also benefitted from participation in Research programmes, but they are relatively few in number.

3. **New technologies are generating a diversity of quantified environmental benefits**, such as reduced CO_2 emissions, better air quality, better water quality and less contamination.

4. **New technologies are improving the provision of healthcare services**. In most cases, this involves the application of existing technologies in new contexts. In this way, the Grants are addressing problems of poor healthcare provision due to outdated or inadequate equipment and poor access for certain communities (e.g. Roma), for those living in certain areas (e.g. rural) or those requiring care at home.

5. **Patent applications have been submitted by some projects**. This has particularly been the case within the Environmental and climate change-related research and technology programme area (PA09) and amongst Green Industry Innovation projects (PA21) focussing on energy innovation and energy efficiency in buildings, greening business operations. In contrast, some of the programme areas do not particularly lend themselves to the development of new technologies that area suitable to patent applications. Indeed, the experience of the selected projects suggested that the development of patent applications depends very much on the type of research undertaken. Different stakeholders (DPPs, POs, project promoters) reported that some project promoters or partners do not have either the resources or the technical skills or sufficient time within the life of the project to file patents and so this might not be a suitable metric to track the development and commercialisation of new technologies. Moreover, some promoters see more value in other ways of protecting their intellectual property (such as non-disclosure agreements) than in securing a patent.

How sustainable are the new technologies, once grant funding ended?

6. **The maintenance and continued operation of equipment can prove challenging when sustained funding is not available**. New equipment is often owned and operated by the project promoter, which can offer costs savings in some cases (e.g. due to lower energy bills). But in other cases, such as some public health projects, additional costs are incurred beyond the life of projects in terms of operating and maintaining new equipment. Similarly, in the Environmental Protection and Management priority sector, the maintenance of new technologies was a particular issue, since some of the monitoring equipment used for managing and protecting environments is expensive to maintain. In contrast, some public health projects in Bulgaria have benefitted from an overall increase in national funding for public health programmes with priority given to investments in new technologies. In other cases, projects are developing their activities (and thus sustaining their new technologies) with EU funding from the Cohesion Fund and Regional Development Fund or Horizon 2020.

Which unintended impacts (positive or negative) did the programmes contribute to?

7. **Most of the positive impacts were intended rather than unintended, since the programme objectives and expected outcomes are quite broad**. The research identified few instances of negative impacts per se, except that in some projects, more action is needed to apply or commercialise the technologies developed. Whilst some technology allows cost savings to be made, in other cases, additional costs are incurred beyond the life of projects in terms of operating and maintaining new equipment.

What were the major factors influencing the achievement or non-achievement of the results? How could the negative factors be avoided in the future?

8. **Bilateral co-operation can play a crucial role in development, application and commercialisation of new technologies**. The projects that involved a donor project partner consistently reported the benefits of such co-operation. In many cases, this has gone far beyond merely exchange of experience and study visits (although those have been useful). Many donor project partners have brought high level technical expertise and experience to bear on projects, which has enabled projects to develop new technologies that would not otherwise have been possible. In some cases, the co-operation has specifically involved technology transfer, whereas in others it has involved the provision of specialist training.

9. **Some important developments require further action if the full potential of the technology is to be exploited**. Particularly in the field of Research and Scholarships, many projects in the 2009-14 programmes undertook basic research. This has paved the way for more applied, and therefore more commercialised research to be undertaken in the 2014-2021 grant round - so some of the new technologies developed as a result of these projects have not yet been fully exploited. There is a need for a solid base of basic research before doing applied research to develop new technologies. Encouragingly, some technologies have been carried forward into projects supported by the current EEA and Norway Grants period or Horizon 2020.

10. **National, legal and regulatory contexts can be crucial to the success of projects involving new technologies**, particularly in respect of commercialisation of new technologies and submission of patent applications. This is the case for innovation in general (not only within the EEA/Norway Grants), where the legislative and institutional context may favour actors with existing technology and there may be a need for reform if new technologies are to be diffused more widely. For example, some Green Industry Innovation projects ran into issues

with the legal and regulatory framework of their host countries, with some reporting that problems were compounded by frequent or unexpected changes to those frameworks. One DPP also reported that some project promoters or partners, particularly SMEs, can lack the necessary expertise in dealing with the national regulatory framework, which could perhaps be addressed in the current programme.

