WHAT'S ON THE HORIZON

FOR UK SCIENCE, RESEARCH & INNOVATION?

THE IMPACT OF EU FUNDING ON UK RESEARCH AND ITS CRUCIAL ROLE IN SOLVING SOCIETY'S GREATEST CHALLENGES, FROM THE CLIMATE EMERGENCY TO LIFE-SAVING HEALTHCARE

€6 BILLION ALLOCATED TO UK RESEARCH UNDER EU HORIZON 2020

13,400 ORGANISATIONS BENEFITTED TO DATE, INCLUDING

2,400 SMALL AND MEDIUM ENTERPRISES, ACROSS

600 PARTICIPATING TOWNS AND CITIES

THE GREENS/EFA in the European Parliament

Green Party for the common good

European Greens

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Foreword by Gina Dowding, MEP

As Green Party MEP for the North West, I was honoured to be appointed Shadow Rapporteur in the European Parliament for Horizon Europe, the EU's next flagship research and innovation (R&I) programme that will have a budget of around £100 billion. For the last seven months, I have represented the European Greens/EFA group in cross-party negotiations to shape the details of the programme and what it should fund.

The role of R&I in society has never been more important – it is crucial to dealing with global challenges such as the climate emergency, digital disruption, the biodiversity crisis, public health and social inequality.

All disciplines of science, including the humanities, are key to unlocking remedies to deal with these complex challenges, not as mere technical fixes but helping to re-design and transform society for the 21st century and beyond.

In October 2019 I launched the Green New Deal in the North West report, which sets out how we can transform our broken economic, environmental and social systems while simultaneously averting the climate crisis and creating thousands of future fit jobs in our region. The report addresses vital changes needed in energy generation, industry, land use, buildings and transport. R&I will underpin much of the success in these areas.

This brief report now aims to emphasise the importance of future research funding to meet those global, regional and local challenges, highlighting the huge range of projects already underway in the UK through the existing Horizon 2020 scheme; and highlighting the risks Brexit poses by severing or attenuating our links with Horizon Europe.

My priority in the European Parliament has been to ensure that the EU adheres to its commitment to spend at least 35% of the Horizon Europe budget on climate-related research. In the context of Brexit, we now need UK politicians to advocate for, and safeguard, the UK's access to EU research funding and all the benefits that come with it. R&I is one of the areas where the UK received more from Europe than it put in. Between 2007 and 2013, the UK paid €5.4 billion into the EU's R&I budget, and received €8.8 billion in return. Since 2014, thousands of UK organisations have benefitted from €6 billion of investment thanks to Horizon 2020. Breakthroughs in revolutionary materials, cancer treatments, eco fuels and more have further cemented the UK's global reputation as a world-leader in science, but Brexit puts all this at risk.

Although the UK government is exploring alternatives, it is clear that funding alone is not enough. Science is a distinctly international activity. Participation in Horizon offers unique opportunities for the mobility of our researchers, for collaboration and access to data, all while using a common language. These are just some of the reasons that make Horizon the envy of the world.

GINA DOWDING MEP
January 2020

ABOUT GINA

Gina was elected as the Green Party MEP for the North West of England in May 2019, and served as a member of the European Parliament committees on Industry, Research and Energy (ITRE), Transport and Tourism (TRAN) and Foreign Affairs (AFET). Her priority interests are climate action, research, sustainable and active travel, and the Israel-Palestine conflict.

Introduction

Horizon 2020 is Europe's largest research and innovation (R&I) programme. With a total budget of €80 billion, the programme has so far provided over 25,000 grants to more than 120,000 participating organisations across Europe and beyond.

The current framework ends in 2020 and its highly anticipated successor, Horizon Europe, is currently being negotiated by EU lawmakers. Horizon Europe will run from 2021-2027 with a budget of around €90-120 billion, depending on the outcome of the negotiations in the EU budgeting process. It aims to encourage promising ideas, enable new technologies and innovations to mature, and move projects from the laboratory to the market to benefit society as a whole.

The resources available to participants are not just limited to funding, but include access to collaborators, standardisation of research and mutual support. With a big emphasis on universities and small and medium-sized enterprises (SMEs), Horizon projects bring together different fields of science and the business community to find real solutions to societal challenges – from ageing populations to the need for clean energy and sustainable agriculture, all the while maintaining European jobs and industrial competitiveness in a fast evolving global economy.

In the last European Parliamentary term 2014-2019, the Greens achieved a binding commitment for at least 35% of the total Horizon Europe budget to be allocated to mainstreaming climate-related research. The Greens' ambitions are now to ensure that all pillars of the Horizon Europe programme maximise their climate contributions, and to help to define what amounts to climate-relevant and climate-directed research. The Panel for the Future of Science and Technology (STOA), a parliamentary body that brings together MEPs from different committees and offers policy advice, has been invited to help provide assistance to meet this aim.

Horizon Europe will run from 2021–2027 with a budget of €90–120 billion

PILLAR I: OPEN SCIENCE

- **Supports frontier projects driven by researchers, via the European Research Council (ERC)**
- **Funds fellowships and exchanges for researchers (Marie Skłodowska-Curie Actions)**
- **Invests in world-class research infrastructure**

PILLAR II: GLOBAL CHALLENGES AND INDUSTRIAL COMPETITIVENESS

Supports research on society's biggest challenges:

