



Llywodraeth Cymru  
Welsh Government

PUBLICATION

# Innovation strategy for Wales

We are seeking your views on the draft innovation strategy for Wales.

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# Contents

[Overview](#)

[Vision](#)

[Introduction](#)

[Innovation Wales: 10 years of progress](#)

[Prosperous](#)

[Healthier](#)

[Resilient](#)

[A Wales of vibrant culture and thriving Welsh language](#)

[More equal](#)

[A Wales of cohesive communities](#)

[Globally responsible](#)

[Consultation questions](#)

[How to respond](#)

[General Data Protection Regulation \(GDPR\)](#)

[Your rights](#)

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# Overview

In 2012, Welsh Government's strategy for science, Science for Wales, laid out a plan for a step-change in Wales' academic performance across the sciences. It also stated that if the step-change is to be translated into widespread, real, and tangible improvements for the Welsh people, then we need to commercialise more of our ideas, discoveries and intellectual property into new or better products and services. To this end, it recommended a new innovation strategy for Wales.

Around the same time, the European Commission invited regions across Europe to develop a Research and Innovation Strategy for Smart Specialisation (RIS3). The purpose was to allow regions to identify particular economic strengths or opportunities and prioritise activities or clusters which could benefit from more research and innovation.

Innovation Wales was subsequently published in 2013.

## Looking ahead

Innovation Wales was successful in stimulating and supporting innovation delivery across Wales. Today however, the innovation landscape in Wales is very different and has changed considerably over the past decade. The previous strategy predates the Well-being of Future Generations (WfG) Act, the UK's exit from the EU, the COVID-19 pandemic, and new targets to achieve net zero carbon emissions by 2050. It, therefore, does not take account of the loss of the European Regional Development Fund (ERDF) money used to support Welsh research and innovation activity including programmes delivered outside of Government.

We intend using the Wellbeing of Future Generations Act and its seven goals as

the template for our overarching narrative on where we want to go with the innovation agenda.

## **Plaid Cymru and Welsh Government Co-operation Agreement and the innovation strategy**

The draft strategy has been developed in accordance with the Co-operation Agreement between the Welsh Government and Plaid Cymru, where it states that a new mission-based national innovation strategy will be developed and implemented across Government and by CTER.

### **Vision**

Our vision is to foster a vibrant innovation culture in a stronger, fairer, greener Wales.

A vibrant innovation culture will depend upon on a shared mission to secure greater wellbeing for the people of Wales and future generations.

Our wellbeing goals will frame our collective direction and stimulate innovation for public value in a modern, dynamic Welsh economy.

We will help to unite our innovation ecosystem in a rapidly changing landscape. A new direction that maximises investment from UK bodies, and beyond, will support the development of new products and services with global impact that address key social and productivity challenges.

We propose a new integrated Innovation Strategy to guide actions government, businesses, third sector, academia and citizens to deliver achievable, ambitious goals in a Wellbeing economy.

Our objectives:

- a stronger and more resilient economy
- effective and sustainable healthcare
- better services for vulnerable people
- higher educational standards, particularly in tertiary education and research
- respond to the climate and nature emergency in everything we do

We have engaged extensively to bring together an integrated strategy to guide the direction of innovation across Wales. We will continue to engage with partners during this consultation to test and explore options for delivery against our ambitious goals.

Stakeholder engagement has so far highlighted the need to:

- mobilise consortia to attract investment from UK funding sources and competitions
- use procurement to drive innovation within the public sector, and in partnership with industry
- share the risk and supporting business innovation
- apply learning from our health innovation programmes to develop a programme of social care innovation
- foster a culture of innovation starting with development of our children through the new curriculum, right through their journey through education into the work place
- use innovation as a tool to increase resource efficiency and reduce carbon emissions
- equality, diversity and inclusion, support more people to participate in innovation, and to feel the effects of innovation regardless of their demographics or where they live in Wales (which aligns with the UK Government levelling up agenda).

We will measure progress against the following. This is not an exhaustive list,

please see each chapter for the full details:

- increased new products/services to domestic and international markets
- new enterprises/jobs, net employment gain
- increased spend within Welsh Economy (supply chain dev't/pub sector proc)
- through new measures of 'value' in RD&I
- increased spend on RD&I (GERD, BERD, HERD, GovERD)
- increased research income won from sources outside of Welsh Government
- increased RD&I activity in Wales
- improved value for money from research and innovation in the HE sector and in industry
- creation and growth of public sector research establishments (PSREs), national laboratories and research institutes
- improved deployment of research from the HE sector on both delivering on the socio-economic, health and well-being and environmental goals and on informing future Welsh Government policy development.
- improved engagement with Innovation Skills (wider education activity?)
- improved productivity (GVA)
- more bilingual software exists which gives good user experience in Welsh and English, more companies create bilingual software and use Wales' bilingualism to expand their software offer internationally to other multilingual areas
- increased leverage of UKG funding streams into Wales
- patent registrations
- reduced use of raw material resources (ie. a reduced material footprint for Wales) and lower consumption and territorial carbon emissions
- improved patient / citizen outcomes
- improved patient / citizen experience
- improved resource efficiency

# Introduction

There has been significant progress and growth in Research, Development and Innovation in Wales since 2013. Our research for this strategy showed that much of this growth was taking place in an increasingly complex landscape, often undertaken by multiple actors in discrete projects, without necessarily understanding how the pieces might fit together, both within Wales and beyond.

Whilst it was recognised that the public sector had to be a key enabler of innovative change, it soon became apparent that much of its stimulation and investment in innovation was being undertaken in many different parts of the public sector and at several different layers of governance.

Wales has a unique set of principles, set out in our Wellbeing of Future Generations Act of 2015, and it is consistent that we should frame an innovation narrative, which describes how we will apply innovation and where we want to go around its seven goals. It is consistent but also necessary, because there is not one of the seven goals that can be better delivered without the application of innovation.

We have therefore set this new strategy out in seven chapters, each explaining how the application of innovation can help deliver on the goals. Following this, we will develop an action plan, aligned to the strategy which moves it forward to tangible costed actions.

## Innovation Wales: 10 years of progress

In 2012, our Science for Wales strategy laid out the Welsh Government's plans for a step-change in Wales' academic performance across the sciences. If this was to translate into widespread, real, and tangible improvements for the Welsh

people, then more of our ideas, discoveries and intellectual property needed to be commercialised into new or better products and services. To support and enable this, it recommended a new innovation strategy for Wales.

Around the same time, the European Commission invited its regions to develop a Research and Innovation Strategy for Smart Specialisation (RIS3), allowing them to identify economic strengths and opportunities and to prioritise activities or clusters which could benefit from more research and innovation.

The innovation strategy, Innovation Wales was subsequently published in 2013, adopting the Smart Specialisation approach and helping shape Wales' EU funds for Research, Development and Innovation for 2014-2020. It identified several key themes where Wales needed to improve its performance:

- improving collaboration
- promoting a culture of innovation
- providing flexible support and finance for innovation
- innovation in government
- prioritising and creating critical mass.

Looking back over this period, significant progress and positive outcomes have been made in each of these areas as a result of the efforts of a great many Research, Development and Innovation (RD&I) stakeholders in Wales.

As a small nation, we have a significant impact at an international level. In academic research, Wales increased its share of internationally co-authored publications by more than 15%, rising to almost 60% between 2010 and 2018. Publications resulting from international collaboration are the most highly cited, with an average citation impact that is more than twice the global average, and the highest of the UK nations. Research in Wales is also deeply engaged in the UK research system, with 20% of Welsh publications produced in collaboration with other UK nations, the highest share of any other UK nation.

Wales recognises the importance of multilateral programmes to address global challenges. In the 2014 to 2020 period, Wales took part in EU Horizon 2020 projects worth over €2 billion with 6,000 partners across a wide range of subjects, from international safety standards for nanotechnology on helmets, to developing products from agricultural waste. We remain an active member in several European Union initiatives, in collaboration with some forty EU regions. We made the most of the EU's Interreg funding, which connected Wales to Ireland and other parts of Europe.

Wales received €150 million Horizon 2020 funding during this period, despite a significant downturn following the Brexit referendum. Per head of population, this is greater than Normandy and Northern Ireland, similar to Brittany and Schleswig Holstein, but considerably below others such as the Basque Country and Estonia. Per head, the West of Inner London received 28 times more funding than Wales. Over 50% of the UK's Horizon Europe funding was won by the south east of England. It is not unusual for research and innovation to be concentrated in certain cities but the golden triangle universities are particularly strong. In 2015, before the UK referendum, just 5 golden triangle universities secured 10% of the EU's Horizon Europe funding for around a thousand universities. Relative to the UK, Wales' Horizon 2020 funding is similar to our percentage of UK R&D expenditure as a whole: around 2%.

OECD research clearly indicates that, of the developed economies, the UK is striking for the scale of the prosperity and productivity gap between its nations and regions. This has been echoed by NESTA, who point out the divide between a highly productive, prosperous knowledge-based economy in the south-east and east of England and an economy that lags behind Northern European competitors in the rest of England, Wales and Northern Ireland.

In terms of UK programmes, projects across all sectors and based in Wales, have secured over £254 million from Innovate UK since 2014, for industry-led innovation, representing over 2% of the annual budget.

Increasing the Welsh share of competitive funding is an important objective, but is one that depends on the fundamental building blocks of the R&I system for success, so must be addressed from all angles. It has long been recognised that the size of the research base is a factor, a higher number of excellent researchers will in turn apply for more funding. Efficiency in achieving that funding is another factor, Welsh institutions can work to improve the amount of competitive funding that we draw down per researcher. However, this should not just be for universities to achieve. The Basque Country's success in Horizon Europe is due to its strong technology organisation such as Tecnalia. National public research centres and large corporations play a bigger role in other countries compared to Wales. Wales has a strong and innovative SME sector but this alone is not sufficient to translate into UK or EU competitive funding success.

Support for effective collaboration between Research Organisations, the public sector and business, through schemes like SMART Expertise have also been highly impactful. These recognise the shared effort between parties, resulting in shared rewards, in particular the generation of Intellectual Property (IP), exploited to create economic and social impact for all partners. To date, 484 organisations have been involved in such collaborations, resulting in 164 new products or services and match funding investment of £29 million from financial support of £26.2 million.

## **Promoting a culture of innovation**

A diverse and active innovation ecosystem has developed within Wales. Assets such as the Advanced Manufacturing Research Centre (AMRC) and the Compound Semiconductor Cluster have been established, alongside academic institutions and industry partners such as the Institute of Biological, Environmental and Rural Sciences, supporting Welsh industrial innovation strengths.

These assets have supported a culture of innovation, engaging more public sector partners, businesses and entrepreneurs in innovation opportunities and events. Support with advice, guidance, partnering and funding has been available to help public, private and academic organisations to collaborate and adopt open innovation practices. Some 15.8% of all graduate start-up in the UK were from Welsh Universities (2019 to 2020 data HEBCI).

Creating a culture of innovation requires interventions at all ages, so there is a commitment for innovation and entrepreneurship to feature in the new curriculum for Wales. The education of our children and young people will now include building the capacity to develop and nurture entrepreneurship for future generations.

Since 2014, our young people have been encouraged and supported to innovate, whether through the Welsh or English language. More than 334,000 young people have attended Big Ideas Wales enterprise workshops, promoting business ideas within young people. Over 33,000 secondary school pupils have enjoyed flagship projects such as Technocamps 2, STEM Cymru, STEM Gogledd and Trio Sci Cymru. More than 13,000 pupils have competed in the WJEC Innovation Awards.

These STEM engagement activities deliver impact, particularly for under-represented groups: in 2021, 52% of Welsh STEM apprenticeship enrolments were women, compared to 44% in England, 9% in Scotland and 3% in N Ireland.

Our £50 million investment in the Sêr Cymru programme aims to bring scientific talent into research posts in Wales. It has generated more than £180 million in research income, increasing Wales' research efficiency, outputs and impact, in areas such as energy materials, life sciences and environmental science.

Between 2014 and 2020, there were over 450 corporate investments into Wales across a broad range of sectors and businesses, many of which involved R&D activity. They delivered over 21,200 new jobs, with a further 18,300 being

safeguarded and represented a capital investment into Wales of £3.8 billion.

Examples include SPTS, a global leader in compound semiconductor equipment, investing to expand both its R&D and manufacturing capabilities at Newport; Aston Martin building its SUV manufacturing and R&D facility in St Athan creating 750 jobs; Wockhardt investing £10 million in a new production line at its Wrexham site to develop and manufacture pharma products creating 50 jobs; Bombora Wave Power establishing its European HQ in Pembroke to develop its marine energy product offering investing nearly £18 million and creating 25 jobs.

## **Providing flexible support and finance for innovation**

As well as growing Wales' access to UK innovation and research funding during this period, there have also been RD&I opportunities exclusively for Welsh companies. Our SMART programme has been delivering projects in every region of Wales, supporting over 520 individual companies to develop new products, services and processes.

The co-investment approach has generated £43 million private sector investment in RD&I from funding awards of £36 million. This support has created significant impact in selected high-value sectors: a recent independent assessment found that '...in five sectors which received a little under half of the grants, GVA per employee in 2018 was in excess of £80,000, with the Welsh average in 2018 being a little over £30,000'.

Welsh businesses have been supported with guidance and finance to innovate internally and over 4,000 businesses have now adopted environmental sustainability strategies. This support continued during the COVID-19 pandemic, rapidly pivoting to areas of greatest need; testing the public sector to trial and implement new technologies, and innovators and businesses to restructure manufacturing processes to produce much needed PPE, sanitisers and medical

equipment.

The Development Bank of Wales has also been investing in innovative Welsh companies, offering a collaborative model that creates long-term working relationships with businesses. Its technology ventures arm has invested over £28 million in 70 companies over the last three years, leveraging a further £71 million in co-investment from the private sector. Of these companies, 34% were start-up businesses with many accessing multiple rounds of equity from the funding escalator structure offered by the Bank.

This support for tech-innovation has had a tangible impact in certain parts of Wales, for example the rapidly growing fintech cluster in Cardiff. Looking forward, it will seek to extend its reach to all areas of Wales. The Bank's support includes working with businesses of all sizes and sectors, covering operational, service and business model innovation as well as traditional R&D. On average, at any one time, 33% of the Bank's clients are undertaking some form of innovation activity, often leading to high-quality employment and corporate growth.