11. **Development and exploitation of new technologies is generally most effective when it forms part of a wider national strategy**. In such an environment, projects are more likely to secure long-term funding to operate and maintain new technologies. They can also gain from a higher profile with sector stakeholders and the general public. Being part of a national strategy also offers more potential for new technologies to be adopted more widely, once tested through a project supported by the EEA and Norway Grants. For instance, the health projects had more guidance about the medical equipment to acquire if this was laid out in the national strategy. In this way, **new technologies can support the achievement of national policy objectives**, including those related to compliance with EU directives, such as those relating to renewable energy or the quality of the environment.

12. **Development of new technologies is most effective when supported by a wider set of complementary activities**. In many cases, such the development of technology has been accompanied by training, modernisation of facilities or information campaigns. In particular, the provision of training for staff to use new technologies seems especially important if technology is to be used beyond the life of the project. Similarly, in the area of public health, the mere purchase of new equipment would not have been sufficient if such equipment was then installed in outdated or decrepit facilities.

7.2 Recommendations

1. **The development, commercialisation and application of technologies should be promoted in the context of wider national strategies** rather than as "isolated" activities. Consideration should be given as to how to gain support for the programmes and projects from a wider set of national stakeholders, e.g. national ministries or regulatory bodies. Where the national legal and regulatory context proves unsupportive of the development and exploitation of new technologies (particularly commercialisation), the POs/FOs (perhaps supported by the FMO) should seek to engage the relevant public authorities in their countries to explore whether solutions are possible and/or how to support projects. The aim would be to create a more supportive policy and regulatory context in which new technologies can be developed and commercialised. An important benefit of such an approach would be to increase the possibilities for projects to have ongoing funding to sustain their new technologies beyond the period of funding from the Grants.

2. **The FMO and POs should consider dedicated calls for applications related to the development, commercialisation and application of technology that cover several priority sectors.** Where the commercialisation of new technologies is a specific programme aim, it should perhaps be compulsory for applicants to include a private company in the project. This would ensure that a larger number of projects specifically pursue such an objective and would facilitate the provision of advice, support, networking opportunities, etc. In the 2014-21 period, this could cover the programme areas of "Business development, Innovation and SMEs" and "Research" and the three areas within "Environment, Energy, Climate Change and Low Carbon Economy".

3. **The sustainability of new technologies could be enhanced by dedicated calls for applications from projects that have made progress in developing new technologies (including, but not only, through basic research) but not yet realised the full benefits of applying such**

technologies. The rationale for such funding is that the standard 3-year length of projects is not always sufficient to allow research to be completed and results to be exploited. Moreover, this final stage typically requires a different form of support or different partners, such as scientific organisations in the donor states with experience in commercialising the results of research. Such funding could incentivise projects to go one step further, for example, through working with a new partner, e.g. from industry or preparing patent applications.

4. **Bilateral co-operation should (continue to) be prioritised in programmes and calls that focus on the development and exploitation of new technologies**. This is particularly the case within the Research and Scholarships, Environmental Protection and Management, and Climate Change and Renewable Energy priority sectors, where donor project partners often have substantial expertise and the most up-to-date equipment.

5. **In relevant programmes, Programme/Fund Operators should inform projects (via workshops, publications, etc.) about the possibilities and practicalities of submitting patent applications and systematically collect information about applications submitted.** The collection of such information can then inform dissemination activities (regarding the effects of programmes) and guidance given to future projects.

6. **Within the priority sector of Research and Scholarship, there is a need for projects to have the necessary competence to deal with a patent application and know about possible support schemes, e.g. start-up incubators**. One possibility would be to prioritise such competence in the scoring system applied to project applications.

7. **Within Public Health, there should (continue to) be recognition that improved prevention and reduced inequalities in health will primarily require the application of existing technologies in new contexts** (particularly those that have suffered from outdated equipment or poor access) rather than the development of entirely new technologies per se. A priority will be to ensure sustained funding for the continued use of new technologies.

8. **Within Environment, Energy and Climate Change, there may be a need to give a more explicit focus to the development and exploitation of new technologies**, since this was not the primary aim of many programmes in the 2009-14 period. Again, a priority will be to ensure sustained funding so that the full benefits can be exploited in the long-term, for example, by ensuring that programmes take place in the context of wider national strategies.