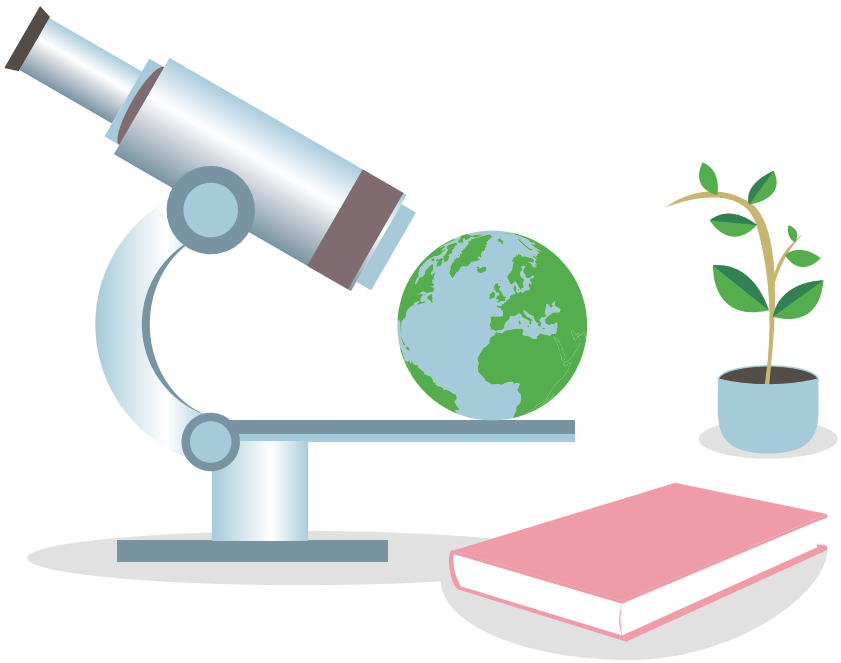
- **Health**
- **Culture, Creativity and Inclusive Society**
- **Civil Security for Society**
- **Digital, Industry and Space**
- **Climate, Energy and Mobility**
- **Food, Bio-economy, Natural Resources, Agriculture and Environment**

PILLAR III: OPEN INNOVATION

- **Aims to make Europe a frontrunner in innovation, via the European Innovation Council**
- **Fosters the integration of business, research, education and entrepreneurship, via the European Institute of Innovation and Technology (EIT)**

Horizon 2020

€80 billion over 2014–2020



PILLAR I: EXCELLENT SCIENCE

- Frontier and collaborative research to open up new fields
- Opportunities for training and career development
- Ensuring access to world-class facilities

PILLAR II: SOCIETAL CHALLENGES

- Health & wellbeing
- Food security & the bioeconomy
- Secure, clean & efficient energy
- Smart, clean, integrated transport
- Climate action & environment
- Inclusive, innovative & reflective societies
- Secure societies

PILLAR III: INDUSTRIAL LEADERSHIP

- Leadership in enabling & industrial technologies
- Leveraging finance for research & innovation
- Fostering innovation in small and medium enterprises (SMEs)

SETTING THE STANDARD

Horizon has been a success thanks to its attractiveness and accessibility. Over half of applicants are newcomers, the share of funding awarded to SMEs has surpassed a target of 20%, and according to independent evaluators the vast majority of funding proposals are of high quality.

7 BENEFITS OF PARTICIPATION

1. **Simple and efficient application process**
2. **Collaboration on large scale with multiple partners**
3. **Maximised competition for funding**
4. **A single set of rules**
5. **Seven-year funding security**
6. **Access to large research pots**
7. **Shared implementation**

65%
of projects are **sustainability** related

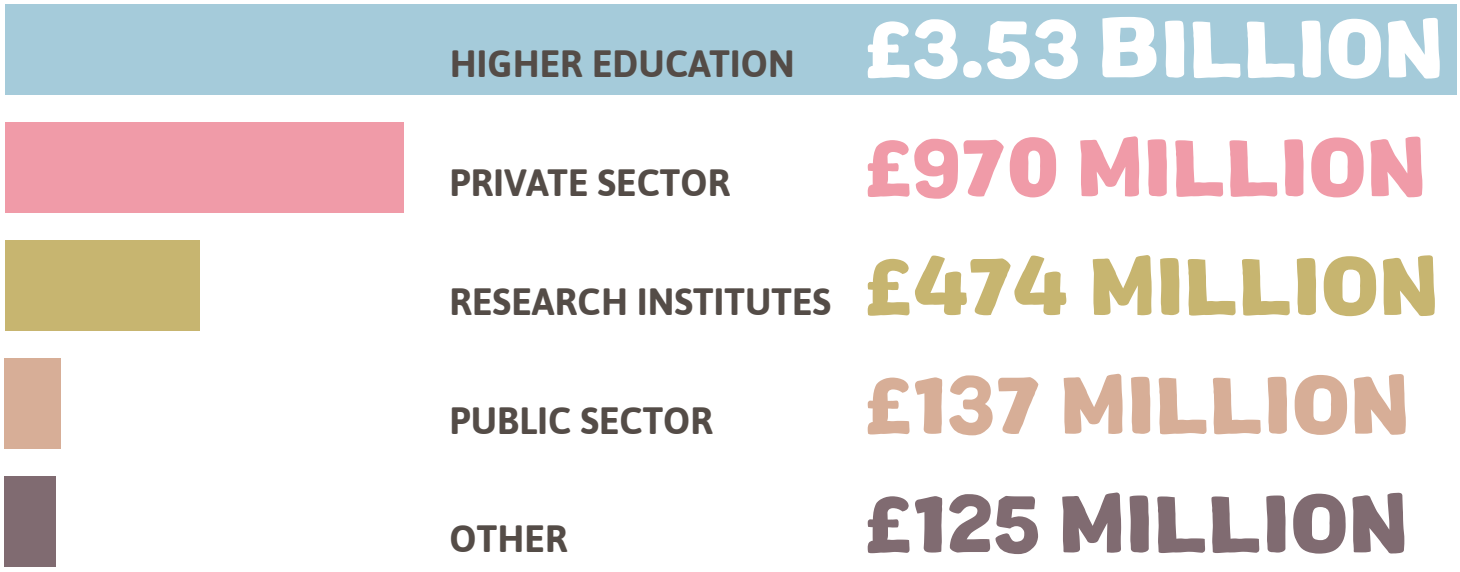
28%
of projects directly address **climate change**

