I am delighted to introduce the third annual report of Horizon 2020 activity in Wales.

Welsh organisations have now benefited from over €83m of Horizon 2020 funding through 189 participations. In just over a year, we have seen an increase of 77 participations and over €30m of funding, with around 2,000 international collaborations to date. It is clear Horizon 2020 is supporting Wales as an outward-looking nation, collaborating with the best in Europe and the world.

This strong performance reflects an active and positive approach from Welsh organisations despite the uncertainty around Brexit and demonstrates the continuing need for this type of research and innovation funding to Wales. The Welsh Government’s Securing Wales’ Future\(^1\) policy paper on Brexit and subsequent paper Regional Investment in Wales after Brexit\(^2\) make clear our call on the UK Government to negotiate continued participation in European Union (EU) programmes such as Horizon 2020 as part of a new relationship between the UK and the EU after Brexit. The Welsh Government highly values its relationship with Europe and has welcomed the joint report from the UK Government and European Commission (EC) on Phase 1 of the Article 50 negotiations\(^3\), which suggests the door remains open to participating in EU programmes such as Horizon 2020. We will continue to make the case for this and will continue to engage in the EC’s development of Framework Programme 9 (FP9)\(^4\), the successor to Horizon 2020.

The importance and relevance of Horizon 2020 and a successor programme to Wales is demonstrated by the many success stories captured in this report. For example, Abercynon-based IMSPEX Diagnostics Ltd has secured funding for their project BreathSpec\(^5\), which is working to revolutionise the way respiratory illnesses are diagnosed. Swansea University, with support of Horizon 2020 funding, is leading an international team of scientists to produce tools for nanosafety assessment, reducing the need to test on animals\(^6\).

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5. Breathspec Project; https://breathspec.com
Many of these achievements have built on domestic regional investments across Wales. As Cabinet Secretary responsible for the Structural Funds, utilising these funds to help build the capacity needed to access competitive funding sources such as Horizon 2020 is a key part of our agenda. Since the start of this programme period in 2014, £280m of European Regional Development Fund (ERDF) funds have been invested in research and innovation, but just as importantly these investments are delivering significant impact in terms of research income won, world-class researchers attracted, world-class facilities developed and innovative businesses supported. Wales’ achievements in using regional funds in a smart, synergistic and strategic way are regularly cited as best practice by stakeholders in Wales, the UK and Europe. It is therefore essential Wales has replacement funding for regional investment of at least the level we currently receive from the EU, and in line with our devolved responsibilities, for us to lead, with our Welsh partners, on the development and delivery of a new regional investment approach when the UK leaves the EU.

This report reflects the wide range of Horizon 2020 related activity in Wales and for Wales in 2017 and provides a forward look to activity in 2018. A clear theme throughout is the importance of partnership in delivery – a key priority for the Welsh Government.

Wales’ success so far has been driven by its world-class science and innovation, ambition to grow as a nation and determination to look outwards to address together the industrial and societal challenges and opportunities of the world. With support from Horizon 2020 and its successor FP9, we will build on this legacy for the benefit of people, businesses and communities across Wales.

Mark Drakeford AM
Cabinet Secretary for Finance
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Introduction

At over €70 billion, Horizon 2020 is the largest ever EU research and innovation programme.

It is enabling Welsh organisations to be at the forefront of international research and innovation and to collaborate across Europe and the world.

Horizon 2020 is open for business, with successful applications made whilst the UK is part of the EU protected by the UK Government’s lifetime expenditure guarantee.

It is also the Welsh Government’s view, that the UK should continue to benefit from access to EU programmes such as Horizon 2020 and their successor programmes as part of a new relationship between the UK and the EU after Brexit.

This annual report sets out how Welsh organisations have performed so far in accessing Horizon 2020, the progress made on the Welsh Government’s key objectives for Horizon 2020, and a forward look to activities in 2018.

The Welsh Government’s Horizon 2020 Unit is available to support all Welsh organisations considering and applying for research and innovation funding from the EU. If you have any questions please get in touch with the Unit by emailing: horizon2020@gov.wales or calling: 0845 010 3355.

Figure 1 - Cowbridge-based SME Cymru Coal Limited has secured €1.3m of Horizon 2020 funds to participate in the €7m IMP@CT project. As part of a consortium led by the University of Exeter and comprising organisations in France, Finland and Germany, Cymru Coal is imparting its significant expertise in mining and related machinery to create viable new methods of excavating small and complex deposits of metal.

11. European Commission CORDIS project & results – IMP@CT ID 730411 Horizon 2020 grant no 430711 – http://cordis.europa.eu/project/rcn/206222_en.html. IMP@CT project website: http://blogs.exeter.ac.uk/impactmine/project

Courtesy of Mineco
Welsh organisations have now been awarded €83,121,553 from Horizon 2020 (see Figure 2). This involves 189 participations with 55 (29%) of these as a single participant or consortium leader. In the period of just over a year\textsuperscript{13}, Wales has achieved 77 new participations and over €30 million of funding.

The actual funding is understood to be greater than this as the EC’s data excludes organisations operating in Wales which have headquarters elsewhere; for example, TWI Technology Centre (€1.2m), Ecodek Ltd (€1.5m) and UK Research Councils.

The impact of Horizon 2020 in Wales goes far beyond the financial benefits. Horizon 2020 is supporting Welsh organisations to collaborate, learn from and share best practice with the best in Europe and the world. There have been 2,002 international collaborations so far (see Figure 3), representing a total investment of €1 billion in projects involving Welsh participants.

\textsuperscript{12} This aggregated data is drawn from administrative data held by the European Commission’s database on Horizon 2020. The data is based on signed grant agreements or closed funding calls as at 2nd October 2017. Figures are cumulative from the beginning of the programme unless otherwise stated. Statistics derived from this data have been validated and checked for their accuracy as far as is possible. However, it should be noted that some minor inaccuracies can inevitably occur during the production of these statistics as a result of missing data, human error or other similar information problems commonly associated with the production and analysis of large administrative datasets.