Annexes

I) Terms of Reference

Background and context

The EEA and Norway Grants represent the contribution of Iceland, Liechtenstein and Norway to:

- reducing economic and social disparities in Europe; and
- strengthening bilateral relations between the Donor States and the Beneficiary States.

For the period 2009-2014, €1.798 billion was set aside. Funding for the 2009-2014 financial period was channelled through 148 programmes in 16 beneficiary countries in Central and Southern Europe and the Baltics.

Each beneficiary country agreed on a set of programmes with the donor countries, based on national needs and priorities and the scope for cooperation. These agreements were formalised in Memoranda of Understanding with each beneficiary state[21]. Grants were made available for non-governmental organisations, research and academic institutions and public and private sector bodies through (mainly) open calls and small grants schemes.[22]

In the 2009-2014 period, programmes were placed under one of the nine priority sectors:

- Environmental protection and management
- Climate change and renewable energy
- Carbon capture and storage
- Green industry innovation
- Civil Society
- Human and social development
- Protecting cultural heritage
- Research and scholarship
- Justice and home affairs

The sectors were further subdivided into 32 programme areas[23]. In a number of Programme Areas, the development, commercialisation or application of new technologies was supported. This includes in particular programmes focusing on Green Industry Innovation, Blue growth, Research, Health, Environment, Climate Change and Renewable Energy.

Purpose of the assessment

This assessment is summative in nature. Its objectives are to:

- Document and assess the direct and indirect impacts of the development, commercialisation and application of new technologies[24] funded by EEA and Norway Grants;

[21] http://eeagrants.org/Results-data/Results-overview/Documents/Legal-documents.
[22] In addition, some projects were pre-defined in various Programme Agreements
[23] https://eeagrants.org/Results-data/Documents/Publications/Brochures/Programme-Areas-2009-2014-brochure
[24] New technologies in this rapid assessment may include those technologies developed from scratch, or technologies newly applied in a particular context e.g. 'first time this is used in country X'.

- Identify the main groups of beneficiaries (direct and indirect) of the new technologies which were developed, commercialised or otherwise applied by the supported programmes/projects.
- Provide recommendations for improving the effectiveness of Grant support for new technologies in the FM14-21, in particular for those programmes where technology development/commercialisation will be supported.

Scope

The review will focus on up to 32 programmes which supported new technologies, drawn from the following Programme Areas: Green Industry Innovation (which includes blue growth, may include prototypes, development of apps, development of new materials), Research (including practical application of new technologies such as medical related technologies, environmental related technologies, or development of new materials such as new plastics), Health (including new equipment applications), Environment and Climate Change, Renewable Energy, Energy Efficiency.

These 5 focus countries shall be included: Bulgaria, Czech Republic, Hungary, Poland, Romania.[25]

In addition, selected projects/programmes from any of the following countries may be included: Estonia, Greece, Latvia, Lithuania, Portugal, Slovakia, Spain.

The set of projects from all the countries/programmes listed above is provided in the attachments to this ToR but will need to be reviewed by the appointed consultants at the inception stage to agree on a final sample. The more detailed programme and country scope is set out in Table 1, also showing programmes where there are 3 or less projects for review.

[25] These countries are chosen as focus countries since they have the greatest concentration of projects relating to new technologies.

Table 1: Candidate programmes for inclusion in this Rapid Assessment. Not all projects in each programme are to be reviewed.

Programme Area	PA01 Integrated marine and inland water management	PA03 Environmental monitoring	PA04 Reduction of hazardous substances	PA07 Adaptation to climate change	PA20 Carbon capture and storage	PA05 Energy efficiency	PA06 Renewable energy	PA13 Public health initiatives (EEA Grants)	PA27 Public health initiatives (Norway Grants)	PA18 Research within Priority Sectors	PA23 Bilateral research cooperation	PA21 Green Industry Innovation	Total
Bulgaria	**BG02**					**BG04** <3 projects	**BG04** <3 projects		**BG07**			**BG10**	**4**
Czech Republic					**CZ08** <3 projects				**CZ11**		**CZ09**		**3**
Estonia											**EE06** <3 projects	**EE07**	**2**
Greece	**GR02**						**GR03**						**2**
Hungary				**HU04** <3 projects		**HU02** <3 projects	**HU02** <3 projects					**HU09**	**3**
Latvia							**LV02** <3 projects					**LV06**	**2**
Lithuania									**LT11** <3 projects			**LT09**	**2**
Poland		**PL03** <3 projects						**PL07**	**PL07**		**PL12**	**PL18**	**4**
Portugal	**PT02**			**PT04** <3 projects			**PT02** <3 projects						**2**
Romania			**RO04**				**RO06** <3 projects		**RO19**	**RO14**		**RO17**	**5**
Slovakia				**SK02** <3 projects								**SK07** <3 projects	**2**
Spain												**ES02**	**1**
Total	**3**	**1**	**1**	**3**	**1**	**2**	**6**	**1**	**4**	**1**	**3**	**9**	**32**