33%
of results are **open source**

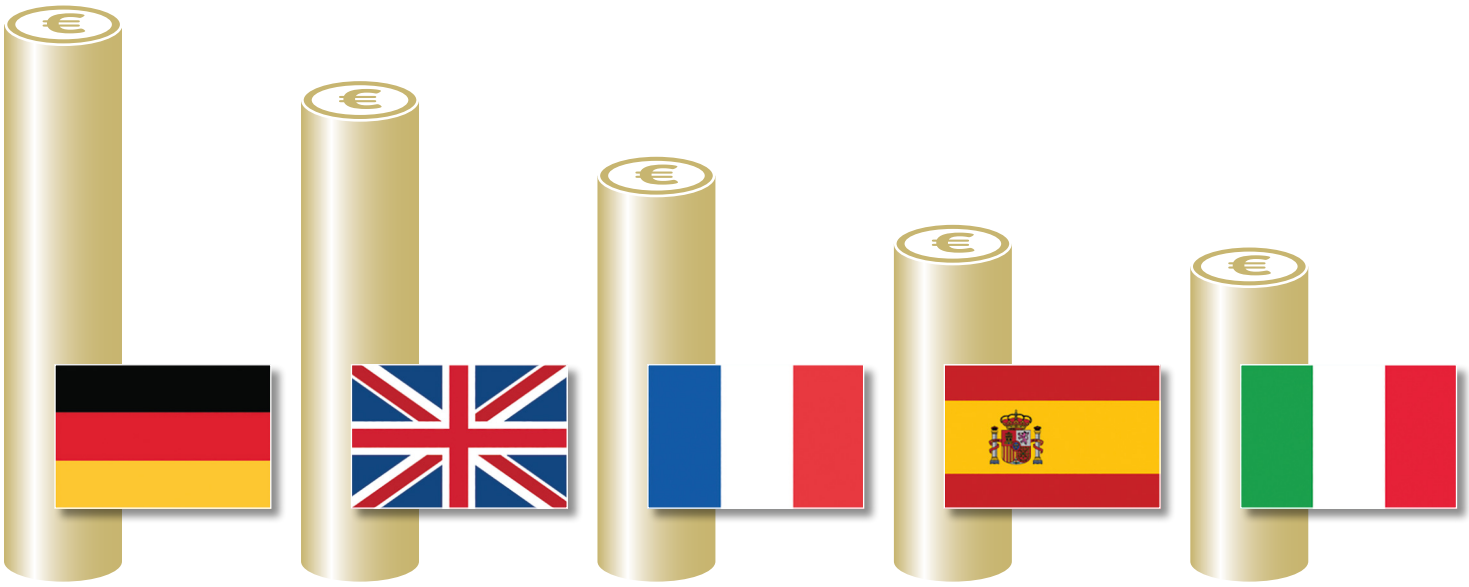
Horizon in the UK

The UK is the second largest beneficiary of Horizon funding after Germany. The majority goes to our universities, but businesses, research institutes and public bodies like local councils also benefit.