\textsuperscript{13} 30 September 2016 to 2 October 2017
Figure 3 – International collaborations by Welsh organisations in Horizon 2020
Comparison with the UK

Uncertainty around the UK’s future relationship with Horizon 2020 has undoubtedly created concerns for some applicants and their partners. In the year to September 2016, the UK won over 16.06% of Horizon 2020 funding awarded by the EC. Despite the UK Government’s expenditure guarantee announcement in Autumn 2016, in the year to September 2017, the share of funding awarded to the UK fell to 13.70%. If the UK had maintained its 16.06% share, the additional Horizon 2020 funds to the UK would have been nearly €215 million.

Despite this slight fall, the UK remains one of the leading countries in Horizon 2020 with 12.65% of all participations and 14.91% of all funding to date. This puts the UK in second place, only slightly behind Germany.

Wales has not only kept pace with the UK, but has experienced a modest increase, both in relation to number of participations and funding (Figures 4 and 5). Cumulatively, the Welsh proportion of the UK participations and funding has increased to 2.35% and 2.09%, respectively.

Figure 4 – Welsh percentage of UK participations

Figure 5 – Welsh percentage of UK funding
The distribution of Welsh participations between the main parts\textsuperscript{14} of the Horizon 2020 programme has not changed significantly since the annual report for 2016 (see Figure 6).

Figure 6 – Welsh participations by programme pillar

There has continued to be a strong performance in Excellent Science. The prestigious European Research Council\textsuperscript{15} (ERC) has awarded scientists in Wales €7.9 million over the last year. The Marie Skłodowska-Curie Actions\textsuperscript{16} (MSCA) brought €6.1 million to Wales, ensuring that excellent researchers continue to locate in Wales.

Importantly, there was also a strong performance in the Societal Challenges this year, with €9.7 million awarded, including:

\begin{itemize}
  \item €4.4 million for Societal Challenge 2 (Food, Agriculture, Marine and the Bioeconomy),
  \item €2.8 million for Societal Challenge 3 (Energy), and
  \item €2.0 million for Societal Challenge 4 (Transport).
\end{itemize}

The Fast Track to Innovation\textsuperscript{17} awarded a further €1.9 million to Welsh organisations.

Further positive results can be seen in Table 1. In particular, when compared to our last annual report, the Food section of the programme has increased its share of UK funding from 1.29\% to 4.64\%. This largely reflects a return to form in an area of historical strength for Wales, including multiple projects in Aberystwyth University, as well as successes in urban waste bio-refining in the University of South Wales, pest control by Russell IPM and an algal biomass project in Swansea University.

\textsuperscript{14} https://ec.europa.eu/programmes/horizon2020/h2020-sections

\textsuperscript{15} The European Research Council: https://erc.europa.eu/


\textsuperscript{17} The Fast Track to Innovation: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/fast-track-innovation-pilot
Table 1 – Areas of strong Welsh performance in comparison with the UK

<table>
<thead>
<tr>
<th>Area of Research</th>
<th>Wales % of total UK funding secured</th>
<th>Wales % of total UK participations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make scientific and technological careers attractive for young people</td>
<td>15.36</td>
<td>15.38</td>
</tr>
<tr>
<td>Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy</td>
<td>4.64</td>
<td>4.62</td>
</tr>
<tr>
<td>Advanced manufacturing and processing</td>
<td>4.52</td>
<td>5.11</td>
</tr>
<tr>
<td>Cross-theme (Fast Track to Innovation)</td>
<td>4.51</td>
<td>4.65</td>
</tr>
<tr>
<td>Marie-Sklodowska-Curie Actions</td>
<td>4.22</td>
<td>2.58</td>
</tr>
<tr>
<td>Innovation in SMEs</td>
<td>4.17</td>
<td>9.09</td>
</tr>
</tbody>
</table>

Some areas of the programme remain challenging for Welsh organisations as can be seen in Table 2. Such areas will continue to be monitored closely, especially those which are benefiting from related regional investments.

Table 2 – Areas of limited Welsh success in comparison with the UK

<table>
<thead>
<tr>
<th>Area of Research</th>
<th>Wales % of total UK funding secured</th>
<th>Wales % of total UK participations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to risk finance</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Biotechnology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euratom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure societies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spreading / widening participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced materials</td>
<td>0</td>
<td>1.27</td>
</tr>
<tr>
<td>Health, demographic change and wellbeing</td>
<td>0.42</td>
<td>1.38</td>
</tr>
<tr>
<td>Nanotechnologies</td>
<td>0.45</td>
<td>0.85</td>
</tr>
<tr>
<td>Space</td>
<td>0.96</td>
<td>0.65</td>
</tr>
<tr>
<td>Research Infrastructure</td>
<td>0.97</td>
<td>2.81</td>
</tr>
</tbody>
</table>
Performance by sector

Performance at sector level has changed little since our last annual report (see Figure 7). However, there are now at least 18 more Welsh organisations accessing Horizon 2020 than there were in 2016, with many winning substantial amounts of funding. This ‘broadening out’ of success is also reflected, to some degree, in Table 3 which shows the top ten Welsh organisations based on funding awarded this year.