Since 2015 Welsh Government grant funding to WRAP Cymru has allowed it to provide resource efficiency innovation support to more than 316 Welsh businesses. From 2019 to 2021 the £6.5 million Circular Economy Fund grant funded innovation in resource efficiency in 21 businesses, with an impact over three years anticipated to include: the incorporation of 62,812 tonnes of additional post-consumer recycled materials into products manufactured in Wales; the prevention of 53,850 tonnes of CO<sub>2</sub> emissions; the creation of at least 103 new jobs; turnover growth in excess of £70.86 million; and over £1.47 million worth of cost-savings. Since 2019 WRAP Cymru has worked with more than 20 partner organisations to deliver four innovative supply chain projects, showcasing how manufacturers can overcome challenges to increasing the use of recycled materials in products made in Wales. The projects address both commercial and technical challenges, while highlighting economic viability and environmental benefits.

## Public sector innovation

The Welsh public sector has become an exemplar in developing and testing solutions to some of our biggest societal problems by using challenge-led procurement to engage with industry; the Small Business Research Initiative (SBRI).

Wales is an active champion for the Small Business Research Initiative (SBRI), which sees public sector bodies publishing problem statements or challenges. This allows suppliers to propose innovative solutions; either novel ideas or tried and tested products from other sectors or countries. We have expanded the use of this challenge led approach into the private sector, running events in areas such as Agri-tech and Blockchain. We will continue to expand the use of challenge led innovation across the Welsh Innovation Ecosystem, with the support of our SBRI Centre of Excellence and through continuing cross sector collaboration.

Since 2014, 28 challenges have been launched with UK partners including the UK Government's Defence and Security Accelerator (DASA) and the Department for Transport. More than 50 Welsh businesses have secured contracts to develop innovative solutions to the challenges posed.

The approach was boosted in 2019 by the establishment of the SBRI Centre of Excellence in Wales at Betsi Cadwaladr University Health Board, which hosts challenges and raises awareness of the opportunities.

These collaborative projects have brought additional funding of £8.9 million for public sector innovation. Recently, the Cardiff City Region Deal and the Mid Wales Growth Deal have developed challenge-led programmes to harness innovation whilst creating economic value.

NHS Wales is proving a very successful test bed for new technologies and

processes developed by SBRI and other innovation initiatives. Since 2015, 58 projects have been supported by the Efficiency through Technology Programme to develop, test, and adopt new technologies, digital tools and processes.

Health Technology Wales, an organisation within NHS Wales, provides a national vehicle to identify, appraise and recommend health and social care technologies for adoption. Between 2017 and 2020, 20 appraisals were completed, advising on appropriate adoption. This advice has the potential to save the health and care service in Wales £5.8 million annually.

Since 2016, Welsh Government grant funding to WRAP Cymru has enabled it to support resource efficiency and a circular economy approach within the procurement activities of 39 public sector organisations, influencing over £4.5 billion of Welsh public sector spend.

## **Prioritising and creating critical mass**

Whilst supporting individual innovations, there is also a need to focus on larger R&D opportunities and strengths, attracting bigger “magnet” investments and delivering greater impact through clustering and prioritising strengths. These large-scale projects will deliver impact well into the life of the new strategy.

Examples include:

The Compound Semiconductor Cluster, which attracted a £43 million investment in 2020 will focus around four key collaborative research and development (CRD) programmes including central coordination activity to represent and promote the cluster to develop regional educational and skills capabilities for the sector.

The South Wales Industrial Cluster (SWIC), a collaboration of over 40 industrial partners, energy suppliers, infrastructure providers, academia, the legal sector,

service providers and public sector organisations, has been successful in attracting investment of £23 million from UKRI's Industrial Decarbonisation Challenge programme. It will develop detailed plans and engineering designs to support the area becoming a carbon net zero region by 2050.

The AberInnovation development at Aberystwyth attracted £40.5 million from the European Regional Development Fund, the Biotechnology and Biological Sciences Research Council (BBSRC) and Aberystwyth University. The translational R&D facilities host a growing pipeline of collaborative projects between industry and academia.

Its incubator for start-ups is currently wholly occupied with 14 tenant businesses and 16 associate member businesses, creating of 34 high-value jobs and raising £3.8 million in grants and investments. Opened in 2021, there are already 68 company alumni of AberInnovation's business programmes, with 16 new businesses incorporated.

## Context

The process of developing a new innovation strategy started with the commissioning of two pieces of work by the Innovation Advisory Council for Wales (IACW):

- an examination of the current landscape of innovation in Wales, conducted by the Centre for Innovation Policy Research at Cardiff University, Scoping the future of Innovation Policy in Wales
- a look across the UK, the EU and global innovation eco-systems for comparators and best practice, undertaken by Amplyfi, a Cardiff-based artificial intelligence data analysis company.

Most of the recommendations in Scoping the Future are reflected at relevant points in this draft strategy. These include the need for academic research to be

more commercially oriented; a recognition of the importance of skills capabilities; mission-based innovation to tackle societal challenges, and an acknowledgement of a place-based dimension to innovation investment plans.

The Amplyfi work looked at world-leading innovation hubs like Singapore, New York California and Taiwan, before having a closer examination, nearer to home, at Ireland, Manchester and an e-Estonia project.

The report identified some key drivers for innovation which find a place in the Strategy like the importance of social innovation and the public sector. It pointed to Sustainability as 'the most prominent theme amongst these drivers, and the one carrying the most momentum'.

It identified the UN's Sustainable Development Goals (SDGs) regarding the Circular Economy, Climate Change, Energy Efficiency and Renewable Energy with our Wellbeing goals and this suggest they form a prominent role in our new Strategy.

## Looking ahead

Innovation Wales provided a strong foundation in how to stimulate and support innovation, but the background to our innovation landscape has changed over the last 10 years. Alongside the macroeconomic impacts of Brexit and COVID-19 we also have a new Programme for Government; the Well-being of Future Generations (WfG) Act passed in 2015, and we now have a legal commitment to reach net zero carbon emissions by 2050.

On the one hand, the UK's exit from the EU means the loss of the European Regional Development Fund (ERDF) money, used to support Welsh research and innovation activity. The Welsh Government has consistently warned of the consequences of the UK decision to not replace in full the funding and decision making powers that have been controlled in Wales for more two decades. The

uncertainty represented within new arrangements to date risks causing delays, confusion and poor value for money. Against a difficult backdrop, our strategy will seek to maximise strategic alignment among partners in Wales to ensure that we can secure ambitious growth in research and innovation activity with dynamic programmes across Wales. We will continue to advocate an approach to broader Post EU governance and funding arrangements at a UK level. Innovation within Wales and across the UK would be strengthened by more stable, long term arrangements that complement the devolution settlement in order to build in greater certainty within an approach that draws strength from a commitment to partnership working across each level of government.

Despite these challenges the UK Government has made a significant commitment for total R&D investment to reach 2.4% of GDP by 2027. The UK Government's Levelling Up White Paper further commits to increase the level of domestic public investment in R&D outside the Greater South East by at least 40% by 2030. Both commitments should lead to greater opportunities for investment in Welsh R&D and we will continue to engage with the UK Government to ensure that the areas of strength represented in our regions are recognised and supported.

The world is changing. We are facing a future that is both precarious and full of opportunity.

## Prosperous

The Mission: to create an innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing fair work.

To achieve this, our strategy needs to have an inclusive approach to innovation, and to build a culture of innovation within Wales. Starting with our young people and education, it should then pervade each sector of the economy where we work, whilst seeking to optimise the resource efficiency of the environment in which we live.

## Our people

The foundations of a culture of innovation lie in our schools, colleges and universities.

The Welsh Government, subject to stakeholder engagement, will launch in 2022 a new STEM enrichment funded programme.

Our new Curriculum for Wales will prepare learners for knowledge-based careers and work. It supports learners to be resilient, creative and ambitious, requiring them to solve problems, engage with different information and work independently and preparing our young people for the opportunities and challenges of an ever-changing economy.

Learners will have every opportunity to develop as enterprising, creative contributors and ambitious capable learners, who are ready to learn throughout their lives. STEM subjects are integral to the Curriculum, which includes Science and Technology, Maths and Numeracy as two of its six Areas of Learning and Experience. These skills will be essential to master new knowledge and the digital skills needed for the fourth industrial revolution. We will continue our partnership with the WJEC to deliver the all-Wales Innovation Awards, encouraging young people in schools and colleges to be technologically innovative and to appreciate the importance of design and technology.

The Engineering Education Scheme in Wales, ESW STEM Cymru, will continue to provide students with the opportunity to gain practical experience working with

industries, businesses and higher education.

At the next level, in Tertiary Education and Research, we plan a joined-up system which is valued by the public, delivers excellence in training, research and innovation, helps tackle inequalities, and has a civic mission at its heart.

For those research groups which have been historically dependent on EU Structural Funds, a major transition towards alternate funding sources, including UK Government, UKRI, charities and business and industry funding may well be required. To maximise opportunities, a change of approach will be needed, given the competitive nature of the UK funding landscape. Tackling these issues will require consideration of the following:

- the critical need to help those research groups making this transition towards greater competitiveness in UK terms and create a general incentive and reward mechanism as part of the overall funding
- an approach that incentivises and rewards successful grant applications from all the major UK and international funders outside of Welsh Government (e.g. UKG, BEIS, UKRI, charities, industry, business, others)
- a need for greater collaboration between our academic institutions and business and academic partnerships, underpinned by local strengths in a collaborative approach using Welsh Government levers which invite UK Government support.

Building on discussions to date it would be beneficial to start the development of a more strategic approach to the allocation of research funding, this would need to take account of the Welsh Government's Programme for Government and its published priorities for RD&I, see [Written Statement: Five priorities for research, development and innovation](#).

By employing these principles, we strengthen Wales' economic well-being, and by collaborating with business we can provide the skills employers and workers need to grow our research and innovation base. Our Knowledge Transfer

Partnerships, delivered collaboratively with Innovate UK, will provide opportunities to link innovative organisations with the UK's world-class academia to deliver innovation led by inspired graduates, helping businesses improve their competitiveness, productivity and performance through better use of knowledge, technology and skills.

There will be new legislation to establish the Commission for Tertiary Education and Research (CTER), which will replace and build on the Higher Education Funding Council for Wales (HEFCW). This will be responsible for the funding, direction and oversight of our higher and further education, local authority maintained school sixth forms, apprenticeships, adult community learning, and aspects of the research and innovation that they deliver.

The new Commission will be designed to align education and training more closely to employers' needs, to protect the interests of learners, ensuring vocational and academic learning are equally valued and to create and sustain a Wales of vibrant culture and thriving Welsh language.

As well as delivering greater productivity, the narrowing of educational inequalities will expand opportunities, raise standards, address employability concerns and ultimately combat poverty. Furthermore, CTER offers the opportunity for aligning research and innovation endeavours in RD&I organisations with apprenticeships, skills development and training so that a holistic and aligned approach between tertiary education and RD&I can be fostered.

HEFCW allocated in excess of £81 million Quality-related Research (QR) funding in 2021 to 2022 to maintain institutions' research capacity in addition to more than £6 million to support Postgraduate Research. HEFCW also supports innovation and engagement activity within Welsh academic institutions through the £15 million Research Wales Innovation Fund, which will continue.

The next phase of the Sêr Cymru Programme will be subject to further

discussion with HEFCW together with all our other partners in the Programme. The proposed drivers behind the Programme will be to continue to build on our research capacity and capability in Wales, using it to leverage in a greater range of funding sources on a UK and international basis, encouraging greater collaboration, co-production, co-delivery and help assist the transition to greater competitiveness for our HE research community in Wales. The next phase will look to align and deploy research in support of the ambitions of the Welsh Government's Programme for Government and will look to theme research calls to aid the focus and collaborative efforts.

## Inclusivity

Evidence shows that innovation and employment have a positive correlation. The OECD found that deployment of new technologies has historically led to net job creation, **Technology, productivity and job creation: best policy practices**. However, innovation can be disruptive and jobs will be lost as well as created. This complicates public policy responses, but like other structural challenges our economy faces (e.g. net zero) it offers a window in which we can improve the skills of people in declining or vulnerable sectors of employment, as well as offering an opportunity to actively mitigate against exacerbating inequalities. It is also the case that jobs are created and lost on a routine basis. In Wales alone, more than 2,000 jobs are created in a typical week and slightly fewer destroyed. This churn in employment is a sign of a healthy labour market. This is also evident in business births and deaths. Churn allows workers to match their skills to appropriate jobs and entrepreneurs to seek out the most valuable investment opportunities.

Our skills and employability priorities must underpin our innovation strategy if the prosperity it generates is to be shared by all. These priorities were set out in Stronger, Fairer, Greener Wales: a plan for employability and skills and they include:

- a Young Person's Guarantee: giving everyone under 25 the offer of work, education, training, or self-employment
- tackling economic inequality: a focus on improving labour market outcomes for Black, Asian, and Minority Ethnic communities, women, disabled people and those with low skills
- promoting Fair Work: encouraging employers to make work better, fairer and more secure; promoting the role of trade unions; empowering responsible businesses; improving the quality of employment; increasing workforce diversity; and enhancing physical and mental health
- supporting people with a long-term health condition to work: by preventing people falling out of employment through health prevention, early intervention, healthy workplaces and optimising the role of NHS Wales as an anchor employer
- raising skill and qualification levels, and the mobility of the workforce: by expanding the system of flexible and personal learning to develop adaptable skills to increase workforce resilience, and for everyone who needs help to progress, improve their skills, find work or retrain.

Regional Skills Partnerships (RSPs) are central to understanding the employment and skills needs of the future. They collate labour market intelligence from employers, providing an evidence base which will help inform decision making, focused on enabling change, to meet an evolving economy as a result of innovation and other drivers such as Net Zero Wales by 2050.

## The UK policy context

Our strategy cannot be developed in a vacuum and recognises Wales' position within the UK. This is not just because we share national RD&I assets, we share an integrated economy. Therefore, we acknowledge at the outset the parallel nature of Welsh and UK ambitions for mutual progress in innovation across the UK RD&I spectrum.

In July 2021, the UK Government published its Innovation Strategy, one year after its UK Research and Development Roadmap. It is within the context of both these documents that our innovation strategy will fit and operate. The UK works better when its parts work together.

The Welsh Government is supportive of the aim to reach £22 billion per year nationally invested in RD&I by 2024 to 2025 and the longer-term goal of reaching 2.4% of UK GDP spent on RD&I by 2027.