Assessment criteria and questions

This review will assess the effectiveness and impact of selected programmes funded by EEA and Norway Grants.

The following questions shall guide the rapid assessment:

1. What are the most significant effects of the development, commercialisation and application of new technologies, in the selected Programme Areas and focus countries? How sustainable are the new technologies supported, once grant funding ended?[26] Identify the effects on direct beneficiaries (which may be SMEs or large enterprises in the case of support to Green Industry Innovation), and where possible, the indirect beneficiaries. In the case of Energy programmes, indirect beneficiaries may be the population of a town or municipality.
2. Which unintended impacts[27] (positive or negative) did the programmes contribute to?
3. What were the major factors influencing the achievement or non-achievement of the results? How could the negative factors be avoided in the future?

For Green Industry Innovation and Research programmes, including Blue Growth which will be a focus:

4. To what extent has the new technology developed with EEA and Norway Grants support been commercialised (e.g. after the end of project funding, or once a patent application was granted)?
5. What were the effects of technology development, application or commercialisation on the competitiveness of the supported enterprises?
6. What were the effects of direct collaboration between research organisations and business entities as regards the development of new technology?
7. In cases where a patent application was made – often as a direct result of the Grant funded project - what was the outcome of the application? Who has benefited directly, and indirectly?

For Health programmes key topics may include: neo-natal technologies, mental illness treatments, cancer treatments, children and youth. Where the purchase of new equipment or technology was financed, analyse the following issues regarding use and sustainability:

8. Where is the equipment installed (e.g. mobile unit, national/local medical centre)?
9. Who now has budgetary responsibility for maintaining this equipment?
10. What is the function of the new equipment?
11. Who was trained in using the equipment?
12. Who are the end beneficiaries? [28]
13. What are the observed long-term effects of this equipment (e.g. ability to provide improved services)?

[26] OECD DAC criteria on sustainability https://www.oecd.org/dac/evaluation/49756382.pdf
[27] **Impact** is an effect of a programme on societal or environmental trends/development.
[28] End Beneficiaries are defined in the Results Guideline as those individuals or groups expected to reap tangible benefits from an intervention. https://eeagrants.org/Results-data/Documents/Legal-documents/Guidelines-mandates-and-strategy/EEA-and-Norway-Grants-2014-2021/Results-Guideline2

For programmes with significant Bilateral cooperation (Research and Green Industry Innovation)[29]

14. What contribution did bilateral cooperation make to (successful) commercialisation of new technologies?
15. What contribution did bilateral cooperation make to achieving longer term (positive) effects from the development, commercialisation or application of new technologies? Did supported projects receive funding from the EU/other sources for further commercialisation or application of results?
16. Did bilateral co-operation help to reach additional beneficiaries?

Methodology

- The rapid assessment will include a short desk review of available documentation, including some Final Programme Reports and a larger number of completed project level information reports (CPLIs). The CPLIs generally contain 1 or 2 short paragraphs on results. The CPLI text is already provided in the attachments to this ToR.
- Interviews/survey with selected Programme/Fund Operators and with project promoters will be needed, to follow up on project results and longer-term effects – including those effects which may not have been captured by the end of the programme period, e.g. where a patent application was submitted but not determined by the end of the programme period.
- Interviews with final beneficiaries may also be required, especially for the project stories. The estimated number of final project stories required for publication is 10-15 in total.

We expect the overall project sample size for review to be around 150-200 projects. The criteria for arriving at an agreed project selection list to be agreed with the FMO, and may take into account: project grant size, project outstanding achievements, geographical distribution, thematic alignment with Communications campaigns, involvement of donor project partners.