![Figure 7 – Welsh participations by sector](image)

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Funding (€m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiff University</td>
<td>8.2</td>
</tr>
<tr>
<td>Swansea University</td>
<td>5.1</td>
</tr>
<tr>
<td>Aberystwyth University</td>
<td>4.5</td>
</tr>
<tr>
<td>Bangor University</td>
<td>3.0</td>
</tr>
<tr>
<td>IMSPEX Diagnostics Limited</td>
<td>1.4</td>
</tr>
<tr>
<td>Cymru Coal Limited</td>
<td>1.4</td>
</tr>
<tr>
<td>Denis Ferranti Meters Limited</td>
<td>0.9</td>
</tr>
<tr>
<td>Blaenau Gwent County Borough Council</td>
<td>0.6</td>
</tr>
<tr>
<td>Creo Medical Limited</td>
<td>0.5</td>
</tr>
<tr>
<td>Microsemi Semiconductor Limited</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Table 3 – Top ten Welsh organisations based on funding awarded between 30 September 2016 and 02 October 2017
Performance of the higher education sector

The Welsh higher education sector (HE) continues to perform well in Horizon 2020. The sector accounts for the majority of participations (63.5%) and funding in Wales (66%), trends which are similar to the UK. This reflects Wales’ strengths in Excellent Science, as well as recent improvements in the Societal Challenges noted earlier.

Performance of the private sector

The private sector in Wales has so far benefited from €16.3 million of Horizon 2020 funding. This includes 11 Welsh private sector companies which were awarded funding for the first time this year.

In Wales, the level of private sector involvement in Horizon 2020 compares very well to the UK as a whole; the private sector accounts for 28.6% of total number of participations in Wales (UK 26.5%) and benefits from 19.5% of the funding (UK 19.8%).

Performance of the public sector

Welsh public sector participation has been low compared to overall public sector participation in Horizon 2020. However, there are now eight public sector participations from Wales, a significant increase in the last year due mainly to the involvement of Welsh local authorities.

Blaenau Gwent County Borough Council accounts for two of the eight participations. Worth over €600,000, these involve two energy grid flexibility projects being delivered in collaboration with Cardiff University.

In the area of health, Cardiff and Vale University Health Board is involved in the Talk project\(^\text{18}\), which focuses on innovation transfer for health services, while the Public Health Wales National Health Service Trust, through the EUROlinkCAT project\(^\text{19}\), is helping children who have congenital anomalies.

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19. EUROlinkCAT project: https://www.eurolinkcat.eu/
Application rates and success rates

Application rates continue to be monitored in order to discern any impact from the UK’s decision to leave the EU. Anecdotal reports suggest that collaborative projects and coordination of projects might have been the first to experience challenges. There is insufficient evidence to confirm any trends at this stage.

Despite the uncertainty around the UK’s future relationship with Horizon 2020 the success rate for UK applications remains at 15%, above the success rate of 14% for Horizon 2020 as a whole.

Encouragingly, Wales has actually seen a slight increase in its success rate since last year, rising from 11% to 12%. By sector, higher education in Wales saw a slight increase in its success rate from 10% to 11%. The private sector remains at 12%, while the public sector’s success rate increased from 17% to 18%.

There are, however, significant variations in success rates between parts of the programme and between applicants which require more consideration. Table 4 demonstrates Wales has a very good success rate in a number of areas.

<table>
<thead>
<tr>
<th>Part of the programme</th>
<th>Wales</th>
<th>UK</th>
<th>All Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation in SMEs (not including the SME Instrument)</td>
<td>62%</td>
<td>38%</td>
<td>46%</td>
</tr>
<tr>
<td>Cross-theme (including Fast Track to Innovation)</td>
<td>31%</td>
<td>9%</td>
<td>5%</td>
</tr>
<tr>
<td>Make scientific and technological careers attractive for young people</td>
<td>22%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>Secure, clean and efficient energy</td>
<td>18%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>Nanotechnologies</td>
<td>13%</td>
<td>13%</td>
<td>12%</td>
</tr>
<tr>
<td>Future and Emerging Technologies (FET)</td>
<td>11%</td>
<td>8%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Table 4 – Areas with strong success rates in Wales when compared with the UK and Horizon 2020 as a whole

In comparison, there are parts of the Horizon 2020 programme which have had no successful proposals from the 56 Welsh applications submitted. These are principally in the areas of Societal Challenge 7 – Secure Societies (21 applications), Biotechnology (19 applications) and Spreading/Widening (9 applications). Clearly, there is an opportunity to improve performance in these areas.
Regional comparison

The EC’s R&I Regional Viewer\(^{20}\) shows Horizon 2020 funding received per head of population. Generally, regions with universities or other research-intensive organisations perform better than those with limited research and innovation (R&I) activity. Horizon 2020 should not therefore be seen as a stand-alone programme; success in Horizon 2020 is interrelated with the wider R&I system in a region.

Making comparisons between different regions or countries is not necessarily that useful for measuring ‘real’ performance. For example, Wales has received a similar amount of funding to Romania, but Wales has a smaller population. Romania has been successful in collaborative calls, particularly in the Societal Challenges and ICT, while Wales’ comparative strength lies in ERC and MSCA.

Lithuania, of a similar population to Wales, has slightly more participations, but less than half the funding compared to Wales.

The Basque Country (Euskadi) is also comparable to Wales in terms of population, but excels in R&I performance and has around four times the number of Horizon 2020 participations and amount of funding compared to Wales.

It can be argued that Galicia, Brittany and North East England offer more equal comparisons to Wales in terms of population and R&I strengths and this is reflected in similar Horizon 2020 performance to date.

Some conclusions

- Uncertainty around the UK’s future relationship with Horizon 2020 has undoubtedly created concerns for some applicants and their partners but the statistics indicate that:
  - There is no obvious bias against Welsh/UK applications in the EC’s assessment process, as success rates remain steady or have improved compared to the previous year. Efforts should therefore focus on proactively maintaining or even increasing the volume of applications from Wales.
  - There has been no significant effect on Welsh participations or funding awarded to date. This would appear to reflect the strength of research and innovation in Wales and the efforts of Welsh stakeholders in continuing to apply for funding.