UK RECIPIENTS



TOP EU RECIPIENTS



GERMANY
€7.1bn

UK
€6.1bn

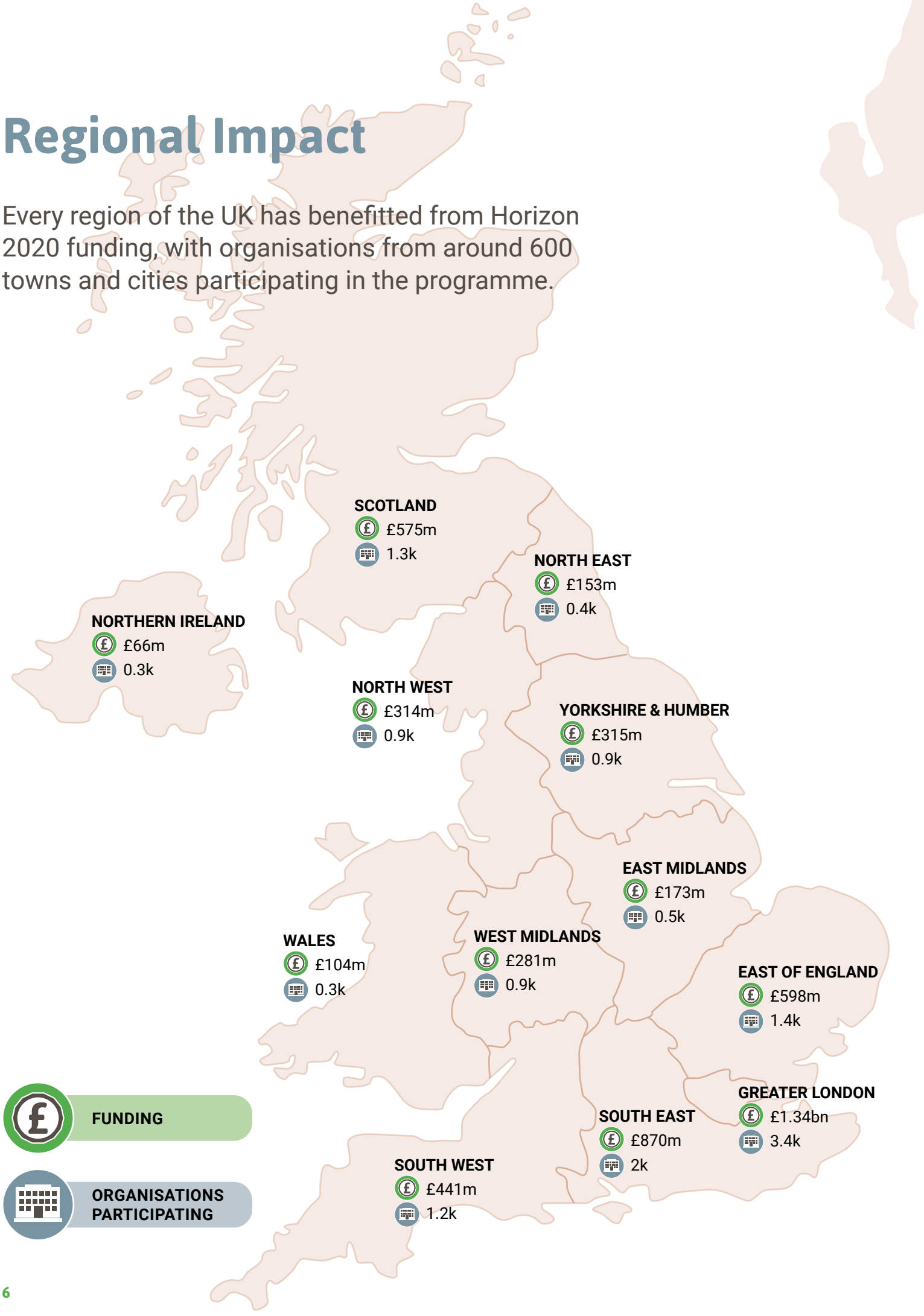
FRANCE
€5.1bn

SPAIN
€4.2bn

ITALY
€3.9bn

Regional Impact

Every region of the UK has benefitted from Horizon 2020 funding, with organisations from around 600 towns and cities participating in the programme.

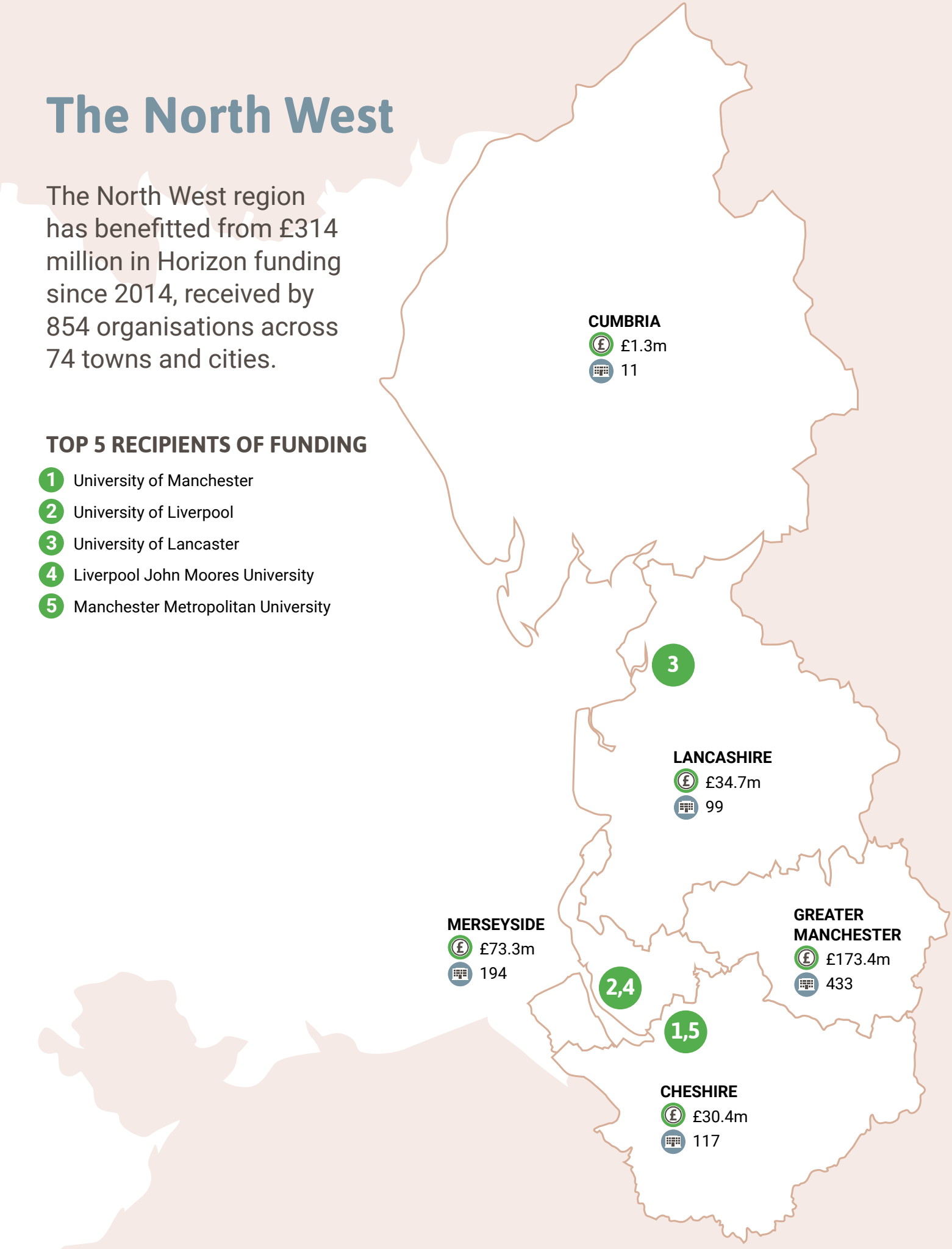


The North West

The North West region has benefitted from £314 million in Horizon funding since 2014, received by 854 organisations across 74 towns and cities.

TOP 5 RECIPIENTS OF FUNDING

1. University of Manchester
2. University of Liverpool
3. University of Lancaster
4. Liverpool John Moores University
5. Manchester Metropolitan University



Case Studies

Horizon funding has supported a huge number of scientific achievements in the UK and further afield, from breakthroughs in health to advanced materials and green energy. Below is a snapshot of some of the projects funded to date.