The Welsh Government and UK Government have overlapping roles in the fields of research, development and innovation. The UK Government distributes significantly more funding which Wales must attract to support delivery of the UK strategy, as well as Welsh innovation priorities on the many areas where we have shared ambitions. Welsh Government and Innovate UK, as the delivery body for UK Government, have committed to work collaboratively.

In terms of prosperity, we agree with the UK Strategy of prioritising the need for RD&I to be commercially focussed and outcome centred. Our own consultations for this Strategy align with the UK's emphasis on missions and technologies, prioritising and stimulating innovation to deliver against the goals in our Wellbeing of Future Generations Act, and drive capability in key technologies.

In last year's Autumn Spending Review, the UK Government committed that by 2030, domestic public investment in R&D outside the greater south-east will increase by at least 40%, and over the Spending Review period by at least one third. It also seeks to leverage at least twice as much private sector investment over the long term to stimulate innovation and productivity growth. These are welcome statements of intent for Wales and we will invest in our capability and capacity, across the ecosystem, to attract this investment and deliver the required impact. However, there is still a shortfall from former EU structural funds.

## The Welsh dimension

There are significant ramifications for Wales in this national approach, particularly for RD&I being undertaken in our businesses and with business led collaborations.

The Welsh European Funding Office calculate that during the last round of EU funding (2014 to 2020) it invested over £500 million in Research and Innovation projects. This included over £68 million ERDF money for the Welsh Government's SMART innovation support for businesses. In addition, £233 million of ESF funding was invested in our apprenticeship scheme.

With a greater proportion of SMEs, a smaller proportion of large corporate R&D practitioners and smaller academic institutions outside of Cardiff and Swansea, Wales has historically underperformed in traditional UK competitive bid funding rounds. If Wales is to increase its share of competitively awarded funding, the research and innovation ecosystem will need to collaborate on their shared strengths and ambition to make strong proposals to UK Government, UKRI, charities, industry and international funding. A strong example is the media.cymru consortium made up of public sector, private sector and academia. The consortium, led by Cardiff University has secured a £50 million programme to grow the Creative Industries sector through RD&I in the Cardiff Capital Region. This programme supported by UKRI, Welsh Government and Cardiff Capital Region Deal will run until 2026, driving inclusive and sustainable economic growth.

This is likely to be a challenging transition and we will scope out ways to support, incentivise and reward this transition.

HEFCW is exploring how a more strategic approach to the allocation of research funding can be developed to help maximise grant capture from other sources. Building on the early success of the Wales Innovation Network (WIN) we will

work with HEFCW, Universities Wales and the sector to support a collaborative approach to maximise the value of HEFCW's research funding in support of the Welsh Government's priorities for research development and innovation and HEFCW's Vision for Research and Innovation in Wales.

Alongside the transition towards more investment from UK Government and beyond, we will continue to provide support to our business community to innovate. We will expand our offer to include Micro, Small and Medium businesses, with both grant and investment support available. We will develop our new grant offer, as we bring our European funded initiatives to a close, which will be ready for launch in 2023. Our Development Bank of Wales will also continue to invest and ensure that Welsh businesses have ongoing availability of capital. This includes the £20 million Wales Technology Seed Fund- supporting start-ups moving from proof of concept to commercialisation; the £8 million Angel Co-investment Fund, encouraging Angel investment into new business ideas; and the £500 million Wales Flexible Investment Fund, supporting innovation from early stage through to large scale growth.

New challenges will also be addressed by the Development Bank. Supporting carbon critical businesses and smaller SMEs to decarbonise will require corporate innovation and investment in green technology. Continuing to scale up opportunity for young entrepreneurs to flourish through innovative start-ups in a post economic shock environment is key to building the future businesses of Wales. These challenges, amongst others, need continuity and accessibility of patient finance to succeed.

The Welsh Government is encouraging the legal sector in Wales to develop and make greater use of innovative technologies in the delivery of legal services to both commercial and private clients. Innovative approaches should provide positive economic impacts on the growth and stability of the sector; and they should be designed to provide more accessible and user-friendly legal advice and services for citizens and businesses across Wales. The expansion of different technologies should equip the legal sector with tools to improve

connectivity, access and cyber security.

It is vital that the large number of smaller high street law firms that make up a considerable part of the legal landscape in Wales have access to the newest available technology to help increase their productivity and competitiveness. We are investing in legal technology infrastructure in Wales. In 2019, we launched a four-year programme using £3.9 million of ERDF to support the establishment and work of the Legal Innovation Lab Wales at Swansea Law School.

Welsh Government have grant funded £100,000 to The Law Society to enable legal practices in Wales to benefit from a recognised cyber security accreditation scheme. With cyber-attacks becoming increasingly prevalent, this investment will make a significant contribution to enabling the legal sector to become more cyber-resilient.

## Looking around

We will look to the successes of other countries across the world who have employed different approaches to RD&I and further assess their applicability to the Welsh context. Examples include Germany's Fraunhofer Institutes, which are strong applied research and innovation institutes with an industrial focus. Israel, Singapore and Taiwan have structures which focus public funding in such a way as to create critical mass which pulls in industrial and business sector RD&I endeavour and funding. These countries marry together a blend of public and private investment for RD&I in an ecosystem which promotes growth, attracts talent and drives economic endeavour.

Cambridgeshire and Oxfordshire present examples where strong public sector investment in university research and innovation capacity has created industrial and business ecosystems which grow and generate high value jobs. The challenge for Wales is to recreate some of this success; opportunities exist to do this around clusters like Compound Semiconductors, FinTech, Digital and AI,

steels and metals and health tech in South Wales, agri-tech in Mid and North Wales, optics, photons and optoelectronics pan-Wales, and nuclear in North Wales.

We will identify, evaluate and assess opportunities for creating and growing nationally important assets based around key science and technology prospects and strengths. We will work with industry, business, academia, education providers and local authorities and communities to identify the strongest and highest potential technology groupings or clusters in areas of priority for Wales and the UK. We will prepare proposals that seek a blend of public and private finance and present these to UK Government for collaborative support.

Welsh Government is currently leading a unique collaborative partnership with the Ministry of Defence (MoD), Defence Science and Technology Laboratory (Dstl) and the Defence Electronics and Components Agency (DECA) to create an Advanced Technology Research Centre (ATRC) adjacent to the existing DECA operation in north Wales. The ATRC will be the first defence-focussed Centre of Excellence in the UK and will be at the heart of a vibrant innovation cluster, encouraging collaboration between government, industry and academia to develop cutting-edge technologies with wide reaching commercial and employment opportunities.

It will conduct vital research that responds directly to some of our biggest long-term challenges and opportunities in areas such as cyber security, software engineering, space, radio frequency and advanced sensing technologies and next generation propulsion. The ATRC concept has been developed through extensive engagement with industry and wider potential partners and aims to incorporate collaborative research space, training and skills support and high security lab space for sensitive commercial research.

Our Global Centre of Rail Excellence will bring together a blend of public and private finance to create a UK national and international facility in Wales. This proposal, led by the Welsh Government, is an example of how major RD&I and

test facilities can be envisioned and developed in a way that bring socioeconomic, sustainability, commercial and industrial opportunities to Wales, while delivering for the wider UK.

An alternative approach to university-centred attractors are the science and technology campuses such as the Science and Technology Facilities Council (STFC) campus at Harwell, Oxfordshire and the UK Atomic Energy Authority campus at Culham. Both campuses have received large sums of public sector investment to create a critical masses of high-tech science experiments, which then attract scientists, technologists, engineers, technicians and supporting services staff. Both are focussed on specialist science and technologies, Harwell on particle accelerator and light (photons) RD&I; Culham on fusion energy. These are hugely successful at attracting business and industry, further broadening their appeal and employment opportunities.

Developing similar facilities in Wales, albeit on a more modest scale, would create attractive environments for newly qualified scientists, technologists, engineers and technicians. Wales has fledgling science and technology groupings which could be grown into bigger assets on the Harwell and Culham model with the right vision and focus, for example Bangor University's M-SParc on Anglesey, Aberystwyth University's Innovation and Enterprise Campus, Swansea University's Bay Campus and Cardiff University's Compound Semiconductor activities.

The lesson from other countries demonstrates that a better balance between 'blue skies' research and applied industrial RD&I is key to maximising value and benefit from public funded endeavours. Both are vital and both should have equity and balance when considering investment, focus, priorities, collective leadership, skills, training and educational development and other input.

To this end, public sector research establishments, national laboratories and research institutes offer vehicles to help in the rebalancing and addressing the current inequity of public sector investment in RD&I between pure academic

research and applied, industry relevant RD&I. Historically, the balance has been weighted very heavily in favour of academic type research; this must change to drive economic impact.

The socioeconomic drivers and feedback funding mechanisms which will be needed to drive this change in balance are not well articulated. However, three things stand out as being critical in this respect and these can be described as the ‘trinity of principles’:

- drive a greater percentage of GVA invested in RD&I
- improve productivity and value generation
- addressing the trade deficit, budget deficit and borrowing requirement by focussing on increasing exports to at least a point of balance (i.e. exports value equals imports value).

The countries referred to are all focussed on the trinity of principles and as a consequence are very successful industrial, commercial and trading nations.

## **Innovation in sectors**

Launched in 2021, “A Manufacturing Future for Wales” provides a framework through which to future-proof manufacturing capability in Wales. Through extensive consultation it identified specific, targeted actions which will develop long-term resilience with a highly skilled and flexible workforce able to deliver the products, services and technologies necessary for our future economy. It addresses the important issues of climate change and the need to decarbonise, embracing the technological changes Industry 4.0 is bringing, including automation, digitalisation and a more connected environment. The plan represents a more collaborative, holistic approach to manufacturing which brings together key stakeholders from across public and private sector, to translate our vision for a well-being economy into reality. This is underpinned by the pursuit of three outcomes:

- a prosperous economy which requires a steady focus on resilience and a capacity for transformation
- a green economy which demands high levels of circularity, where resources are kept in use adding economic value and where waste is avoided
- an equal economy which means investing in the productive potential of all people in communities.

Manufacturing is a broad definition which includes a wide range of sub-sectors and enabling technologies. The role of RD&I is a critical thread that flows through every aspect in identifying, developing and implementing new technologies and processes which will ultimately drive change toward meeting our aspirations. This is evident across the ten themes identified within the plan; Climate Change, Technology, Skills, Collaboration, Communities and Clusters, Infrastructure, Fair Work, Leadership, Supply Chain Resilience and Anchorage.

An example of where actions are delivering wider impact is the mapping of supply chains across a number of these manufacturing sub-sectors to better understand existing supply chain capability, resilience and anchoring opportunities. This work will result in geo-spatial sector maps across the whole of Wales which will help to improve collaboration opportunity, transparency and resilience of supply chains.

## **Life sciences**

The Welsh life sciences industry is built on an excellent science base and a business-friendly environment, both of which are critical for economic growth. The sector currently employs more than 12,000 people, in over 360 companies, ranging from SMEs and start-ups to large blue chips, with an approximate turnover of £2 billion.

It has a strong competitive advantage in diagnostics, wound healing,

regenerative medicine and cell therapy, categorised into two principle sectors: MedTech and Biopharma. Examples of key Biopharma companies based in Wales include Quay Pharma (recently acquired by Swiss company SGS), Wockhardt UK, Ipsen Biopharm, and Norgine, and Med Tech businesses include EKF Diagnostics, Cytiva, Ortho Clinical Diagnostics, BBI, and Huntleigh Healthcare. Approximately 75% of the life sciences market in Wales is export focussed, amounting to about £980 million p.a.

The life sciences and health sector is distinctive in that business growth also delivers significant social and economic benefits. Demographic changes are creating demand for innovation through an increase in the incidence of age and lifestyle-related conditions like diabetes, dementia and obesity. Therefore, life science is one of five headline RD&I priorities confirmed by Welsh Ministers, with a challenge of increasing our capability to predict, prevent or better manage disease.

In Wales, we have world leading health research and innovation strengths in, dementia, cancer, immunology and experimental medicine. For example, the Cluster for Epigenomic and ADC Therapeutics (CEAT), funded through SMART Expertise. includes Swansea University, Glaxo Smith Kline (GSK), GE Healthcare, Bruker, Porvair, Axis Bioservices and BiVictriX, and is using innovative technology approaches to develop new therapeutics and diagnostics for ovarian cancer.

We also have areas of established excellence in the treatment of mental health conditions. For example, a partnership between Cardiff University and Takeda Pharmaceutical Company Limited to identify new approaches for treating schizophrenia and other psychiatric disorders.

Welsh Government is working closely with the Office for Life Sciences to determine how these recognised international strengths can play a meaningful contribution in implementing the core healthcare missions of the **Life Sciences Vision**. This is part of a significant opportunity to enhance Wales' position in

health and care research and life sciences innovation. If we can secure a proportionate share of UK funding, it would bring benefits for our economy, universities, industry and communities.

The Welsh life science sector creates business opportunities and partnerships, supports global trade development, improves access to vital clinical expertise and aligns support with sector needs to further Programme for Government goals. For example, support for new technologies in the MedTech sector can enable fast and effective advice and treatments. The skills and recruitment opportunities in life science companies can provide opportunities in the use of shared and degree apprenticeships and coordinating activities can help build on our approach to the Foundational Economy, assisting local supply chains, local delivery and logistics services in the sector.

## **Tackling the climate emergency**

### **Accelerating decarbonisation**

In October 2021, the Welsh Government published its second statutory emissions reduction plan Net Zero Wales (2021 to 2025). The plan focuses on our second carbon budget, but also looks further, to build the foundations for Carbon Budget 3 and our 2030 target, as well as net zero by 2050.

In addition, we have a programme for Government commitment to support the net-zero transition and Welsh Ministers have committed to a decade for action in Wales. We must cut emissions more in the next ten years than we have in the last thirty and innovation will provide part of the solution.

To meet our climate targets, we need whole system change, where every citizen, community, group and business in Wales engages with and responds to the climate emergency.

## Climate change action and the foundational economy

We will build on our innovative approach to aggregate demand and support resilient supply chains to maximise the economic benefits that carbon transition presents, in areas such as electric buses, low carbon homes and heat pumps. At the foundational level, we will promote and support the re-use, repair and remanufacturing sectors to grow our communities and town centres, building on the learning from our Circular Economy Fund.