- With at least 18 more organisations in Wales accessing Horizon 2020 than there were in 2016, it would appear that efforts to increase and broaden the participation of Welsh organisations in Horizon 2020 are working.

- The higher education sector is contributing significantly to Wales’ overall performance in Horizon 2020 and access to EU funds continues to be important for that sector, supporting world-class research and building the capacity needed to seek further competitive research funding.

- Welsh private sector engagement in Horizon 2020 remains positive, particularly with the increase in new applicants. The increasing success of local authorities and health boards will also help to broaden the benefits of Horizon 2020 funding among citizens.

- There are clear thematic strengths in Wales but also areas of challenge requiring more targeting of application support in the future.

- Welsh organisations have strong collaborative networks across Europe and beyond, but there are some areas where collaborations could be increased, e.g. with Ireland. Effort will need to be focused on both maintaining existing networks and developing new ones, and regional investment can play an important role in achieving these aims.
Key Objective: Build a ‘stairway to excellence’

EU funds have given Wales the opportunity to make significant improvements to its research and innovation capacity. Figure 8 shows how key investments and support are aligned along a ‘stairway to excellence’, so whether you are a Welsh business exploring a potential innovation for the first time or an excellent research group looking to build an international collaboration, there is support available. Some organisations/individuals may not yet be ready to access competitive funding such as Horizon 2020, but the activity supported by the ‘stairway’ (and the other key objectives) will encourage them to consider applying for funding in the medium or long term and support them when they do.

Figure 8 – The Welsh ‘stairway to excellence’
Progress to date

Investment in the ERDF research and innovation portfolio reached over £280m between 2014 and the end of 2017. This included the first investments made following WEFO’s call for innovative, niche proposals for the commercialisation of research. As shown in Figure 9, this significant portfolio of strategic, complementary and niche investments add value to each other and directly target Wales’ smart specialisation opportunities. These also build on historical investments in capacity during previous funding rounds, particularly during the 2007-2013 programmes.

For example...

£5m ERDF has been awarded to Bangor University’s Centre for Environmental Biotechnology. The five-year operation will establish a world-leading facility that will exploit biomolecules from extreme environments to develop new biotechnologies for the chemical and advanced materials industries.

The investment builds on existing research excellence, demonstrated by the €7.4m Horizon 2020 project INMARE where Bangor University is leading a consortium of 24 European and North American organisations to create safer, cleaner and cheaper pharmaceutical and agricultural products.

Figure 9 – ERDF research and innovation portfolio

21. £5m EU funding boost for Bangor University http://gov.wales/newsroom/environmentandcountryside/2018/180118-5m-eu-funding-boost-for-bangor-university/?lang=en
23. Approved operations (*) and proposed investments in an advanced stage of development. Figures Pan Wales with exchange rate £1/€1.17. Further details of approved EU Structural Funds Projects and ideas under development are available online http://gov.wales/funding/eu-funds/2014-2020/approved-projects/?lang=en
These investments are also delivering significant impact. For example, the current ERDF portfolio has already won over £60m in competitive research and innovation funding. Figure 10 illustrates that Sêr Cymru\(^24\) has continued to attract world-class researchers to Wales from across the globe through its unique combination of ERDF and Horizon 2020 investment. In the vast majority of cases these researchers are working in research areas that have benefited from ERDF and/or Welsh Government investment; a clear example of the smart, strategic and synergistic use of regional investment in Wales.

![Previous locations of researchers attracted to Wales by the Sêr Cymru scheme](image)

The European Social Fund (ESF) also continues to deliver complementary activity; for example, supporting the extension to December 2022 of the Materials and Manufacturing Academy (M2A)\(^{25}\) scheme led by Swansea University’s College of Engineering. M2A will support over 200 graduates to gain masters qualifications or doctorates in engineering, in areas of research relevant to the steel and manufacturing industries.

The European Territorial Co-operation programmes\(^{26}\) continue to provide opportunities to strengthen research and innovation capacity through collaboration and co-operation with other EU regions and Member States. Examples of projects approved in 2017 include:

- **ECO-STRUCTURE\(^{27}\)**, a €3.2m ERDF project supported by the Ireland Wales programme. Led by Aberystwyth University, it employs interdisciplinary cross-border research to explore how Irish and Welsh coastal communities can meet the challenges of climate change while minimising the impacts on the natural environment and maximising potential secondary ecological and socio-economic benefit;

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25. Materials and Manufacturing Academy (M2A) scheme: [http://materials-academy.co.uk/](http://materials-academy.co.uk/)
• MANUMIX\textsuperscript{28} is a consortium of policy leaders in the area of advanced manufacturing across the EU, a €1m ERDF project funded by the Interreg Europe Programme – the Welsh Government’s Innovation team is a partner in the project.

• NASPA, a €2.2m ERDF project led by Bangor University together with Aberystwyth University and Swansea-based SME Emerald Crop Sciences Ltd. NASPA will develop zero residue bio-derived agents to improve soil biodiversity and prevent crop losses from fungal diseases within the Atlantic region, benefiting both growers and consumers whilst also improving the SME’s product portfolio.

The European Innovation Partnership for Agricultural Productivity and Sustainability\textsuperscript{29} (EIP Wales) has already supported ten projects which are exploring a range of opportunities and challenges to deliver a more competitive and sustainable future for the agriculture, horticulture and forestry sectors. Many of these activities are expected to link closely with ERDF investments in agricultural science and food innovation.

Significant progress has been made on complementary European Maritime and Fisheries Fund\textsuperscript{30} (EMFF) and ERDF bids to marry research on product development and production/processing technologies with commercial processing in the aquaculture sector. This integrated approach offers the opportunity to trial innovative processes and techniques in the commercial environment prior to wider industry roll-out.