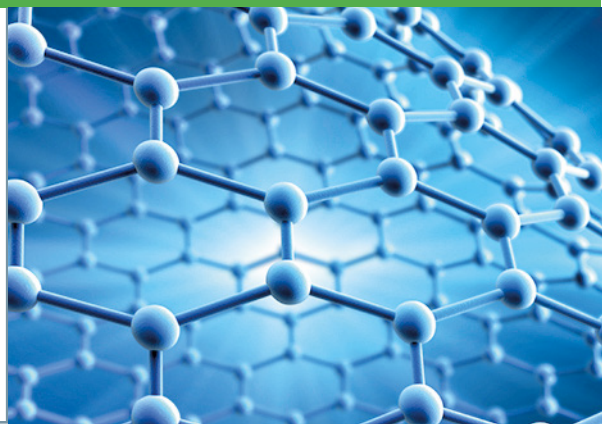
Total Horizon funding **Countries involved** **UK participants** **Funding for UK participants**

GRAPHENE CORE

€89 MILLION
21
24
£13.5 MILLION

First discovered by scientists at the University of Manchester in 2004, graphene is set to become the wonder material of the 21st century. At just one atom thick, it has a huge range of applications from energy and transportation to clean water and health. Part of the EU's Graphene Flagship initiative, the aim is to take graphene from a state of raw potential to a point where it can revolutionise multiple industries.

www.graphene-flagship.eu



EUROPEAN AIDS VACCINE INITIATIVE (EAVI)

€23 MILLION
13
4
£7.6 MILLION

EAVI unites scientists from 22 institutions to pool their knowledge and expertise on developing a safe, effective and affordable vaccine that can prevent HIV infection and ultimately end the HIV epidemic. Led by Imperial College London, the project supports experimental medicine human vaccine studies to select and refine the best options for novel candidate vaccines that can be taken through to human trials.

www.eavi2020.org

HUMAN BRAIN PROJECT

€88 MILLION
20
17
£6.9 MILLION

The Human Brain Project is a flagship initiative aiming to develop the most detailed model of the brain yet, allowing researchers around the world to improve our understanding of the brain and unlock new opportunities. Benefits from the research are expected to include better diagnosis, disease treatment and drug interactions, to new techniques for interactive supercomputing. The University of Manchester is the largest UK participant.

www.humanbrainproject.eu

ESMART

€6 MILLION

6

6

£3.1 MILLION

Led by the University of Strathclyde in cooperation with 13 cancer centres from five EU countries, researchers have dedicated five years to the development and testing of a digital app that can remotely monitor and help manage the side-effects of chemotherapy. The app provides patients with real-time information and advice on how to manage the symptoms of chemotherapy at home. If the patient requires medical assistance, an alert is triggered to notify the hospital.

www.strath.ac.uk/science/computerinformationsciences/esmart

GROWGREEN

€11 MILLION

9

6

£3.3 MILLION

Co-ordinated by Manchester City Council, the GrowGreen project aims to create climate and water resilient, healthy and livable urban environments by investing in 'nature-based solutions' such as green spaces and waterways in seven test cities. The project supports innovative solutions to major challenges such as flooding, heat stress, drought, poor air quality and biodiversity.

http://growgreenproject.eu

ATLAS

€8 MILLION

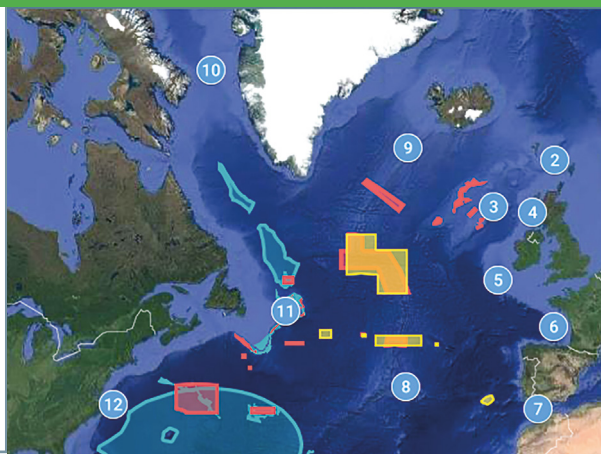
12

10

£3.6 MILLION

Led by the University of Edinburgh, ATLAS is a large-scale ocean observation project aiming to improve our understanding of how deep ocean ecosystems function, including in their roles as reservoirs of biodiversity and their health under future scenarios of climate change. By shedding more light on the darkest depths of the marine environment, researchers will be able to better inform the sustainable management of deep sea habitats.

www.eu-atlas.org



INTERNATIONAL NETWORK FOR TERRESTRIAL RESEARCH AND MONITORING IN THE ARCTIC (INTERACT)

€10 MILLION

18

2

£0.6 MILLION

INTERACT aims to create a 'one-stop-shop' in the Arctic for EU and international research partners through a network of 86 field bases. The aim is to identify environmental change, facilitate understanding and provide data and information to decision makers about transformations to the Arctic over time. The University of Sheffield is the largest UK participant in the project.

www.eu-interact.org

HYDROGEN MOBILITY EUROPE (H2ME)

€32 MILLION

9

4

£3.6 MILLION

H2ME is one of Europe's most ambitious hydrogen deployment projects, aiming to create the first EU-wide network of hydrogen refueling stations to support the expansion of hydrogen vehicles. Led by Element Energy in Cambridge, the project will help to confirm the commercial readiness of hydrogen vehicles, refueling stations and hydrogen production techniques.

www.h2me.eu

SOCIAL INNOVATION IN MARGINALISED RURAL AREAS (SIMRA)

€5.6 MILLION

14

4

£1.2 MILLION

A project involving Lancaster University, SIMRA seeks to advance the understanding of social innovation in agriculture, forestry and rural development in marginalised rural areas, such as new social arrangements or networks that could improve the economy, society or the environment. The project aims to support community engagement and contribute to science and policymaking for rural areas.