Our energy system is fundamental to almost every area of life and the supply and use of energy for heating, power and transport is the source of the vast majority of our greenhouse gas emissions.

Our vision is for a decarbonised energy system which provides wider economic and social benefits for Wales than the system we see today.

Much of the change will be driven by greater electrification of heat and transportation and the flexible use of generating technologies, energy demand, storage and low carbon fuels, enabling a transformation of our industrial base. Technological change will need to be married to behavioural and regulatory change. We will use the 2020s as a decade of demonstration and early commercial roll-out of many of these technologies prior to full implementation.

Innovation is required to support a significant increase in the deployment of renewables which drive low-cost electricity and therefore accelerated electrification. The economy will also need to become more resource and energy efficient with cost effective technologies to remove emissions from the atmosphere (engineered Greenhouse Gas Removals). Hydrogen will also play a significant role, with innovation reducing the cost of production and enabling fuel switching.

# Innovation in the power system

This can help develop:

- new renewable energy technology to drive faster and deeper decarbonisation and support the green economy
- new storage of power and smart technologies which use renewable power more efficiently and when it is available
- new infrastructure design, such as offshore wind platform design, mooring and anchoring technologies
- new environmental data acquisition and onward application of strategic environmental design in Welsh waters
- wider behavioural change to create demand for efficient products and regulation which encourages a push for high efficiency products in the market
- a re-balancing of costs between power and other fuels to ensure power is as cheap as it can be
- a more integrated energy system, technologically and regulatory, which retains benefits in Wales.

This will require actions from others. The UK Government must continue and extend innovation funding to drive relevant network changes and introduce energy efficiency regulation to drive markets. Business needs to invest in new technologies to reduce the power and heat used to produce their goods and services.

In the short to medium-term, Welsh Government will focus efforts upon:

- continuing an innovative, regionally planned approach, instead of top-down and market-driven approaches, delivering at speed and optimal cost and in a socially equitable way which leaves no people or places behind
- innovative models of ownership as well as technologies. Models that deliver

lower cost electricity will be fundamental for the inevitable increase in renewable deployment and networks to support the new energy system

- highlighting opportunities for UK funding for innovation
- funding innovation in renewable energy generation
- working with regions and local partners to identify opportunities to support innovation in local area energy plans
- working with network operators and the regulator to support innovation in energy infrastructure for a net zero energy system.

## Innovation in the transport system

There are significant opportunities for improved air quality from a wholesale shift to zero emission vehicles. Congestion and issues related to a sedentary lifestyle can also be tackled.

Innovation in the transport system will need to include:

- battery technology: manufacturing, energy density, recycling
- zero emission technologies for aviation, shipping, and heavy-duty vehicles
- connected and autonomous vehicles
- micro-mobility
- integrating public transport and active travel to help the public to use these modes of travel more effectively;

Again, innovation in the transport system will require action from others. The UK Government must regulate to drive technological and market innovation, supported by appropriate funding. Business can lead the way with implementation of new technology to further stimulate markets.

In the short to medium-term, the Welsh Government will focus efforts upon:

- encouraging a modal shift to active and public transport

- trialling battery electric trains (Viva Rail)
- zero emission taxi pilots
- zero emission car clubs
- e-bike rental scheme trials
- hybrid hydrogen transport schemes
- flexible on-demand public transport
- innovation in logistics
- The Global Centre of Rail Excellence, providing unique capability in the UK and Europe, to support innovation, including the testing of cutting-edge, green technologies
- grid connections for EV charging: high power charging, rurality
- remote working hubs
- road surface innovation

## Innovation in heating systems

This can include:

- driving down the costs of new low carbon buildings and the retrofit of existing buildings
- creating new business models, such as heating as a service which uses bill-payer funds over a long period to pay for deep retrofit and mass deployment of heat pumps
- delivering flexibility in electric heat, such as hybrid hydrogen/electric heat pumps
- enabling behaviour change, aided by technology and regulatory change
- enabling in-home data-driven innovation, automation and AI to monitor and deliver interventions that support carbon reduction
- new funding models, blending low-cost, interest-free loans, grants from government and third sector, and financial incentives from, for example, mortgage providers which apportion responsibility to all parties (homeowners, government etc).

As with the power and transport systems, innovation in the heat system will require action from others. The UK Government should drive the development of technology to meet new efficiency standards, market gaps and new business models, using innovation funding. Business must invest to develop new technology and collaborate to create new business models. Banks, building societies and mortgage lenders must continue to develop new lending models to incentivise homeowners and buyers to decarbonise properties when selling and buying.

In the short to medium-term, the Welsh Government will focus efforts upon:

- Optimised Retrofit Programme: ORP3 will launch in summer 2022 providing £50 million funding to social landlords to decarbonise homes, focussing on partnership working between social and private landlords to expand into the private rental sector
- a Development Band for Wales pilot: funding to incentivise owner occupiers to decarbonise their homes.
- mainstream learning and embed effective working practices derived from the Innovative Housing Programme
- piloting smart, flexible and digitalised systems to (maximise use of assets) and help reduce demand.

## Gas and electricity networks

The Welsh Government has established a project with the energy network operators in Wales, along with Ofgem, to develop a long-term plan for the energy networks in Wales. It will look to 2050 to understand the networks needed for a net zero energy system which will best serve our communities and places and help inform Future Wales, our National Plan.

We have appointed the Energy Systems Catapult to lead this work and develop a joint view across all participants of our likely future energy needs in 2050. It will

bring together the thinking across the gas and electricity networks and from the transmission and distribution networks. We aim to be the first country to have a joined-up approach to developing gas and electricity networks, enabling opportunities for innovation and greater prosperity.

We expect the work to identify several Future Energy Scenarios for Wales by summer 2023, and we will work closely with network companies and Ofgem to innovate. This will include looking to Ofgem's Strategic Innovation Fund to trial new ways of using networks to maximum effect.

## Smart Living

The Smart Living initiative is integral to the Welsh Government's approach to driving innovation in the energy system. It pilots new approaches which combine whole-systems thinking with place-based solutions. The holistic approach is enabling Welsh decision-makers to understand the complex challenges posed by our net-zero target and to innovate.

Smart Living is currently operating two pilot whole-systems schemes, using an open competition, or SBRI, model to bridge the gap between development and deployment phases of innovative projects.

The Whole System Business Research Innovation for Decarbonisation SBRI (WBRID) is a challenge initiative for whole system innovative ideas. The Welsh Government funded 4 local authorities across two phases to challenge business to help communities and the public sector to integrate different energy sources and sectors on a whole-system basis. The focus was on developing whole system design to address key barriers identified as part of Smart Living and other innovation research. Results from the pilot scheme will inform future opportunities for funding support and a further iteration of WBRID 2.0 during 2022 to 2023.

The Hydrogen Business Research and Innovation for Decarbonisation SBRI (HyBRID) is addressing opportunities for the deployment of hydrogen by developing research and innovative solutions deriving from the ten objectives of the Welsh Government's Hydrogen Pathway report. Phase 1 drew on a fund of £2 million and supported 17 feasibility projects. All will be eligible to submit proposals for a second phase at Technology Readiness Levels 4 to 9, focussed on prototype development and evaluation, running to March 2023.

## **Circular economy: beyond recycling**

We cannot isolate our ambitions for prosperity from the environment in which we live. They sit alongside each other in the Well-Being of Future Generations Act and succeeding in one at the expense of the other would be no success at all. 45% of global emissions and 90% of species loss are due to goods and services made and used in our daily lives. We are now working on an approach which keeps resources in use for as long as possible and avoids waste: a circular economy.

Innovation can increase resource efficiency through waste avoidance, re-use, repair and re-manufacture across all sectors of the economy. Wherever appropriate, we aim to substitute high carbon, energy intensive materials with sustainable ones. To effectively tackle the climate emergency and nature crisis we must address unsustainable consumption of resources as a root cause.

A circular economy improves economic and social outcomes. It can improve productivity, increase raw material supply resilience, create employment and increase competitiveness. Social benefits include shortening supply chains, reducing the health impacts of polluting emissions and distributing resources more fairly. It can provide more opportunities for communities to come together to share resources, helping revitalise places.

All innovation needs to be low carbon and resource efficient, and this presents a

great industrial opportunity. Developing a new approach to resources, will see us use less virgin materials and reduce consumption, which requires cross-government action and changes in behaviour from citizens and stakeholders.

Our strategy, Beyond Recycling, has innovation at its heart including a key theme of “Driving innovation in materials use”. By reducing the carbon footprint of supply chains and purchasing lower carbon products we can take a whole-life approach and by incentivising better product design, we can make products which last and which consumers want to buy.

## Digital

The Digital Strategy for Wales, published in 2021, sets a clear vision and ambition for a coordinated digital approach across sectors in Wales. It outlines how we will use digital and data to improve the lives of people in Wales across six Mission areas, public services, inclusion, skills, economy, connectivity and data.

The Digital Strategy’s ambitions for the economy, skills and data missions closely align with the ambitions for innovation. Our aim is to ensure that people, businesses and public services in Wales have the skills and confidence to embrace the opportunities that digital technologies and innovations can offer. This will ensure that Wales can attract new talent, stand out in global competition for new markets and industries, and, foster a culture of innovation and collaboration - using the potential of data driven innovation and the internet of things to benefit the people of Wales.

To this end, the Welsh Government will support a Wales Data Nation Accelerator project. A collaboration of Welsh Universities and the Welsh Government it aims to fuel innovation in data and Artificial Intelligence (AI) for new solutions and applications in key industrial clusters and public services.

The Data Nation Accelerator will work alongside public, private and third sector organisations to shape a programme that helps grow businesses, investments and skills in data science and digital technologies. Its work will be underpinned by data that is used ethically and consideration of fair work and impact on workers where appropriate. It will focus on the opportunities provided by the unique data assets, capabilities and potential we hold in Wales in the following areas:

- public services innovation
- health and wellbeing
- net-zero and the environment
- future manufacturing and systems
- creative and professional services

## Public sector procurement

With £7 billion spent annually by the public sector in Wales there is significant scope to leverage our spending power to consider alternatives to purchasing and, where possible, to buy innovatively.

The Wales Procurement Policy Statement (WPPS), published in March 2021, sets out the strategic vision for public sector procurement in Wales. It can help define our progress against our well-being goals for future generations by putting them at the heart of procurement processes. We have a responsibility to ensure we are preventing problems, thinking about the long-term, while maximising opportunities to deliver economic, social, environmental and cultural well-being.

The WPPS sets out this key principle: We will align our ways of working and increase stakeholder involvement to support innovative and sustainable solutions through procurement

Welsh Government Procurement will observe the following WPPS principles

when working towards Welsh Government policy commitments:

- encourage pre-market engagement with our supply chains to create an environment that stimulates innovation
- work with internal customers to create procurement pipelines that allow time to identify sustainable solutions and seek innovation
- encourage collaboration and a co-production approach to drafting requirements.

The aim of the Public Procurement (Reform) Bill is to boost growth and productivity in the UK, maximising value for money and social value, promoting efficiency, innovation and transparency.

Through our approach to Procurement Reform in Wales, we will encourage the use of innovation. The proposals include a new competitive flexible procedure, which gives contracting authorities the ability to design and run a procedure that suits the market in which they are operating and will drive greater opportunity for innovation.

Changes to the procurement regime will sit alongside wider initiatives to achieve the following:

- industry, government and academia working closer together to drive research, enhance investment and promote innovation
- improving the speed of acquisition and help incentivise innovation and productivity
- creating a more digital and integrated procurement system, linking different data sets using automation and data analytics to increase efficiency, visibility, accessibility, sharing enhanced insights as to what Government is procuring and where there are additional opportunities for innovation.
- more emphasis on planning and pre-market engagement should support effective use of the new competitive flexible procedure
- the new competitive flexible procedure gives contracting authorities the

ability to design and run a procedure that suits the market in which they are operating and thereby driving greater innovation

- a renewed emphasis on using the procurement system to drive forward a Wales of vibrant culture and thriving Welsh language (with a particular emphasis on multilingual technology)
- new public notice requirements for planning procurements and early market engagement will provide transparency of contracting authorities' procurement pipelines and processes.

## How will we measure progress?

- increased new products/services to domestic and international markets
- new enterprises/jobs: net employment gain
- increased spend within Welsh Economy (supply chain dev't/pub sector proc)
- through new measures of 'value' in RD&I
- increased spend on RD&I (GERD, BERD, HERD, GovERD)
- increased research income won from sources outside of Welsh Government
- increased RD&I activity in Wales
- improved value for money from research and innovation in the HE sector and in industry
- creation and growth of public sector research establishments (PSREs), national laboratories and research institutes
- improved deployment of research from the HE sector on both delivering on the socio-economic, health and well-being and environmental goals and on informing future Welsh Government policy development
- improved engagement with innovation skills (wider education activity?)
- improved productivity (GVA)
- more bilingual software exists which gives good user experience in Welsh and English, more companies create bilingual software and use Wales' bilingualism to expand their software offer internationally to other multilingual areas

- increased leverage of UKG funding streams into Wales
- patent registrations.

Reduced use of raw material resources (ie. a reduced material footprint for Wales) and lower consumption and territorial carbon emissions.

## Healthier

### **Our mission for innovation in health and social care**

A coherent health and social care innovation ecosystem, collaborating with industry, academia and the third sector to deliver greater impact and value; by developing, sharing, and adopting innovative practice and technology.

This innovation ecosystem will support NHS Wales and social care to effectively deliver their recovery strategies from the pandemic. It will target new and different ways of working, identifying opportunities to lever additional funding and better support the adoption of innovation at scale.

This innovation ecosystem will be underpinned by clear infrastructure and a robust policy framework, which has the full support from health and care leadership, to create a culture of innovation at all levels of the health and social care system.

### **The development of a coherent health and care innovation ecosystem in Wales**

Over the last decade we have seen a significant development of the health and care innovation ecosystem in Wales, through a range of policy development activity, provision of funding and supporting infrastructure.

In policy terms, innovation has been recognised in the 2016 NHS Wales Planning Framework, and was a central theme of 'A Healthier Wales', the Welsh Government's long-term plan for health and social care in 2018. In 2020 the University Designation criteria was updated and supporting guidance issued to health boards and trusts that remained focussed on the three themes of Innovation, Training and Education and Research and Development. More recently the University Designation Criteria has been included in the Integrated Medium Term Planning Process for NHS Wales' 2022 planning cycle.