SCoRE Cymru\textsuperscript{31} has continued to play its important role in the ‘stairway to excellence’. Since it was launched in 2013 it has invested nearly £400,000 in 80 organisations. This has resulted in a number of successful Horizon 2020 applications worth a total of over €3 million funding to Welsh organisations (see BreathSpec example on page 20). An interesting feature this year has been the use of SCoRE for bid-checking/bid-polishing services, particularly for the Marie Skłodowska-Curie Actions.

Forward look

The £60m competitive research and innovation funding already won by the ERDF portfolio provides some confidence that this figure should increase significantly during 2018. There will also be a continuing emphasis on integration across the ERDF portfolio and beyond, with schemes expected to share data and intelligently signpost organisations/individuals to the right support mechanism. This will help drive the innovative and collaborative behaviour that will put Welsh organisations in the best position to access all relevant competitive research and innovation funding streams.

A number of other ERDF investments are expected to be made in the first quarter of 2018. Demonstrating the importance of research and innovation to Wales, WEFO is also investing around £30m to support collaborative and outward facing research and innovation activities. The funding call for this activity will close at the end of March 2018 and is expected to attract project proposals that will directly support the principle of the ‘stairway to excellence’ and help expand European and international networks.

28. MANUMIX: https://www.interregeurope.eu/manumix/
31. SCoRE Cymru (Supporting Collaborative Research and innovation in Europe) provides grants to stimulate participation by Welsh organisations in European collaborative research and innovation programmes, particularly Horizon 2020. Funding can cover the travel and accommodation costs involved in identifying and building consortia (up to £1,000) and the cost of subcontracted expertise for developing funding proposals (up to £10,000).
Excellence delivers ‘downstream’ benefits too

Swansea University’s Centre for Sustainable Aquatic Research (CSAR) was established in 2003 with a £2m infrastructure investment from ERDF, the Welsh Government and Swansea University.

As a consequence of this investment their modern facilities and leading expertise in aquaculture have led to their involvement in a number of R&D collaborative projects. These include participation in two Horizon 2020 projects, MARIBE and AMBER, generating €1.3m of competitive research income for Wales and distinguishing CSAR as a centre of excellence in the field.

Based on this excellence, a further £1.4m of ERDF was awarded in 2017 for the ‘SMARTAQUA’ project. The £2m project will collaborate with Welsh businesses in aquaculture industries, such as fish, shellfish, seaweed and microalgae, to develop ground-breaking new products and services and establish Wales as a lead player in this technologically driven niche sector.

32. Centre for Sustainable Aquatic Research (CSAR): http://www.swansea.ac.uk/csar/
34. Adaptive Management of Barriers in European Rivers (AMBER). A €6.2 million research and innovation project led by Swansea University under Horizon 2020 which aims to produce the first atlas of stream barriers in Europe and to restore stream connectivity through adaptive barrier management. Project ID689682, https://cordis.europa.eu/project/rcn/203267_en.html
35. £1.4m EU boost for new aquaculture project: http://gov.wales/newsroom/finance1/2018/180130-1m-EU-boost-for-new-aquaculture-project/?lang=en
Key Objective: Increase the engagement and success of businesses

There is a recognised need for support and advice for Welsh businesses to access Horizon 2020 opportunities. This should be integrated into the wider innovation support offer, ensuring businesses receive the right intervention for their stage of development (the ‘stairway to excellence’ principle). It must also add value to existing and emerging support available in Wales, the UK and Europe.

Progress to date

The performance of the private sector in Wales since the last report is encouraging, particularly as eleven private sector companies received Horizon 2020 awards for the first time. We will continue to target support and advice at businesses to ensure that this progress continues.

The Welsh Government’s ERDF funded SMART schemes36 (SMART Innovation, SMART Cymru and SMART Expertise) provide an integrated suite of interventions to drive innovative behaviour in Welsh businesses. SMART Innovation has already engaged with over 1,800 companies and encouraged 240 of these to seek competitive funding from Innovate UK37 and Horizon 2020. SMART Cymru and Expertise have supported over 340 companies with R&D projects worth over £40 million.

For example...

With financial backing from the Welsh Government’s SCoRE Cymru scheme IMSPEX Diagnostics Ltd, based in Abercynon, secured €1.4m of Horizon 2020 funds as the lead partner in the €3.3m38 BreathSpec project.

IMSPEX Diagnostics is working with leading manufacturers and clinical trial specialists in Germany and Ireland, the University of Warwick and South Wales-based RedKnight Consultancy Ltd, to develop a rapid, non-invasive device which can diagnose bacterial or viral infections through ultra-high sensitivity breath analysis and will help combat the global challenge of antimicrobial resistance (AMR).

With over £150m now invested in the commercialisation of research through the ERDF portfolio, Welsh businesses are increasingly being exposed to the collaborative research environment, helping to drive the right behaviours for accessing competitive funding.

SCoRE Cymru continues to target Welsh businesses. Of the £400,000 invested so far, £284,000 (71%) has been awarded to businesses.

The Horizon 2020 Unit works closely with key support mechanisms for businesses such as the SMART schemes, Enterprise Europe Network Wales, the UK’s National Contact Points and Knowledge Transfer Networks, and thematic support mechanisms such as the Life Sciences Hub and Innovation Point. In 2017 this included targeted events for businesses on the SME Instrument and the opportunities in digital and ‘Industry 4.0’.

36. ERDF funded SMART schemes: https://businesswales.gov.wales/expertisewales/smart-suite-programmes-0
37. Innovate UK: https://www.gov.uk/government/organisations/innovate-uk
38. Breathspec Project: https://breathspec.com/
Forward look

Significant support is available to businesses and the Welsh Government will continue to review this support in the light of new opportunities and challenges. For example, Smart Innovation will be introducing a new and innovative manufacturing support element in preparation for implementation of technologies associated with Industry 4.0.