www.simra-h2020.eu

TRIANGULUM

€25 MILLION

6

5

£5.8 MILLION

Using Manchester, Eindhoven in the Netherlands and Stavanger in Norway as testbeds, Triangulum aims to support the development of 'smart' cities, focusing demonstrating innovative sustainable mobility, energy and IT technologies. Participants in the Manchester-side of the project include Manchester City Council, both Manchester Universities, Siemens, and Clicks and Links – a local SME. The findings are being replicated in 'follower' cities in Germany, Spain and the Czech Republic.

www.triangulum-project.eu

MOBILISING EUROPEAN CITIZENS TO INVEST IN SUSTAINABLE ENERGY (RESCOOP MECISE)

€2.2 MILLION

4

1

£0.2 MILLION

Recognising that citizens and local authorities often lack the time, finance and technical expertise to initiate sustainable energy renovations of their buildings, REScoop MECISE aims to mobilise action by working with energy co-operatives to foster collaboration and develop a new approach to financing. The UK-side of the project is led by Energy4All, a community energy co-operative in Barrow-in-Furness.

www.rescoop-mecise.eu

UK & Horizon: The Future

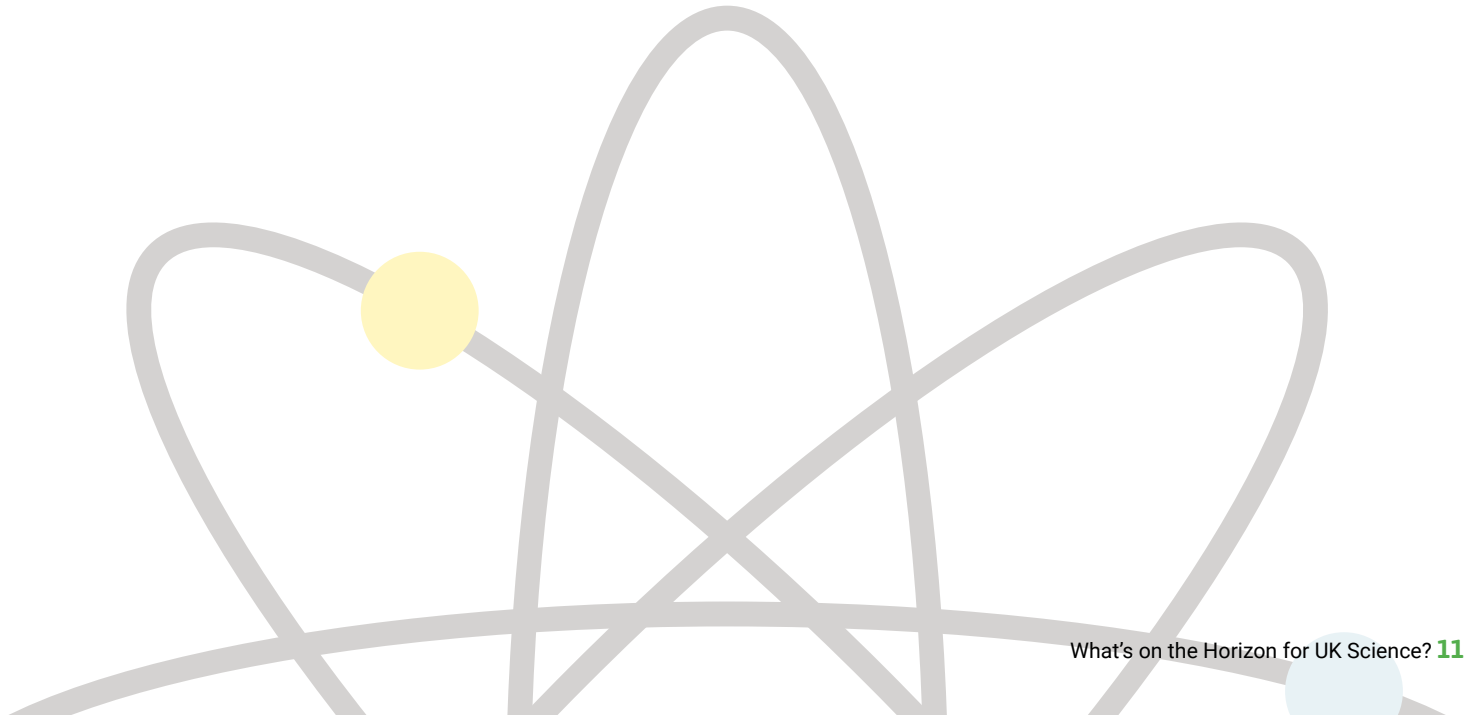
Leading voices of UK's research community, such as Universities UK and The Royal Society, recognise that continued access to Horizon is extremely important. The added value for UK researchers is not easily measured in monetary expenses and earnings alone – the collaboration with scientific communities across Europe and access to datasets and other resources is invaluable.

"The EU has been the best thing for British science for decades. The European research council has provided support that didn't exist, like starter grants for young scientists and advanced grants for senior scientists to do novel work. It has been transformative."

SIR ALAN FERSHT
Distinguished chemist and Royal Society Fellow

"Brexit has a special downside for science. The UK has traditionally been 'welcoming', and its scientific strength benefits hugely from the participation of EU citizens... It's absurd to suggest that post-Brexit we will develop stronger links with the rest of the world... Our international standing is being embarrassingly enfeebled."

MARTIN REES
Cosmologist, astrophysicist and Astronomer Royal



Even before ratification of a final Brexit deal, Brexit has already had a negative impact on UK science. A range of issues will come to the fore over the coming weeks, months and years:

SCIENCE IS ALREADY FEELING THE STRAIN

The UK's annual share of Horizon 2020 grants has fallen by almost a third – or half a billion Euros – since 2015, with almost a 40% drop in UK project applications. The Royal Society warns that top scientists and research centres are already looking elsewhere for more stable partners, and there are now 35% fewer top researchers coming through key schemes – making the UK a less attractive destination for the best science talent.