Structurally, a Welsh Government Health and Social Services Technology and Innovation Division was established in 2014, with a range of new innovation roles and teams subsequently established across NHS Wales and Social Care organisations, including research, innovation and improvement hubs and regional partnership boards across Wales.

Since 2015, approximately £60 million of Welsh Government funding has been provided through its Efficiency through Technology Programme. This programme has also secured significant additional match-funding and support from a wide range of Welsh, UK and EU sources. Examples include the Accelerate and AgorIP programmes, with combined project values of £40 million, including industry, academic and EU match funding. Programmes like the Bevan Commission's Innovation Exemplars, have supported more than 350 projects, leveraging NHS Wales staff resource and university health board and trust funding.

## **Impacts of COVID-19 on the health and social care innovation agenda**

The pandemic has irreversibly altered the provision of health and care services. In addition to creating major new pressures, COVID-19 has also offered new opportunities for the health and care system to think differently to meet priorities, promoting the need for greater innovation support in health and social care

delivery.

The learning which resulted from the pandemic was published in [the NHS Wales COVID-19 Innovation and Transformation Study Report](#), 2021. This Study, which evaluated a huge range of health and care practitioner feedback, presented themes that demonstrated Wales's ability to rapidly adopt service change, innovation and transformation as part of the response to COVID-19.

In May 2021, the First Minister set out a clear position that innovation in health and care is central to ensuring that we do not lose the momentum and culture of 'getting things done quickly' during the pandemic, to deliver the best possible outcomes for patients and the public in Wales:

“ (And then) innovation, making sure that all the things the health service has done so quickly to cope with coronavirus, that we don't lose that culture of getting things done quickly and doing things differently, because to get the health service back on its feet, it simply cannot be going back to how things were before coronavirus ever began. ”

## **Aligning innovation to support COVID-19 reset and recovery priorities**

Although a great deal of work is underway within health and care organisations to mitigate the impact of COVID-19 through reset and recovery, it is more crucial than ever to prioritise support and investment in innovation through new ways of thinking and working. We must fully utilise innovation to solve our live system pressures: keeping people in their own home, supporting more people to access treatment, tackling patient backlogs, and developing services which are sustainable for the long term.

The Minister for Health and Social Services, Eluned Morgan AM has stated:

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“innovation must enable us to respond to the challenges posed by the pandemic, supporting people to access treatment and to help people to keep healthy at home for longer.”

‘A Healthier Wales’ and its vision for a seamless, coordinated whole system approach to health and social care remains our primary focus. With this in mind, it is important that the innovation agenda and ecosystem supports ‘new and different ways of working’ that can drive our pandemic recovery and meet system transformation priorities. This must also include demonstrable links to outputs that will sustain our recovery plans for both sectors, including how these will deliver more community based care and self-management.

The broad range of innovation and technology initiatives put in place over the past 10 years, combined with the significant and recent learning from the COVID-19 pandemic, provides a strong platform from which to build. We will ensure our health and care innovation ecosystem is equipped with a strong and dynamic leadership, supported by a robust national policy framework that allows for ingenuity and innovation to thrive. We will continue to support this through the aims and objectives outlined in ‘A Healthier Wales’ and the delivery of a new co-ordinated health and care innovation programme. This programme will play a key role in supporting the integrated innovation strategy and is covered in more detail later in this chapter.

We have identified three thematic areas for innovation to support COVID-19 recovery:

- developing an innovation policy framework, a range of new policy initiatives and a better aligned innovation ecosystem to support COVID-19 recovery
- embedding COVID-19 recovery strategic objectives into our existing innovation funding schemes and programmes
- supporting innovation training provision to the wider health and care workforce, to support new ways of thinking and working, at greater scale

across the system.

## **Framing the health and care innovation ecosystem: the 'Healthier' component of an integrated Innovation Strategy for Wales**

In support of the development of this 'Healthier' chapter of the integrated innovation strategy for Wales, we have reflected on a broad range of internal and externally commissioned evidence from across the health and care sector. This evidence (a list of which will be published separately) includes detailed responses from NHS Wales organisations, Social Care Wales and a range of those delivering innovation, leaders across Wales and reports produced independently by external consultancies.

Reflecting on the significant evidence base we have developed, the new demands and requirements of the innovation ecosystem, the learning gained from COVID-19 and the urgent need to embed innovation within system recovery priorities, Wales now has a strong policy rationale for a new development phase of the health and care innovation ecosystem in Wales.

A number of common themes have emerged from this evidence, which will shape our future focus:

- we must better align our existing health and care innovation infrastructure. Supporting health and care organisations to work closely to generate an innovation 'pull' based on need, and collaborating more with the external innovation environment, who provide an innovation 'push' based on co-developed solutions
- more strategic leadership for innovation is required, with a consistent message to support innovation at all levels, to drive a more supportive culture for innovation across the ecosystem
- we must better support Innovation adoption and scale across the system, by

creating the appropriate supporting infrastructure, that can share and support the uptake of good practice, through a range of local and national networks

- a more strategic approach to innovation funding is required; to maximise the existing funding envelope, realign funding to a new innovation system direction and support income generation from innovation activity
- to embed new ways of working across pandemic recovery and system priorities, we must build capacity for innovation at all levels of the workforce and system
- to increase the impact and reach of innovation, we must integrate innovation approaches through other policy areas and delivery mechanisms.

Encouragingly, these themes of focus align well with the European Union's five key action areas: Innovation Ecosystems, Better Innovation Policy Making, Talent, Access to funding and Regulation. These areas are outlined in their upcoming New European Innovation Agenda policy document, which will be adopted in summer 2022.

## **Co-ordinating health and care priorities with the wider economy and community innovation capability**

There is significantly more innovation capability and structure in the system now than five years ago. We will continue to improve the coordination and alignment of existing initiatives, partners and platforms, to provide a one-system offer capable of generating innovation 'pull' from health and care organisations; working in partnership with a dynamic external innovation environment capable of providing innovation 'push'.

We will support increased sharing and communication of innovative activity and best practice through better aligned innovation infrastructure, which includes utilising existing regional, national and international networks and fora.

Key mechanisms to drive increased adoption and sharing of best practice will be:

- annual engagement to assess university health board and trust designations through the NHS Wales planning framework, with innovation confirmed as one of the three key criteria for an NHS Wales university health board or trust
- the upcoming NHS Executive function, which will provide new leadership and central direction, more consistently improve the quality and safety of care across the whole system and strategically drive the national mandate for innovation.

This will bring greater coherence, remove duplication and create a more optimal environment for innovation to flourish. To support the continued impact of innovation upon our healthcare and wellbeing sectors, we will map out our known strengths and develop opportunities for appropriate investment to support our national and regional plans.

Our innovation agenda must also balance priorities in areas such as preventative health, diagnostics, eliminating waiting lists and addressing mental health with transforming our integrated services and supporting a sustainable and talented workforce. We will increase awareness of sources of innovation support and the capacity they can provide to maximise the impact of activities in these areas.

## **Leadership and culture**

We will support our leaders to explore new approaches that improve resilience to the pandemic's impacts and help to meet our most urgent health and care priorities. Through a collective Welsh Government, NHS Wales and Social Care approach we will empower our leadership to be the champions for innovation and collaboration with industry, academia and the wider community.

Innovation and best practice needs to be disseminated more effectively across the public sector. Our health and care leadership can positively support the development of a 'culture of collaborative innovation' that encourages focused and meaningful engagement with industry and academic partners to drive the adoption of innovative ideas.

Health Technology Wales will continue to provide a horizon scanning function for new technologies, but more horizon scanning functions are needed, to explore wider innovation approaches and ways of working that can be adopted from elsewhere, using evidence-based approaches.

## Infrastructure

Innovation infrastructure can build on the successes of our existing national Research, Improvement and Value infrastructure, in addition to national programmes such as Allied Health Professionals, the Healthcare Science Programme, and Major Health Condition delivery teams.

The NHS Wales Innovation leads network continues to support existing 'co-funded, jointly agreed, needs based' national projects such as the Innovation and Transformation Intensive Learning Academy, the NHS Wales COVID-19 Innovation and Transformation Study, Bevan Exemplar programmes, the Commercialising Innovation review and Welsh Health Hacks.

We will ensure that this infrastructure supports local, regional and national activity, networks, funding calls, events, capability building and knowledge transfer, with increased communication of innovative activity and best practice.

## Funding

We will scope out, and seek to secure longer-term models of innovation funding,

informed by the success of more stable research and improvement funding approaches. We will work with stakeholders and UK Government to explore the opportunities for developing new innovation centres of excellence that will link our health and care priorities with academia and industry partners to turn our innovation and life sciences strengths into commercial value.

A clear commercial direction must be set for health and care innovation, to encourage the appropriate management of intellectual property, commercialisation of innovation and the generation of new value and income streams. We will support and facilitate the development of policies and frameworks that work across health and care in the transfer of know-how and exploitation of assets.

A single funding portal to access health and care innovation funding will also be developed, which will include mechanisms for innovative procurement to support working with Welsh and UK Life Sciences sector and others. This will compliment and support the co-development of a UK Innovative Devices Access Pathway.

## Capacity building

Innovation capacity and capability must be developed across the broader health and social care workforce to support new ways of working and thinking that can further strengthen the innovation ecosystem. This will help to embed innovation to support pandemic recovery and meeting system priorities.

Through assets like the Intensive Learning Academies, we will scope and develop a common training programme for innovation, including the rationale for innovation, core concepts, creative thinking and ideation routes, assumption challenging, awareness-raising of existing initiatives and, support tools. Innovation training should be professionalised and recognised, with training designed and provided at a range of levels from foundation through practitioner

and expert to champion.

## **Integrating innovation more broadly**

We will support the development of a specific Social Care Innovation programme that builds on innovation learning and successes in health. We will explore, and co-ordinate with initiatives in other sectors, the potential for health and care innovation via centres of expertise in other fields e.g. social care, 3D printing, artificial intelligence, robotics, genomics, wearables, data sciences, environment and sustainability. The Data Nation Accelerator is an example which provides opportunity for the use of data assets to drive innovation in digital health and social care.

Innovation must also be embedded across and through other health and care policy areas, to ensure new and different approaches are considered and improved impact and reach, in strategic partnership with others.

## **A consolidated innovation programme for health and care**

Alongside wider government announcements for an integrated innovation strategy for Wales in 2021, the Minister for Health and Social Services also set out plans for a new, consolidated innovation programme for health and care, bringing together existing activities which had been tested and proven during the pandemic.

The new programme will introduce a tighter focus to our healthcare innovation infrastructure and better coordination of related activity across our health and care services, in support of the development of a more coherent and collaborative innovation ecosystem in Wales. Adopting learning from the successes of Health and Care Research Wales, Improvement Cymru and Value-Based Healthcare, this programme will:

- consolidate existing and new health and social care innovation activities into a single cohesive programme with a strong, collaborative governance structure
- bring a tighter focus to existing and future activities, in places expanding their national role
- strengthen national system direction through a new innovation policy framework for health and social care
- build on the innovation and technology progress made through the Efficiency through Technology Fund, the activity delivering 'A Healthier Wales' and the system response to COVID-19, and
- lock in positive changes adopted in response to COVID-19, driving pace and scale of change in health and social care to meet key priorities.

The Innovation Programme will adopt a focused delivery approach through five pillars that have been developed in response to evidence-based recommendations submitted by our stakeholders.

## The five pillars

1. A National Policy Framework: to set clear policy objectives and guidance within which health and care organisations have freedom to act, simplifying governance
2. Structured Support: national networks and organisations which help to aggregate innovation and provide common support to delivery organisations and partners
3. Targeted Investment: to identify, develop and bring innovations to ready-for-adoption stage
4. Promoting and Rewarding innovation: incentivising and recognising success
5. Building Skills and Leadership: investing in people to grow capacity and capability, and to change behaviours and culture.

Collectively, these pillars form a framework to harness our ambition for a

stronger, more integrated innovation performance across all sectors. One that is driven by a need to accelerate our health and care recovery in the short term and create the right environment for innovation and transformation to occur and thrive for the longer term. This provides an opportunity to deliver optimal alignment with both our COVID-19 thematic objectives and the aims of an integrated strategy that maximises our ability to make progress against the following objectives:

1. Focus on COVID-19 reset and recovery working with our innovation infrastructure to drive impact and positive change.
2. Connect the Health and Social Care sector with the wider innovation ecosystem to improve capacity and leadership.
3. Accelerate and stimulate innovation across the whole system that matters most to people and will help recovery from the impacts of the pandemic.

## **Supporting innovative digital transformation across health and social care**

Digital infrastructure is a key enabler to improvements and has a shared interest with innovation on the use of health data, providing services digitally and artificial intelligence. The Welsh Government's Digital Priorities Investment Fund (DPIF) has contributed to the development of a range of innovative collaborations over recent years in the digital transformation of the health service. Many of these coming to the forefront in mitigating the impacts of COVID-19.

We recognise that further transformation and improvements in data quality, accessibility, inclusion and standards are required. A Digital Health and Social Care Strategy for Wales is currently being developed to accelerate the digital ambitions laid out in 'A Healthier Wales', in full alignment with the national direction set for digital services in 'A Digital Strategy for Wales'.

Specifically, the Digital Health and Social Care Strategy for Wales will 'optimise

the use of digital services and patient/user data' by improving population health, wellbeing, deliver better quality and more accessible services centred on people and their needs. The successful delivery of this strategy will support the delivery of the quadruple aims outlined in 'A Healthier Wales'.

This strategy is nearing completion, with approval planned during summer 2022. It is expected that this Strategy will be delivered in partnership by Welsh Government, NHS Wales and relevant Social care bodies.

## Health and social care research

Co-ordination across the research and innovation spectrum is essential to maximise the potential and impact of health and care research which is the largest sector for investment in the UK by both government, the public sector and industry– c. £8.6 billion pa, or over a quarter of all UK R&D spending.

Welsh Government investment in health and care research, primarily through Health and Care Research Wales (HCRW) and the Higher Education Funding Council for Wales (HEFCW) plays an important part in enabling the NHS and universities in Wales to access the larger streams of funding from UK government, charities, and industry.

The Welsh Government's Research and Development Division (RDD) leads on strategy, policy and funding for health and care research in Wales. It fulfils this responsibility through HCRW which has a remit to stimulate research excellence, build capacity and capability, and support research delivery in translational and applied research.