WEFO will be making further investments in the commercialisation of research during the first quarter of 2018. Also WEFO’s current £30m call for collaborative and outward facing research and innovation proposals specifically encourages industry partnerships.

Business grows through investment and collaboration

Chepstow-based Creo Medical Ltd\(^3\)\(^9\), a medical device company, has undergone significant growth after building on EU backed investments worth £4.3m from Development Bank of Wales\(^4\)\(^0\) (formerly Finance Wales) to raise a further £20m by successfully floating on the AIM stock exchange\(^4\)\(^1\).

Creo Medical is now expanding their research activity by their involvement in the €4m Horizon 2020 project Sumcastec\(^4\)\(^2\). Working alongside Bangor University and a consortium of EU partners, Creo Medical is helping to develop a device that can improve the treatment of brain tumours prevalent in children.

Professor Chris Hancock of Creo Medical said: “Horizon 2020 offered us an exciting opportunity to create a collaborative research environment to help move our ideas forward to commercialisation. To develop a new medical device you need specialist clinical input and the project is benefiting from expertise from neurosurgeons, microbiologists and engineers from our partners across Europe.”

“The funding is also really important in enabling us to invest in equipment and people which will help take the company forward, and we’ve taken on a PhD student as part of the project cementing the links between the company and Bangor University.”

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40. Development Bank of Wales: https://developmentbank.wales/
Key Objective: Develop a Horizon 2020 culture and community in Wales

To deliver a step change in Welsh performance in competitive funds such as Horizon 2020, it is important that we encourage and support a culture change through targeted events, training and communication activity. Welsh organisations need to understand the long-term strategic benefits of engaging with such funds despite the challenges they may face in doing so.

Progress to date

Working in collaboration with a number of stakeholders, the Horizon 2020 Unit delivered two significant events in 2017, as well as several highly topical workshops and general promotional activity.

The third Horizon 2020 Annual Event took place on 30 March 2017 and gave Welsh, UK and European stakeholders the opportunity to discuss the mid-term evaluation of Horizon 2020 and Wales’ White Paper on Brexit ‘Securing Wales’ Future’. During the afternoon specialist workshops were held on smart energy systems, jointly organised with Cardiff University, and on the range of support available to Welsh businesses.

On 11 November 2017, coinciding with the opening of the first health calls of the 2018–2020 Work Programme, Wales hosted the UK’s Horizon 2020 Health, Demographic Change and Wellbeing Information Day in Cardiff. Chaired by the Chief Medical Officer for Wales, the event included presentations from the European Commission on the new work programmes, information on related UK funding and advice on the support available to access the many opportunities. Four workshops also covered the detail of the calls, proposal development, and legal, financial and IPR matters.

Figure 11 – Welsh, UK and European stakeholders discussed key issues at the Horizon 2020 Annual Event in March 2017.

43. https://beta.gov.wales/brexit
Other 2018-2020 Work Programme information events delivered in Wales included ‘Nanotechnologies, Advanced materials, Biotechnology and Advanced Manufacturing and Processing’ in partnership with Cardiff University, WHEB\textsuperscript{44} and Innovate UK; as well as innovation funding workshops in North and South Wales, in partnership with Innovate UK and a range of business support providers.

In addition, we would like to acknowledge the events run by others, such as Bio Wales, ColInnovate, the Digital Festival 2017, the Atlantic Action Plan UK National Workshop on Marine Energy, Engineering Wales Conference and the SMECluster\textsuperscript{45} which enabled the Horizon 2020 Unit to promote funding opportunities during the year.

Activity in Brussels included the Horizon 2020 Unit presenting at two workshops in the high profile European Week of Regions and Cities\textsuperscript{46} in October to share best practice in maximising the synergies between EU funds.

In addition to events, we have continued to promote Horizon 2020 through a range of other communication channels. Our Horizon 2020 e-News has proven popular with seven bulletins issued during 2017 covering the latest information on Brexit developments, Welsh successes, application tips and links to relevant events and funding. Our Horizon 2020 tweets attracted over 38,000 impressions in 2017. The Horizon 2020 pages\textsuperscript{47} on the Welsh Government website now contain over 20 case studies of Welsh success.

**Forward look**

The fourth Horizon 2020 Annual Event will be held on 15 March 2018, and the theme will be ‘Horizon 2020 and FP9: Forging partnerships, driving success’. It will explore how continued commitment to collaborate with Europe and the rest of the World will help drive Wales’ competitiveness and growth. Discussions are likely to focus on the issues and opportunities Welsh organisations would like to see addressed in the development of the next Framework Programme (FP9). Afternoon workshops will focus on the SME Instrument and the opportunities provided by European networks such as the Vanguard Initiative.

The Horizon 2020 Unit is also working with partners to scope and develop a number of other events and workshops during 2018. There will also be communication activity around the development of FP9, with signposting to the EC’s public consultation on FP9 already underway through WEFO’s e-newsletters and Twitter account.

\textsuperscript{44} Welsh Higher Education Brussels: http://www.wheb.ac.uk/en/
\textsuperscript{45} SME Cluster: http://www.smecluster.com/
\textsuperscript{47} Welsh Government H2020 Pages: http://gov.wales/funding/eu-funds/horizon2020/?lang=en
Hear about the benefits in their own words

A notable feature of the year has been the use of digital footage to celebrate Welsh success for key events and statistical releases. WEFO has worked with stakeholders to promote Wales’ performance in Horizon 2020, strengths in Welsh research and innovation and individual success stories.

The success stories of Welsh participants, hearing in their own words the benefits of engaging in Horizon 2020, are particularly powerful. The wider benefits of engagement in the programme, such as ongoing access to world-class research partners and new business opportunities, are covered prominently by the interviewees. They also challenge the myths around how difficult it is to engage in the programme and share many tips on how to be the ‘right partner in the right place at the right time’.