An initial selection of projects from the available project lists in the attachments to this ToR should be made as follows:

1. Projects from one of the programmes mentioned in the Terms of Reference Table 1.
2. Projects specifically highlighted in the text of relevant Final Programme Reports as good examples of 'new technology', 'innovative technology' or 'new to the country technology'.
3. Project ticked as Best Practice in the Doris Report 41.
4. Project with yellow highlights in the FMO pre-selection list.
5. Projects with a project website/contact details are available.

Available documentation

The following (attached or linked) documents are examples of information available for this assessment:

- Example Final Programme Reports (attached)
- Doris Report 41 (project list, showing projects marked as good practice)
- FMO pre-selection of projects (showing projects highlighted of interest)
- EEA and Norway grants project portal: https://eeagrants.org/project-portal

[29] Significant bilateral cooperation in this context means those programmes with a high share of projects with a donor partner, and/or programmes that were specifically focused on bilateral cooperation e.g. Bilateral Research.

Deliverables and Timeline*

The deliverables consist of the following:

Kick-off meeting in Brussels to discuss the work plan, methodology and deliverables.

Inception Report not exceeding 10 pages, to be delivered 2 weeks after the kick-off meeting (likely May 2019). The draft inception report shall contain a proposal for the final programme, country and project sample to be reviewed, a description of assessment methods and plans, any data quality issues and the planned structure of the Final Report and project stories.

First draft final report in July 2019. The FMO and the donors shall have the opportunity to make comments and corrections to the draft. Some subsequent drafts may be needed. The review shall illustrate the main findings and conclusions with country/programme/project examples.

The Final Report not exceeding 30 pages, excluding annexes, to be delivered by end-July 2019. The report shall include a short Executive Summary and a communication-friendly brief which can be used as stand-alone document.

The date of delivery for the project stories to be confirmed.

Additional deliverables

Annex with an agreed number of high-quality project stories, for external communication purposes, illustrating key achievements and including longer-term effects. Maximum 1 page per project story, each story to contain at least one image or photo and preferably a quote. Project stories will need to align with key communication themes related to 25 years of the EEA and Norway Grants, and also to represent both EEA and Norway funded projects Estimated 10-15 project stories in total. Further information on the presentation of the project stories will be given to appointed consultants.

Public presentation of the findings in Brussels (optional).

All written deliverables (drafts and final reports) shall be proofread for spelling, grammar and style prior to being submitted to the FMO.

** the timeline is approximate and subject to change*

Budget

The maximum budget for the rapid assessment is **€50,000**, excluding VAT. The expected maximum duration of the work is 4 months, commencing in April/May 2019.

Team

The team shall include some national consultants who should be able to carry out fieldwork in more than one sector, and possibly in more than one country. The following skills and competencies are expected of the team:

- Expertise in the relevant technology sectors a strong advantage
- Strong data analysis skills;
- Ability to draft communications friendly material
- Experience of field work such as interviewing beneficiaries;
- Excellent written and oral proficiency in English;
- Team leader: A strong record in carrying out impact evaluations or ex-post evaluations;

- Knowledge of EEA and Norway Grants, in particular the key sectors and focus countries, is an advantage.

For each team member, please attach signed declarations stating there is no conflict of interest for this assignment.

FMO Contact persons

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Annexes

Annex 1: Extract from DORIS Report 41 – full list of projects for programmes included in this Rapid Assessment. Please note whether the project is considered as Best Practice by the Fund Operator/Programme Operator.

Annex 2: FMO pre-selection of projects – for programmes included in this Rapid Assessment. Please note whether the project is considered as of special interest by the FMO. The added highlights show the projects which will be of interest to this Rapid Assessment, with deep yellow highlights being the most relevant. Pale yellow are of secondary interest, pale pink are projects which may be relevant but are all very similar. Red highlight means the project has already been included in another rapid assessment.

Annexes 3-7: Selected approved Final Programme Reports. Please note the relevant sections of these reports are the Executive Summary, Sections 2 (programme area developments), 3 (outputs), 4.1 (outcomes), 5.1 (bilateral outcomes), 6 (sustainability), 7.2 (project implementation), 11 (information and publicity, especially project websites.