Investments in research will produce innovations that make real differences to health outcomes and to the lives of patients and people in our communities. In addition, research across both academia and industry (pharmaceuticals, medical devices, diagnostics and medical information technology sectors) creates new

products and services that bring high value jobs and prosperity to our economy. Research can make our health and care services more effective, efficient and productive, improving care and saving and reinvesting resources. It has been repeatedly shown that research active teams and organisations provide higher quality care and have better outcomes.

Health and Care Research Wales is in its next planning cycle, building on the Cross Party Group on medical research published in February 2021; a report based on hearings held over several months which made five main recommendations to Welsh Government:

- funding: match UK levels of funding in HEFCW research grant to universities and in HCRW budget
- collaboration: support and incentivise academic and industry partnership across and outside Wales, and engagement with research in the NHS in Wales
- careers: provide long term funding and opportunities for research careers, including protected time for clinical academics and clinicians, and continuing support for the Sêr Cymru scheme to foster talent
- patients and the public: ensure people have the opportunity to take part in research and have equitable access to clinical trials
- research impact: create effective fora for knowledge transfer between researchers and policymakers. increasing the utilisation of new evidence into Welsh Government policy.

Also, in 2020 to 2021, an ambitious UK strategy for clinical research was developed aimed at recovery, resilience and growth with the explicit intention to make the UK the global hub for life sciences research. Key areas include investments in digital research/trials, expanding the clinical research workforce, and aligning research more closely with NHS need.

## Future Welsh health research priorities

Over the next few years, Welsh research priorities will include:

- establishing an evidence centre and rapid evaluations programme (building on initial investment in a COVID-19 evidence centre)
- implementing the UK strategy for clinical research
- establishing a HCRW faculty to build a sustainable research workforce, and improving the share of UK Health and Care research funding spent in Wales.
- implementing the cancer research strategy to consolidate areas of research strength in this area.
- enable HCRW to respond flexibly and rapidly to research needs across the full scope of health and social care
- develop focussed social care initiatives to drive up capacity in the sector and address the imbalance in social care research compared to health.

## How will we measure progress?

A set of performance and impact metrics is in development for the new health innovation programme. In line with the national Value Based Healthcare programme, Value metrics will be applied, and broadened, to measure the specific health and care impacts of innovation projects:

- improved patient / citizen outcomes
- improved patient / citizen experience
- improved resource efficiency

To recognise the significant economic impact of the health and care innovation ecosystem, we will also include a range of wider health and economic metrics, to include:

- increased adoption of innovation across health and social care
- increased external investment into health and care
- increased match funding to health and care innovation projects
- increased income generation through health and care innovation activity
- increased partnerships between health, care, academia and industry
- increased generation of intellectual property and patents.
- wider government portfolio area impacts (e.g. disinvestment of redundant equipment/practices, meeting decarbonisation goals, wider societal/health measures e.g. quality of life, wellbeing)

## Resilient

The Mission: to Create a Resilient Wales:

“ “A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change. ”

Innovation is, and will continue to be, necessary to protect and promote biodiversity, including sustainable management of our natural resources. For a more resilient Wales in the future, which will see a reduction in carbon emissions, we must adopt circular principles and wider use of renewable energy, protect and preserve our ecosystems and increase our capacity to adapt to climate change.

## Growing our resilience

There are many goals where innovation can be a catalyst to greater resilience in Wales.

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- the Circular Economy Fund will continue to support innovative repair and re-use, and a higher recycled content, in the products we need and use
- we can prioritise the use of sustainable and low-carbon materials in public sector funded construction to support progress towards whole life net-zero carbon for construction projects
- support for businesses to innovate to find high quality uses and markets for secondary materials derived from waste and provide investment for this through the Circular Economy Fund. This will include innovative uses for wastes from food manufacturing and the forestry industry, i.e. ‘valorisation’ and ‘bio-refining’ to derive value from wastes
- innovate to replace the use of hazardous chemicals in the products manufactured and consumed in Wales that can prohibit their second life use, limiting our ability to extend life-cycles
- develop innovative solutions for the additional infrastructure needed to collect and recycle household materials not currently widely recycled such as absorbent hygiene products, wood, plastic film, rigid non-packaging plastic, cartons, textiles, mattresses, carpets and waste electrical and electronic equipment
- improve the recycling of packaging, by introducing an Extended Producer Responsibility (EPR) scheme for packaging to ensure producers bear the full end of life costs for their packaging and that they report on and meet packaging recycling targets set for Wales. This will require significant innovations to drive more refill and recycling solutions
- work in partnership with local authorities to develop innovative regional ‘eco-park’ hubs where collected materials are recycled, reprocessed, and remanufactured into new products, thereby deriving greater added value and capitalising on the economic opportunities from a more circular economy
- work with the private sector to improve the processing capacity within Wales to be able to unlock the full potential of our world-class recycling
- use our communications to promote the innovations taking place across Wales such as those supported by our Circular Economy Fund, examples of businesses that are keeping resources in use and realising the economic

benefits. We will raise awareness also with the public sector to encourage new ways of procuring goods such as leasing and buying remanufactured products

- work to decarbonise the waste collection and recycling service, including through the continued roll out of Ultra-Low Emission Vehicle fleets across Wales
- provide support for resilient supply chains to maximise the economic benefits the transition offers in areas such as electric buses, low carbon homes and heat pumps
- encourage more use of bioplastic from renewable sources where the use of plastic is still needed, and where this represents the best overall environmental option. Communicate the impacts of new forms of packaging such as compostable plastic to citizens and stakeholders
- support innovation in developing new, alternative materials with a lower environmental footprint and products that use fewer materials, and switch to lower carbon alternatives for the materials we use. We will strive to eliminate the use of chemical additives which can cause harm or prevent recycling at end of life including through improved labelling
- incentivise innovative digital disruption by investigating digital and 'smart' technological solutions to improve resource efficiency. For example, exploring a digital solution to how the introduction of a Deposit Return Scheme can work with our existing successful household collection arrangements
- promote sharing, waste prevention and re-use and support the re-use, repair and remanufacturing sectors to grow in our communities and town centres building on the learning from our dedicated Circular Economy Fund.

## Adapting to climate risk

Decarbonisation is only one aspect of a unified response to climate change. We must also innovate in order to adapt and build resilience to the impacts of the

changing climate in Wales. These changes will include:

- increasing frequency of extreme heat events, with temperatures expected to exceed 40 degrees during the summer one in every two years on average by 2050. This will impact upon human health, pests and diseases, productivity and ecosystems
- more frequent and severe droughts, with impacts on water supplies, ecosystems, natural carbon stores, agriculture and forestry, and increasing risk of wild fires
- increasing frequency of storm events, heavy rainfall and flooding, with impacts on homes and communities, infrastructure, power supplies, supply chains and emergency services
- rising sea levels, with impacts on coastal communities, agriculture and ecosystems in Wales and beyond.

Our current climate adaptation plan, Prosperity for All: A Climate Conscious Wales was published in 2019. However, in the summer of 2021, our statutory advisors published updated evidence in the **third Climate Risk Independent Assessment (CRIA3)**, which will inform further actions by Welsh Government and stakeholders. This assessment identifies 61 climate risks and opportunities for Wales and especially highlights the following areas as needing the most urgent action:

- risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards
- risks to soil health from increased flooding and drought
- risks to natural carbon stores and sequestration from multiple hazards, leading to increased emissions
- risks to crops, livestock and commercial trees from multiple climate hazards
- risks to supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks
- risks to people and the economy from climate-related failure of the power system

- risks to human health, wellbeing and productivity from increased exposure to heat in homes and other buildings
- multiple risks to the UK from climate change impacts overseas

Like our approach to decarbonisation, we will need effective research and innovation if we are to understand and build resilience to the changing climate across our communities and the environment, and to do so in a way that ensures fairness across society.

## Climate change and agriculture innovation

Agriculture in Wales will have a key role in the future in not only providing high quality food, but also enabling decarbonisation, our adaptation to climate risk and improvement of ecosystems. Potential areas of innovation include:

- farm incentive schemes: Sustainable Farm Scheme and transitional schemes, Farm Business Grant and Sustainable Production Grant
- animal health improvements: set out in in the Animal Health and Welfare Framework
- genetics: through the Red Meat Development Programme and the Dairy Improvement Programme
- agri-machinery innovation driving increased efficiency and fuel switching: proposed agri-tech action plan
- land-use change: tree planting and peat restoration
- knowledge transfer: through Farming Connect

In order to meet our goals, alignment and a collaborative approach with the UK Government will support the use and development of technology and research, such as genetics, methane reducing feed, feed additives and manure remediation to minimise methane and nitrous oxide release with a view to minimising overall carbon footprint and environmental impact.

The private sector also has a role in supporting investment and uptake in new innovations and practices, supporting the circular economy and bringing forward novel approaches for natural accounting investment vehicles that farmers and land managers can access. Welsh Government will continue to work with farmers, processors, retailers and industry representatives to support decarbonisation across the supply chain.

In the short to medium term, Welsh Government will focus efforts on:

- Sustainable Farming Scheme (SFS). The proposed SFS will provide support to farmers, both financial and advisory, which will be targeted at outcomes not currently rewarded by the market. We expect to commence this transition in 2025
- transitional scheme support. On 31 March, Welsh Government announced a package of support for farmers, foresters, land managers and food businesses worth over £227 million over the next three financial years to support the resilience of the rural economy and our natural environment. The framework complements the development of the Sustainable Farming Scheme. The package includes the Horticulture Development Scheme and Horticulture Start Up Schemes to develop businesses through investments in new technology, sustainably expand production and enter new markets
- Red Meat Development Programme, which includes performance recording and using Estimated Breeding Values (EBVs) enabling a robust and faster rate of genetic improvement and is a proven, cost-effective and long-term way of improving animal production efficiency
- Dairy Improvement Programme (DIP), which aim to increase the performance, health and resilience of the Welsh dairy sector. Healthy animals help protect the productivity and production levels of farmers, reduce capital losses, minimise negative trade impacts as well as reducing pollution and CO2 emissions
- work with farmers and the waste sector to improve resource efficiency and increase circularity on farms
- we will support agricultural businesses to exploit opportunities for use of low

- carbon farm technology and on farm renewable energy generation
- hydrogen in farming, as part of our wider approach to developing our hydrogen economy
  - precision farming. Welsh Government will develop an agri-tech action plan; providing a clear direction of change, help stimulate activity and encourage innovation (as well as accepting the trial and error nature of innovation), working with industry to realise a change in lieu of existing market forces
  - changes in consumer and farmer behaviour can release land from agriculture whilst maintaining an improved food production sector. Improving efficiencies on farm as well as some small changes over time to diet can also release land within Wales.
  - in terms of food processing, the Welsh Government launched its Vision for the Food and Drink Industry in autumn 2021. The goals for this Vision document are to achieve growth and productivity improvement which benefit the workforce, people and society, support the industry to reach high levels of sustainability, and to raising the industry's reputation in Wales, the UK and export markets. Innovation forms a key part of supporting this Vision document. By encouraging business to innovate in terms of new product development, decarbonisation and the adoption of new technologies to improve productivity, the food industry can continue to grow and prosper
  - support for the food industry comes from a number of sources, including from Food Innovation Wales, the Helix programme, AMRC Cymru, and Aber Innovation. Innovation can help business in Wales grow from small to medium and medium to large and support the reputation for excellence in Welsh produce.

## **A Wales of vibrant culture and thriving Welsh language**

The Mission: in Cymraeg 2050: A million Welsh speakers, we declared our

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ambition to grow the number of Welsh speakers in Wales to one million, and to double the number of us who speak our language every day from 10% to 20% of the population by 2050. We know that such transformations create opportunities for the Welsh language.

Just as we state that Cymraeg belongs to us all, however much or often we speak it, we also want technology and innovation to belong to and benefit all of us to harness the opportunities to live in Welsh, learn in Welsh and for the Welsh language to be at the heart of innovation and digital technology.

Just as Cymraeg belongs to all Ministerial portfolios so does innovation, and our cross-governmental approach will make sure our policies support both. One of the many ways we are helping the daily use of Welsh when we innovate is by making it easier to overcome access to services in our language.

We want technological services to work seamlessly and give a good user experience in English and Welsh. Companies told us that they didn't know how to do that so we have created a bilingual technology toolkit **Bilingual technology toolkit for good user experience**. It's free, easy to read and easy to use by all, including in procurement and grant exercises within the public sector.

Our logic in innovating in this way was that by developing a high quality user experience in English and Welsh, companies can build capacity for creating multilingual products, increasing their sales potential and enabling our language to bring economic benefits to Wales.

Another approach adopted to make Welsh 'easy' in innovation is our funding model for Welsh language technology components. When we fund the development of new Welsh language technologies, we require them to be released under a suitably accommodating open licence for use, reuse and embedding in other companies' products. You can see a list of all these on our Helo Blod business support service **Business Wales: Welsh Language**

## Technology.

Our aims and experience in bilingual innovation in Wales can create value for companies the world over. One example of this is Microsoft's forthcoming Live Human Interpretation functionality in Microsoft Teams which we in Wales have jointly developed with Microsoft. Although we requested this for Welsh, it will benefit bilingual language communities and organisations around the globe.

Creative Wales leads on economic development of the Creative Industries, this includes developing innovation across film and TV, digital, music and publishing. Working within the context of the significant 'soft power' of the Creative Industries globally, specifically the UK's ability to produce great content provides an opportunity to invoke both cultural and economic benefits through further investment.

## More equal

The Mission: to create a transparent innovation ecosystem that ensures inclusivity in its activity, reflecting the diverse nature of the Welsh population. Equality is reflected in the demography of the people undertaking Research, Development and Innovation, as well as the geographical distribution of investment and the development and stimulation of innovation skills and talent.

This strategy commits to delivering a more equal Wales, in the context of innovation. To do this Wales needs a fairer distribution of investment in Innovation activities for all organisations and across all regions.

To support this Welsh Government, together with the Wales Innovation Network and UK agencies, will invest in building the capacity and capability across the Innovation Ecosystem to attract and absorb the levels of investment which will be available from Welsh, UK and international sources.

We must build the right culture of collaboration, across sectors, to ensure strong partnerships. The Wales Innovation Network is already in place to support the academic sector to form the partnerships across sectors and share the infrastructure needed and similar infrastructure will be required for private, wider public and third sector actors.