Feedback from Welsh, UK and European stakeholders on the digital footage has been very positive. The Horizon 2020 Unit has heard of several examples of the footage being used independently by stakeholders to promote Welsh success and attract potential collaborators. We encourage stakeholders to do more of this.

Hear what beneficiaries say about Horizon 2020

Key Objective: Maximise the impact of existing and emerging support

There is a significant amount of skills, experience and expertise available at Welsh, UK and EU levels. This support structure will continue to evolve and emerging sources of support must complement and add value to existing activities. It is a key aim of the Horizon 2020 Unit to engage and focus these resources for the benefit of Welsh organisations and ensure a consistent service. Maintaining and developing European and international networks is also recognised as key to this objective.

Progress to date

A significant proportion of the advice and support activity covered in this report has been delivered in partnership with Welsh, UK and European stakeholders, for example the events activity. The Horizon 2020 Unit and its partners have also continued to operate a ‘no wrong door’ policy for Welsh organisations seeking support on Horizon 2020 or alternative funding sources. The increasing amount of data emerging from the Welsh research and innovation ecosystem, including from ERDF investments, has enabled greater targeting of this joint activity.

The Horizon 2020 Unit has also continued to engage with the UK Government, devolved administrations and Welsh stakeholders around the implications of Brexit, using its networks and communication channels to raise concerns and address misconceptions.

The Welsh Government’s EU office in Brussels has continued to engage proactively with the EU institutions, regional and national representations and Brussels-based networks on research and innovation issues, working closely with WHEB. Examples of activity include:

- Wales becoming a full member of the Vanguard Initiative\(^{50}\), a network of EU regions which focuses on Smart Specialisation through innovation. The network provides opportunities for

\(^{50}\) The Vanguard Initiative: http://www.s3vanguardinitiative.eu/
collaboration, with a view to joint bidding for research and innovation funding in areas such as advanced manufacturing and the bio-economy. The Welsh Government, working closely with WHEB, has been working to maximise participation from Wales, and a number of Welsh HE institutions have expressed an interest in exploring this further. This is a good example of how our ambitions for further collaboration with partners across Europe, beyond the UK’s exit from the EU can be supported.

- Wales is a long-standing member of the European Regions Research and Innovation Network (ERRIN)\textsuperscript{51} and participates in a number of its thematic working groups. As members of the Health Working Group, the Welsh Government is currently helping to draft an engagement plan as part of a Horizon 2020 project, promoting activities through the European Innovation Partnership on Active and Healthy Ageing\textsuperscript{52} and attracting new members.

- The Brussels office is helping to strengthen the relationship between Wales and Québec, Canada. Wales and Québec already have a strong track record of working together in a number of areas, including between our HE institutions, and there are numerous areas where this collaborative working can be expanded, including in the life sciences and advanced manufacturing sectors. To help us with our EU transition, Wales can also learn from Québec’s experience of participating in the European Commission’s research programmes (with Canada as a “third country”).

- European Commissioner for Security, Julian King, visited Cardiff in September 2017, where he met the Welsh Government’s Cabinet Secretary for Finance and Cabinet Secretary for Economy and Transport. He also delivered a speech on security, focusing on Cybersecurity.

For example...

Wales is represented on the executive board of a number of European organisations, including EHTEL\textsuperscript{53}, EUREGHA\textsuperscript{54} and RSCN\textsuperscript{55}. These networks are helping us to create partnerships and through them benefit from a range of Horizon 2020 projects. For example, EUREGHA is a partner in the BOOST project – Building social and emotional skills to BOOST mental health resilience in children and young people in Europe\textsuperscript{56} – and will showcase activities in Wales.

Forward look

A key area of activity for 2018 will be engagement in the EC’s development of FP9, using all available networks and channels of influence to ensure the Welsh viewpoint is heard.

Partnership delivery will continue to be a key principle for the Welsh Government as will the use of data from the Welsh research and innovation ecosystem to help target support.

Links with key European regions and Member States such as Ireland will also be strengthened, for example through joint events or building on existing and future Structural Fund investments. Similarly, opportunities to develop and strengthen research and innovation links beyond Europe will be sought, such as with Québec.

\textsuperscript{51} European Regions Research and Innovation Network: https://www.errin.eu/
\textsuperscript{52} European Innovation Partnership on Active and Healthy Ageing: https://ec.europa.eu/eip/ageing/home_en
\textsuperscript{53} European Health Telematics Association: https://www.ehtel.eu/
\textsuperscript{54} European Regional and Local Health Authorities: www.euregha.net
\textsuperscript{56} Building social and emotional skills to BOOST mental health resilience in children and young people in Europe: http://www.euregha.net/news/221-boost-project-kick-off-meeting-18-19-january-brussels
The value of networking

Professor Shareen Doak of Swansea University has secured over €12m of Horizon 2020 funding to lead an international team of scientists to develop realistic tools for nanosafety assessment; despite the fact that only one project was funded under the whole call.

Professor Doak used an existing network of individuals in Europe and internationally who were working in aligned areas to explore the potential of a bid for Horizon 2020 funding. They dissected the fine detail of the call to break down the EC’s exact requirements and identified the most suitable partners to ensure all aspects were addressed. The consortium was assembled very early in the process which meant key players in this highly specialised field were on board before other potential projects could attract them. This work resulted in 24 partners from universities, government bodies and the private sector, across 13 countries world-wide.

The PATROLS project* (Physiologically Anchored Tools for Realistic nanOmateral hazard aSsessment) will establish and standardise a battery of innovative, next generation safety testing tools which can more accurately predict adverse effects caused by long-term engineered nanomaterial (ENM) exposure in humans and the environment.