CONTINUITY OF HORIZON 2020

The UK government has said it will guarantee funding for any successful bids for Horizon funding before the EU exit date. Successful bids up until the end of 2020 will also be guaranteed, but only for calls open to 'third-country' (non-EU) participants. No commitments have been made for after 2020.

A UK-ONLY RESEARCH PROGRAMME?

The 2019 Queen's Speech pledged to introduce new UK research programmes, but it could take years to develop alternatives, leaving UK researchers behind. The government has commissioned options for a domestic replacement scheme of excellence similar to Horizon. An independent report on possible alternatives was published in November 2019, but the reality is that it is difficult to imagine any UK-only scheme being able to match the breadth and access that Horizon offers.

ASSOCIATE MEMBERSHIP?

The UK could attempt to gain 'associated country' status under Horizon Europe after Brexit. However, new restrictions on 'third' and 'associate' members are being debated in the EU, which could make it harder for the UK to access to programme. Even if the UK pays into the system for access as an associate member, it is unlikely to maintain its privileged position. Switzerland is currently the largest associate member of Horizon 2020, but it has received just €1.5 billion to date – far below the €6 billion the UK has received as an EU member state.

ADDED VALUE FROM PUBLIC FUNDING

Public research funding allows companies and universities to carry out projects that would otherwise have been too expensive or risky. EU funding provides insurance against research and commercial risks for entities betting big on developing breakthrough technologies, providing a catalyst for additional investment from participating organisations. If public research funding declines after Brexit, a decline in private investment will follow – damaging both our efforts to tackle societal challenges and the capacity of UK businesses to innovate.

PROTECTING THE PRECAUTIONARY PRINCIPLE

One of the core tenets of EU law is the 'Precautionary Principle', which demands that policymakers err on the side of caution where doubts exist about long-term impacts on public health or environmental damage. However, the European Commission is now considering a new concept called the 'Innovation Principle', which seeks to grant companies more freedom in bringing products onto the market because of their significance as a scientific advance. Proponents argue that this principle will move research closer to the forefront of technological discoveries, but it could act as a Trojan horse for big business seeking to undermine environmental and health standards. The ongoing debate has important implications for any future public research criteria in the UK.

PUBLIC MONEY FOR PUBLIC GOOD

Taxpayers' money should clearly not finance projects that threaten to endanger the health of citizens or our environment, or allow corporate interests to steer the priorities of research. Going forward, public resources in the UK must not subsidise business interests and profits, but rather focus on projects that could benefit society. Future-proofing funding criteria, such as ensuring Horizon Europe's commitment to direct 35 per cent of funds to climate-related research, has to be a priority.