## Equality and diversity

Equality is central to our vision for Wales. A more equal Wales ensures equity of access to services for all citizens, commits to tackling inequality wherever it exists and seeks to ensure fairer outcomes for our population now, and in the future. This strategy seeks to use innovation to support the delivery of those outcomes, but we must also strive for equality in innovation. We will ensure that everyone, regardless of their background or circumstances, has the opportunity to participate in innovation, by innovating themselves, by influencing where innovation happens or by enjoying the benefits of innovation.

Where Welsh Government provides targeted support for innovation we will ensure that our processes are straightforward and accessible to all. We will also support and encourage other organisations within our innovation ecosystem in Wales to do the same.

Good progress has been made within the Creative Industries sector, both Clwstwr and Media Cymru have specific goals to improve equality and diversity. Clwstwr have already moved from 22% female led projects to 66% in 2021. Media Cymru have also set targets with specific actions to increase bilingual projects and diversify production, including neurodiversity.

Our engagement with stakeholders has revealed that often people do not realise they are innovating, and so do not know there is support available. We will raise awareness across Wales of what innovation is and the opportunities it presents. We will support those who are new to innovation, whether it be through research

and development or the adoption of new innovation, to harness the benefits it can bring to citizens, the economy and the natural environment in which we live.

We are keen to see more of our innovators, from all groups in society, enjoying success from UK wide and, where applicable, international funding and partnership opportunities. An example of this is the recent UK level competitions, Women in Innovation and Young People in Innovation. We will develop interventions to better support people to develop their ideas into strong proposals, and to build the skills they need to attract investment from a range of sources.

We will ensure our interventions are accessible and offer something to all innovators in our society. Our vision is for a flexible and rapid funding programme, which offers a simple and transparent application, assessment and monitoring process. In designing our offer we will engage with a diverse range of innovators to ensure it is visible and inclusive.

Most importantly, we will keep a watchful eye on our progress by collecting meaningful data on the impact our interventions in this area have, identifying any continuing gaps in provision and taking swift action. We will also work with our partners, such as Innovate UK, to ensure where we are co-funding activity we are collecting data consistently to ensure our joint offer is inclusive.

The public sector in Wales is bound by the Well-being of Future Generations Act to work in a way which involves people. In developing this strategy we have ensured that citizens have a voice, however it is important that they can influence where innovation happens. In health and care in Wales, their experience and perspective of new innovations will be captured. Through challenge led innovation there will be opportunities for citizens to tell us where the most important challenges exist for them, to test solutions, and to feel the benefit of innovation.

The improvements in productivity are key to progress away from a 'low wage'

economy that dominates in parts of Wales. However, in improving productivity and the wealth that goes with it, care will be necessary to provide equality and diversity of employment so that the labour force has equal parity and status between university educated and non-university educated people. As just over half of the recent school-leaver population is not university educated, there is a clear need to recognise the importance of vocational and skill based employment. An area where this can be achieved is high-value-add manufacturing. Successful high-value-add manufacturing will be achieved by investment in RD&I, productivity improvement and competing in world markets by exporting products and services, i.e. the trinity of principles.

## The regional dimension

Wales has four recognised economic regions, each leading on the development and delivery of their respective City and Growth Deals. Population levels, business communities and the presence of RD&I infrastructure and assets, such as academic and research institutions vary, so each has developed a distinct Regional Economic Framework.

Published in December 2021, the Frameworks for all four regions are integral to our commitment to a place-based model of economic development where we build on and work with the distinctive strengths of the regions.

They have been formed with partners in each of the regions, including local authorities and regional bodies and are evidence-based, with priorities for regional investment, the economic mission and the programme for government. Their approaches share a common vision of a fairer, greener and more prosperous Wales.

The Frameworks are the vehicle to promote collaborative planning and delivery by public, private and third sector partners, working to a shared vision and a set of common economic development objectives. They inform collective efforts,

including the development of the new innovation strategy, by recognising the distinctive strengths of the regions, supporting inclusive and sustainable economic growth and maximising opportunities to address national, regional and local inequalities.

All four recognise a key role for innovation in delivering their visions:

## **North Wales**

The Regional Economic Framework has identified and endorsed 3 strategic priorities for north Wales after wide regional consultation, they are the Social and Community Wellbeing Economy; the Experience Economy; and the Low Carbon and Low Emissions Economy.

Innovation, digital connectivity, skills and decarbonisation are at the core of these priorities as cross cutting themes and as part of project delivery. The region has developed a number of key magnets and clusters which attract budding entrepreneurs, international RD&I projects and inward investment, they also work with the local/regional supply chain around the strategic priorities to enhance their RD&I capability to keep them ahead of competition which creates and safeguards sustainable work within north Wales.

Applied and commercial R&DI is carried out by Bangor and Glyndwr Universities and a number of key capital magnet projects:

M-Sparc, the low carbon incubator centre on Anglesey work with clients to turn initial ideas into successful ventures. They ignite ambition and offer a facility to energise, somewhere to spark a better future. Their tenants are built from great ideas at the cutting edge of science, they are offered expert knowledge, support, encouragement and investment to succeed. M-Sparc also work with a number of international businesses who are developing major infrastructure projects on Anglesey in nuclear, solar, marine and offshore wind, they encourage the use of

local content in the supply chain by supporting companies to develop their capability a capacity to compete for tenders in these major projects.

The OpTIC Technology Centre, owned by Wrexham Glyndŵr University and operated by Glyndŵr Innovations, is a landmark building in a setting that inspires creativity, innovation, and a desire to succeed. It provides R&D and serviced innovation facilities for start-up and early-stage companies. It also specialises in innovative optical systems, product development, engineering and technology consulting. It has developed cutting-edge technology with an unparalleled array of highly specialist equipment and laboratory space. The Centre attracts all areas of technology innovation particularly within the advanced manufacturing and life science sectors.

AMRC Cymru is part of the University of Sheffield Advanced Manufacturing Research Centre and a member of the High Value Manufacturing (HVM) Catapult, a consortium of leading manufacturing and process research centres backed by Innovate UK. The state-of-the-art centre, which was funded with £20 million from the Welsh Government and is managed by the University of Sheffield, focuses on advanced manufacturing sectors including aerospace, automotive, nuclear and food in the key research areas of future propulsion, sustainability and digital manufacturing.

North Wales support a number of strong emerging clusters, Wales Nuclear Forum part of the North West Nuclear Arc and Hinkley Supply Chain, Marine Energy Wales Forum and the Offshore Energy Alliance for north Wales and the north West. These encourage collaboration especially around the innovation and skills agenda.

## **South west Wales**

One of the 3 missions for the South West Wales Regional Economic Framework is to make the area a UK leader in renewable energy. That means taking

advantage of its natural assets and industrial and R&D capabilities to build an internationally significant presence in future fuel technologies and to drive the decarbonisation of its industrial base and the wider economy.

The region has important economic assets with two substantial universities, R&D assets and ambitious plans for growth. There are big opportunities and advantages for the region with the potential of low carbon energy, the future growth of our universities and the development of their relationship with the business base.

Strengths of the region include HEI excellence, commercialisation of research with combined FE provision and a committed labour force. The region has sectoral strengths in energy, advanced manufacturing and digital with strategic sites and innovation centres. Key assets include the Universities at Swansea and University of Wales (Trinity Saint David) and the range of world class industrial and scientific research such as Swansea University SPECIFIC Innovation and Knowledge Centre; the Active Building Centre and ASTUTE (Advanced Sustainable Manufacturing Technologies) and the University of South Wales' Hydrogen Research and Development Centre at Baglan.

## **Mid Wales**

One of the 8 priorities in the mid region's Framework is for applied research and innovation, leveraging its significant industries and internationally recognised R&D assets such as IBERS and Aber Innovation to offer opportunities for regional productivity and growth.

The region provides academic excellence, research capability and innovation potential through key hubs and industrial clusters across the region which is also a testbed for innovation, developing new products and processes capitalising on existing research and industry strengths and creating new or strengthening existing industrial clusters.

Key assets include the University of Wales Trinity St David and Aberystwyth University. The Aberystwyth Innovation and Enterprise Campus (AberInnovation) provides world-class facilities to support bioscience, agri-tech and food and drink, co-located with the Institute of Biological, Environmental and Rural Sciences (IBERS). The Wales Veterinary Science Centre and Vet Hub development also aligns to a research Centre of Excellence in Bovine TB at Aberystwyth University firmly establishing mid Wales as a leader in providing services to the agricultural sector and training the next generation of UK veterinarians.

## South east

The region contains a highly regarded science base through its universities and innovative businesses collaboratively providing a strong foundation for developing new technologies and applications.

The region will support the development of a strong economic and innovation ecosystem to develop clusters of excellence. Building on our competitive advantage and opportunity within the economy, we will strategically target clusters that provide resilient and sustainable growth for future generations and where the region can compete effectively on a national and international basis. The region will build on recognised strengths such as those in Compound Semiconductors and continue to support emerging innovation in key tech strengths, including Fintech, AI/Data and Cyber Security.

## Regional governance

The Local Government and Elections (Wales) Act 2021 provided for the establishment of four new Corporate Joint Committees (CJCs) Four have been established which are coterminous with Wales' city and growth deal areas. These provide a 'ready-made' consistent and accountable mechanism to

support regional collaboration between our local authorities.

CJCs are designed to provide flexibility and enable local discretion. How a CJC delivers its functions, operates and employs staff will be largely determined by its members. This flexibility will enable CJCs to be well-placed to deliver local and regional innovation priorities as part of their power to improve the economic well-being of their region.

## **A Wales of cohesive communities**

Mission: to create attractive, viable, safe and well-connected communities

### **The current position**

Innovation can play a significant role in digitally connecting up our communities. Research collated by Digital Communities Wales (DCW) shows that the level of digital exclusion in Wales is higher than in the UK, with 7% of the population, 180,000 people, not using the internet.

Some of our most vulnerable groups in society are at risk of being left behind in the digital health revolution:

- older adults: there is a higher proportion of digitally excluded people in older age groups. Only 36% of people over 75 have basic digital skills, compared with 87% of 16 to 49 year-olds
- people with disabilities or long-term health conditions: 87% of people with a disability or long-term health condition use the internet, compared with 93% of those without
- those with lower educational attainment: 93% of those with qualifications at degree level or above demonstrated all five digital skills compared with 51%

of those with no qualifications

- lower income individuals and families: those who are economically inactive are less likely to visit a website (71%) than those in employment (82%)
- people in rural areas: due to problems in broadband provision for fixed line and mobile broadband services
- Welsh speaking people and others who do not use English as their first language: digital systems need to be designed to accommodate Welsh speakers and minority languages.

There are clear public policy and equality reasons for improving digital inclusion, as well as a strong business case. The benefits of being online for people, especially older people, unemployed people and those living in social housing, include:

- time saved through accessing services digitally
- cost saved through accessing services and purchasing goods digitally
- reduced loneliness and isolation
- increased employability
- improved self-care for minor ailments
- improved self-management of long-term health conditions.

In March 2021, the Welsh Government published a Digital Strategy for Wales, highlighting six key missions:

### **Mission 1: digital services**

- Deliver and modernise services so that they are designed around user needs and are simple, secure and convenient.

## **Mission 2: digital inclusion**

- Equip people with the motivation, access, skills and confidence to engage with an increasingly digital world, based on their needs.

## **Mission 3: digital skills**

- Create a workforce that has the digital skills, capability and confidence to excel in the workplace and in everyday life.

## **Mission 4: digital economy**

- Drive economic prosperity and resilience by embracing and exploiting digital innovation.

## **Mission 5: digital connectivity**

- Services are supported by fast and reliable infrastructure.

## **Mission 6: data and collaboration**

- Services are improved by working together, with data and knowledge being used and shared.

## **Looking to the future**

There are several areas of work which are underway which can strengthen our understanding of the barriers and challenges within Wales for addressing digital

exclusion and basic digital skills.

## Minimum digital living standard for Wales

The Digital Strategy made a clear commitment to explore a minimum digital living standard for Wales. This 'Standard' would look to consider the type of device, broadband speed and/or mobile data required (for both upload and download) and the recognised five basic digital skills, which, as a minimum, are needed to be digitally included in a modern Wales.

To set a baseline, the Standard will look to gain views from a representative sample of both digitally excluded and digitally included citizens from across Wales, and from the recognised priority groups. A defined Standard will then be scoped, with a rationale for how it might be best measured e.g. by household or individual citizens across Wales.

## Mapping of digital inclusion

As part of Mission 2, we are working closely with the Centre for Digital Public Services (CDPS) to understand the current provision, support and funding available across Wales for digital inclusion (basic digital skills, devices and connectivity). This work will look to map existing provision, by local authority or health board level, allowing officials to identify possible gaps in support. CDPS are working with [DataMapWales](#) to ensure this work is available to the public and help organisations to target support appropriately.

## Digital Communities Wales (DCW)

DCW has developed a programme which focuses on the impact of digital exclusion in Welsh communities, with over 1,648 organisations from across

Wales already engaged. Regular updates demonstrate the kind of work undertaken to improve the experiences of those who are digitally excluded or who require basic digital skills.

Two recent examples of DCW activity:

- Welsh language: in Sept. 2021 DCW held an online event aimed at organisations focused on supporting the Welsh language, from nationwide charities (Merched y Wawr and Cymdeithas Eisteddfodau Cymru) to small community run social enterprises (Tafarn y Plu, Llanystumdwy and Antur Waunfawr). The aim was to explore the challenges for those organisations, the Welsh language, and communities in the digital age. Following the event, all attendees were invited to participate in a regular network, headed by Mentrau Iaith Cymru. The Network will focus on digital inclusion, digital technology and innovation, to align with the [report on the effects of COVID-19 on Welsh language community groups](#)
- libraries: DCW has agreed a plan to provide a consistent approach to digitally upskilling library staff across Wales. The pilot saw a mapping exercise, with Gwynedd and Rhondda Cynon Taff libraries undertook a basic digital skills audit to identify gaps in staff and volunteer skills. Based on the responses, a six-week training programme was developed, focussing on accessibility and online safety.

## Addressing ‘data poverty’

This is defined as individuals, households or communities who cannot afford sufficient private and secure mobile or broadband data to meet their essential needs.

Digital Communities Wales continues to provide training focussed on the digital and financial inclusion agenda. It identifies areas where support is needed and aims to understand the impact data poverty can have on communities and

citizens in Wales.