Professor Shareen Doak said:

“Several problems currently exist in the field of nanosafety testing: standard non-animal tests are unreliable for nanomaterials, so there is a greater emphasis on nanosafety testing in animals. However, tests on animals are also unsuitable because they are expensive, time-consuming, and are associated with substantial moral concerns. Additionally, animal tests do not predict the consequences of long-term exposure on both human health and the environment.”

“PATROLS will address these limitations by providing state-of-the-art 3D culture models of the human lung, gastrointestinal tract and liver. The project will also deliver advanced testing methods for environmental safety testing and robust computational models that will allow us to more accurately predict human health and environmental safety based on data generated in cell culture. These approaches will therefore facilitate the reduction of animal testing currently required for ENM safety assessment.”

As the lead co-ordinator of the project Swansea University will receive over €1.4m of Horizon 2020 funding.

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Key Objective: Support and develop our experts and evaluators

There are a number of Horizon 2020 experts and evaluators in Wales with valuable knowledge and experience. By supporting them we can help ensure Wales maximises its influence on the delivery of Horizon 2020 and the development of FP9. We can also use their knowledge to support the wider Horizon 2020 community in Wales. Working with stakeholders to help them understand the benefits of supporting their experts/evaluators is also important as it has the potential to increase the number of experts/evaluators and in turn the benefits to Wales.

Progress to date

The ‘community of practice’ of Welsh experts/evaluators met three times in 2017. Once again it has proven a useful forum for discussing the implications of Brexit, with the group reiterating that they were not experiencing any bias in the evaluation of UK proposals following the referendum result. Discussions have also covered important insights on the application process and upcoming topic areas to help ensure Wales continues to maximise the opportunities in Horizon 2020. The Horizon 2020 Unit has also used the meetings to test the latest thinking on potential support mechanisms, including the scope of the second ERDF call for research and innovation proposals.

The ‘community of practice’ activity has extended beyond meetings with exchanges on key issues also taking place by email and members of the ‘community’ supporting thematic workshops with presentations on what makes a good application.

For example...

There has been a significant increase in the number of experts from Wales chosen to evaluate proposals since FP7. This is positive but given the size and breadth of the Horizon 2020 programme there is clearly room for many more if Wales is to maximise its influence. Discussions with the ‘community of practice’ have highlighted the importance of keeping your evaluator profile and CV on the Participant Portal up to date in order to increase the chances of being selected. Those with industrial experience should highlight that on their profile; you do not need a PhD to demonstrate relevant industrial expertise. For more information, see our guide on the ‘Benefits of being a Horizon 2020 Expert/Evaluator’ which was developed in partnership with the ‘community of practice.’

Forward look

The ‘community of practice’ will continue to meet regularly during 2018. A key topic for conversation will be the development of FP9.

With the support of the experts/evaluators, further ‘master-class’ sessions are also expected to take place on developing a successful proposal in key topic areas across Wales.

The Horizon 2020 Unit will continue to encourage stakeholders to put forward individuals as experts/evaluators. The capacity for which is being built through the strategic investment of ERDF funds.

Welsh expertise drives societal change

Building on historical EU funding investments in low carbon research, for example the Low Carbon Research Institute60 and the RegioStar61 finalist SEREN62, Wales has a significant pool of expertise which is helping to drive forward developments in global challenges such as energy and the low carbon economy.

The FLEXIS63 project has received £15m ERDF to take forward research into flexible energy systems. For example, Professor Nick Jenkins of Cardiff University is addressing how energy systems must evolve to provide sustainable, secure and affordable supplies over the next 30 years. His research builds on the research of seven academics and their researchers in the Centre for Integrated Renewable Energy Generation and Supply (CIREGS). The research group is involved in two Horizon 2020 energy projects: in the MAGNITUDE project64, Professor J Wu and Dr C Ugalde-Loo are bringing flexibility provided by multi energy carrier integration to a new magnitude, and in InnoDC65, Dr J Liang is looking into Innovative tools for offshore wind and DC grids.

There are also many links to world-class researchers supported through the Sêr Cymru scheme. For example, Professor Andrew Barron, a Sêr Cymru chair, is a principle investigator in FLEXIS but is also planning to take forward the Reduced Industrial Carbons Emissions (RICE) project led by Swansea University in partnership with the University of South Wales. RICE aims to deliver transformational change through the translation of innovative processes to reduce CO2 emissions and decrease Heavy Industry’s energy and raw material consumption.

The downstream benefits of this Welsh expertise can also be seen in the Caerau mine-water project66, a cutting edge green energy solution using a former colliery as a geothermal source of energy with heat pump technology and a network of pipes helping to warm around 150 nearby homes. The project, supported by £6.5m ERDF, builds on expertise developed under the SEREN project and is collaborating with the EU funded SPECIFIC67 ‘Buildings as Power Stations’ project.

This critical mass of expertise means that Wales is shaping and influencing technology development trends, funding programmes and relevant policies and regulations in the UK, Europe and globally.

60. The Low Carbon Research Institute: http://www.lcri.org.uk/
62. SEREN project: http://grc.engineering.cf.ac.uk/research/seren/
63. FLEXIS: http://www.sewales-ret.co.uk/flexis-flexible-integrated-systems/
64. MAGNITUDE: https://cordis.europa.eu/project/rcn/211956_en.html
67. SPECIFIC project: http://www.specific.eu.com/
Horizon 2020 in Wales
2017 highlights

- €83m Funding secured
- €30m increase this year
- 189 Horizon 2020 participations
- 77 Participant increase this year
- 29% of participations led by Welsh organisation
- 18 Newcomers this year
- 2000 International collaborations
- SCoRE £0.4m invested, yielding €3m
- £280m ERDF invested in R&I since 2014