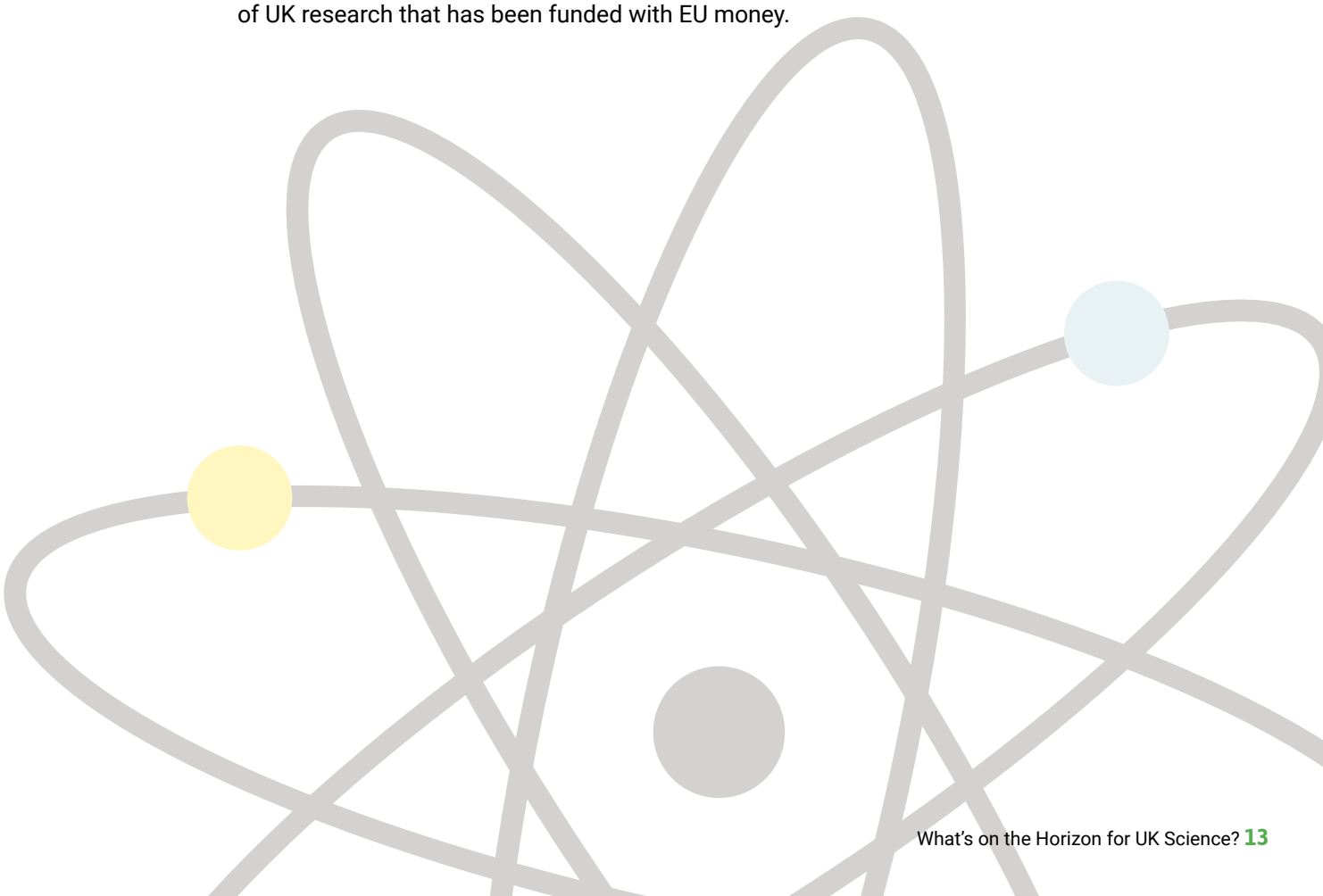
UK-EU Negotiations

To become an associate member of Horizon, an agreement has to be ratified with the EU. As a large and industrialised nation, the UK has a lot to gain from achieving this status.

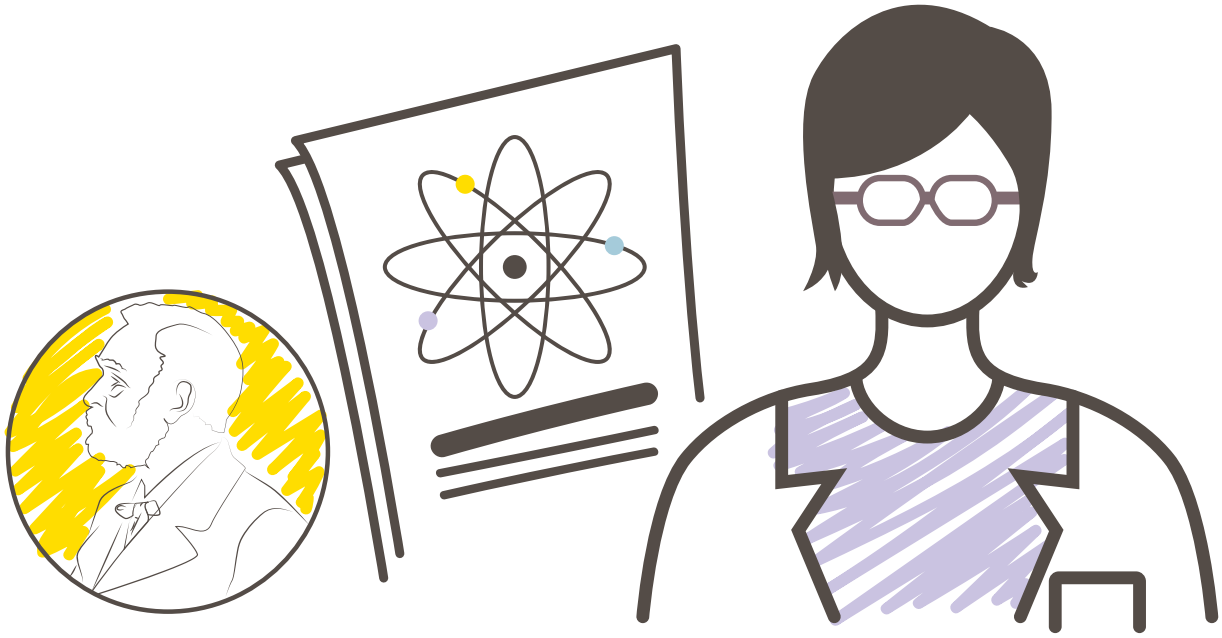
However, the EU will no doubt be wary of the UK's ability to exploit EU resources, data and networks without paying its proper due. The terms of an agreement will be extremely contentious and are likely to become an important bargaining chip in the wider negotiations on the future relationship between the UK and the EU after Brexit. The EU is well-aware of the importance of such an agreement to the UK, so the UK may not be in the best negotiating position in these discussions.

To date, the UK government's official line for achieving associate status is "one pound in, one pound out". This will be a hard sell for EU decision-makers, who will probably be of the view that the UK should pay more for the privilege, but any agreement for the UK to contribute more than it receives in real money will be a hard sell for UK MPs.

In any case, as an associate member of Horizon the UK would have to pay into the system without having any say in the programme's priorities and policy objectives. Depending on the UK's status post-Brexit, there is also the potential that British companies might face difficulties in exploiting the results of UK research that has been funded with EU money.



Conclusion: Preserving UK Scientific Excellence



133
NOBEL PRIZES
(2ND ONLY TO THE US)

15%
OF THE MOST-CITED SCIENTIFIC PAPERS

43%
OF PEOPLE EMPLOYED IN THE KNOWLEDGE ECONOMY

1:225
RATIO OF RESEARCHERS TO GENERAL POPULATION

The potential loss of the UK as a key and equal participant in Horizon is of deep concern. At a time when there is a need to work together to find tools and solutions to the environmental crisis, the UK's departure will be a huge blow for both the UK and the EU, as well as for the implementation of the Green New Deal.

As a non-EU member of Horizon Europe, collaboration will be far more difficult for our researchers and innovators. Horizon's raison d'être is to encourage excellence and find innovative solutions to society's challenges. Much of the programme's success has been credited to the collaborative and cooperative spirit that it fosters. Now, more than ever, we need to uphold and protect that spirit, and preserve the UK's track record of scientific excellence.

"Science matters to every one of us, in the UK and across the world. Tomorrow's treatments and technologies are grounded in today's science, and it's the deep collaborations between UK researchers and colleagues around the world that help make the UK a leading scientific nation. For UK science to remain strong after Brexit, we need to continue working closely with our European partners. If we try to go it alone, we risk falling behind."

SIR PAUL NURSE
2001 Nobel Prize winner

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www.ginadowding.org.uk