Recently DCW examined the link between digital and financial hardship. It highlighted how this situation creates inequalities for individuals from low-income backgrounds, with 18% of people in social housing in Wales do not have internet access, as compared to 6% in the privately rented sector.

## Globally responsible

The Mission: to create “A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being”

For Wales to become a globally responsible nation, we need to establish ourselves as an innovative and entrepreneurial place, welcoming and fair to all, underpinned by effective leadership, a sense of global citizenship (including addressing the need for global social and environmental justice), and active international engagement. Being globally responsible is about making informed future decisions that benefit not just our own but the world’s wellbeing. This includes implementing sustainable supply chains, promoting the efficient use of our natural resources and collaborating on shared international challenges.

The Welsh Government has a joint responsibility alongside the UK Government to support the transition to net zero. As well as being one of the central missions of this Strategy, it represents an opportunity to demonstrate global responsibility.

All our support for innovation needs to be low-carbon and resource efficient focussed supporting all those wishing to take this journey from whatever their starting position. We will encourage a new approach to resources, which sees us use less virgin materials and reduce consumption, requiring cross-

government action as well as changes in approach from citizens and stakeholders. Moving to a circular economy is one of the greatest innovation industrial opportunities of our time.

## **Making informed decisions**

Being globally responsible needs to start from the bottom up and there is much that can be achieved within the foundational economy.

We will support regional economic development to transition to a circular economy which encourages shorter supply chains and a more local and regional focus on sourcing materials. We will work with the Valleys Taskforce and City and Growth Deal Regions to encourage the development of resource efficient infrastructure, encouraging place-based solutions which align with priorities in the Regional Economic Frameworks for north, mid, south west and south east Wales.

Where supply-chains are necessarily much longer, we will encourage measures which ensure they are fair, ethical and sustainable.

We need to ensure every business in Wales can access practical advice on improving their resource efficiency by, for example, reducing their waste or improving the eco-design of their products and associated packaging through support provided by Business Wales, Food and Drink Wales and Farming Connect and available from WRAP Cymru and the Food Innovation Centres.

Using our understanding of supply opportunities for future investment plans to establish what is required for local businesses to engage in supply chains and deploy support such as our Backing Local Firms Fund to enable businesses to develop future, green skills and attain relevant accreditations, generating the new jobs of a greener future.

We will also support the development of innovative products that have a longer life, and support the expansion of maintenance, repair, and overhaul (MRO) businesses that extend the lifespan of equipment used by firms and public bodies and facilitate reuse and remanufacture at the end of first life, including when major infrastructure is decommissioned.

We recognise the limits of the global environment and will encourage the use of more bioplastic from renewable sources where the use of plastic is still needed, and where it represents the best overall environmental option. We will also communicate the impacts of new forms of packaging such as compostable plastic to citizens and stakeholders. We will strive to eliminate the use of chemical additives which can cause harm or prevent recycling at end of life including through improved labelling.

## **Global responsibility and international engagement**

In 2020 the Welsh Government launched a new International Strategy. It has three aims: raising Wales' global profile; growing the economy through international trade and inward investment; and establishing herself as a globally responsible nation. It confirmed international engagement as a Ministerial priority and is the relevant vehicle for Wales to continue to network, influence, learn and reinforce its political and commercial credibility, both in Europe and globally. Innovation can play a key role in all three of the International Strategy's aims.

Welsh membership of multi-national innovation-related platforms like the Vanguard Initiative (VI) for innovative European regions and the Circle of Research and Innovation Quebec-Europe (CRIQUE) continue to promote Wales' global profile of strengths in innovation support and infrastructure.

The Vanguard Initiative (VI) is a network of c.38 industrialised European regions with a focus on strengthening innovation collaborations across strategic value

chains, to strengthen Europe's competitiveness on a global scale. Our engagement in VI since 2016 supports the WG International Strategy as membership includes key partner regions for Wales with whom it has priority relationships (e.g. Basque Country, Baden-Württemberg). VI is an influential and well-respected network, particularly within the EU policy.

Wales chaired the Vanguard Initiative in 2020, and will continue as a Board member until our tour of duty expires at which point we will continue as an active member and partner. Our on-going proactive engagement with such platforms has led to numerous opportunities for Wales to undertake new and strengthened collaborative innovation activities.

Over the last year, we have accelerated international knowledge transfer activity for our businesses and academia by:

- attending or organising a total of nine strategic engagements
- receiving a total of over 360 attendees for cross-regional events
- engaging with over 30 EU and global regions on innovation-related activity.

Agreements with our priority regional partners, such as the Memorandum of Understanding with the Basque Country and a Declaration of Intent with Québec, as well as close working relationships with others including Baden-Württemberg's e-Mobil cluster and Catalonia, have all developed strong innovation strands and we will continue to use these to raise Wales' global profile.

By working with these regions either on a one-to-one basis, or collectively, on international knowledge transfer and commercialisation projects, we help our businesses to network and collaborate across borders. This interaction affirms Wales' reputation for innovation, and will help make a compelling case when these foreign businesses consider investment in the UK.

The International Strategy set out our clear ambition to grow our economy by

increasing our exports, with Wales having a long history as a successful trading nation with award winning innovative goods and services being exported globally.

In 2020 Welsh Government published its Export Action Plan for Wales. The plan sets out our vision to create a strong, vibrant and sustainable exporting sector to help strengthen the economy to safeguard existing and create new jobs and opportunities for the people of Wales. The Export Plan supports our ambition to establish a firm base of Welsh businesses capable of selling outside of Wales so unlocking the immense potential in businesses to export more to established and new markets, in addition to broadening the base of businesses that export.

We will continue to deliver a series of measures to support businesses to export through multiple delivery channels from Inspiring Exports, to building capability, finding customers to direct support to enable companies to get to market.

## Smart Specialisation

Wales was an early adopter of the EU concept of Strategies for Smart Specialisation (S3) approach to innovation in 2013. This has been defined as ‘national or regional innovation strategies which set priorities in order to build competitive advantage by developing and matching research and innovation strengths to business needs in order to address emerging opportunities and market developments in a coherent manner’

S3 embodies aims which this Strategy strongly endorses:

- to focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development
- to build on each country/region’s strengths, competitive advantages and potential for excellence.
- To support technological as well as practice-based innovation and aim to

stimulate private sector investment

- to get stakeholders fully involved and encourage innovation and experimentation
- to use evidence-based data and sound monitoring and evaluation systems.

Currently, European regions are engaged in a pilot to develop S4, or Partnerships for Regional Innovation, with the intention of transforming S3 strategies by introducing multi-level governance and cross-departmental sustainability and digital dimensions, turning them into whole-government instruments of change.

Whilst S4 is at a pilot stage we cannot be certain what its end shape will look like. Initial views indicate a strong alignment with this strategy, with its emphasis on our Well-being of Future Generations Act:

- it will look to combine top-down policies with bottom-up initiatives in a multi-level governance model. The EU has developed supra-national policies, the European Green Deal and its New Industrial Policy, for a sustainable recovery towards the new green and digital economy
- it changes policy implementation by seeking cross-sector solutions and a whole-government approach, while leaving no one behind; it focuses on synergies between innovation, sustainability, infrastructure and skills, themes which are common to this Strategy
- it stresses a regional policy which shifts focus to transformative changes. Innovation must not just follow commercial impulses but should respond to broader, longer-term societal challenges like fostering sustainability and inclusiveness. This reflects our Strategy's priority of the primacy of outcomes
- S4's proposed Entrepreneurial Discovery Process is an open, challenge-based procurement process which aligns with our intention to make more extensive use of our Small Business Research Initiatives through the SBRI Centre of Excellence, based at Betsi Cadwaladr Health Board
- good governance. S4 will require enhanced coordination from a multi-level delivery perspective. This aligns with our recognition that the Welsh

- Government is only one actor in a complex innovation ecosystem in Wales
- there is a recognition for the need to develop new metrics for the impacts of interventions on outcomes (e.g. measuring direct and indirect effects over time on, for example, Decarbonisation, healthy ageing, and so on).

The adoption of an S3/S4 approach to innovation is not essential for non-EU innovative regions, but we believe they align very well with this Strategy. The incorporation of the Well-being of Future Generations Act into all Welsh Government's innovation interventions, from appraisal and sustainability, through monitoring and outcome metrics is an effective S3/S4 approach in itself.

It will also greatly facilitate future innovation collaborations with European regions with whom we have Memoranda of Understanding, and others with whom we have growing innovation links.

The importance of international trade and especially export trade is vital for an economy which aims to grow wealth, investment, high-value employment, skills and education and to generate the tax revenues and household disposable income which will be necessary to support and fund all the socioeconomic, NetZero, environmental skills, training, education, equality and diversity aspirations of any government. This applies even more so to Wales which is starting from a position of lagging behind many areas of the wider UK for example London and the SE. Three things are critical in this respect and can be described as the 'trinity of principles covered earlier in the Strategy.

## **RD&I investment, productivity and export**

RD&I investment, productivity and export trade work together in a self-reinforcing cycle with each contributing positively to the others in different ways. Investment in appropriate RD&I improves productivity and competitiveness which in turn allows successful competition in international trade.

Remaining competitive internationally demands further investment in RD&I and increases in productivity. At all stages the identification and measurement realisation of 'value' is a key factor which should be used to drive future investments, i.e. value of RD&I, value of productivity improvements, value of export trade. Only by increasing all of these will sufficient household and taxable wealth be created to pay for all the other imperatives that Welsh Government wishes to pursue.

## Consultation questions

### Question 1

What would you like the Innovation Strategy to achieve in the short (1 year) term in relation to:

- Economic growth
- Skills development
- Social equity
- Climate and environment
- Other

### Question 2

What would you like the Innovation Strategy to achieve in the medium (2 to 5 years) term in relation to:

- Economic growth
- Skills development
- Social equity
- Climate and environment

- Other

### Question 3

What would you like the Innovation Strategy to achieve in the long (5+ years) term in relation to:

- Economic growth
- Skills development
- Social equity
- Climate and environment
- Other

### Question 4

We set out some high-level objectives that underpin our vision in the draft strategy. We recognise that Wales cannot be a global leader of innovation in all areas. Is there a specific mission or missions, linked to economic sectors or areas of social outcome where you think activity and resources should be concentrated?

### Question 5

What impact, positive or negative, do you think the Innovation Strategy will have on Wales?

### Question 6

What new actions are needed from the Innovation Strategy?

## Question 7

Which aspects of the Innovation Strategy should remain the same?

## Question 8

What are the main challenges and barriers to innovation in Wales? What needs to be done to overcome these barriers?

## Question 9

The Innovation Strategy aims to achieve a more prosperous Wales through introducing new products and services, job creation, spend in the Welsh economy and productivity. An ecosystem where innovation becomes everyone's responsibility.

- a. Do you believe the proposed Innovation Strategy has set out clear objectives to achieve this outcome? If not, what is missing?
- b. What impact, positive or negative, do you think innovation can have on helping improve the economic prospects and well-being of the people of Wales?

## Question 10

The Strategy aims to grow a more Resilient Wales which aims to improve a healthy natural environment, adopt circular economy principles and increase our capacity and capability in adapting to change.

Do you believe the proposed Innovation Strategy has set out clear objectives to

achieve these outcomes? If not, what is missing?

## Question 11

An equal Wales is an objective of the Innovation Strategy. This proposes a transparent innovation ecosystem that ensures inclusivity in all Research, Development and Innovation activity and a fairer distribution of investment where all regions in Wales feel the benefit from increased innovation activities.

- a. Do you believe the proposed Innovation Strategy has set out clear objectives to achieve these outcomes? If not, what is missing?
- b. Do you believe the strategy has the potential to positively impact every region in Wales? If not, what actions are needed?
- c. Are there any existing inequalities within the Research, Development and Innovation sector that have not been highlighted in the draft strategy? How could the strategy address these inequalities?
- d. Are there any under-represented groups that have not been identified as priority groups within the strategy?
- e. In the context of the UK levelling up agenda, how can we further consider Welsh regional diversity within the development of this strategy?

## Question 12

The Innovation Strategy aims to promote a globally responsible Wales through decision making processes that take account of the impact of our innovation activities on global wellbeing, as well as a collaborative approach to working in partnerships internationally to share knowledge, skills and undertake projects

with a social purpose.

Do you believe the proposed Innovation Strategy has set out clear objectives to achieve these outcomes? If not, what is missing?

## Question 13

The proposed strategy aims to create cohesive communities which will see greater cross sector collaboration, greater community connectivity and adoption of digital technologies, and the aligning of activities towards delivering for our communities in Wales.

Do you believe the Strategy will support this ambition? If not, how can we achieve this?

## Question 14

The new Innovation Strategy wants to achieve a Healthier Wales through a more coherent and aligned innovation ecosystem that targets new and different ways of working, supports recovery strategies from the pandemic and enables greater adoption of innovation.

This will be underpinned by a Health and Social care system that collaborates across industry, academia and the third sector to deliver improved healthcare value by developing, sharing, procuring and adopting innovative practice and technology.

Do you believe the strategy will support this ambition? If not, what additional activities need to be included?

## Question 15

As part of Welsh Government commitment to a vibrant culture and thriving Welsh language, the proposed Innovation Strategy looks to ensure multi-lingual development as standard.

Do you agree that the strategy outlines the ways in which it hopes to successfully create the right conditions to increase the use of the Welsh Language across all proposed innovation activities? If not, what additional activities should be undertaken?

## Question 16

The strategy aims to create a culture of innovation in Wales, one which collaborates, shares risk, encourages participation and supports the ecosystem to innovate.

- a. What does an innovation culture mean to you? What is needed to develop an innovation culture in Wales?
- b. Do you feel that you have the opportunity to participate in innovation? Please explain why you feel that you are able / unable to participate in innovation?

## Question 17

Do you think this Innovation Strategy would positively impact you? If not, how could this be changed?

## Question 18

Alongside the final strategy we plan to publish an action plan which will address resourcing and implementation of the strategy. The Commission for Tertiary Education and Research will have a leading role to play in the implementation of the strategy, as will the Welsh Government and other bodies and partners. Wales currently does not have one lead body responsible for the coordination and delivery of our innovation system. Turning to implementation, how would you like to see this strategy implemented?

## Question 19

Which stakeholder group would you consider yourself to represent:

- Research Organisations/ Academic Institutions
- Private Sector
- Citizen
- Third sector
- Community Group
- Public Sector

## Question 20

We would like to know your views on the effects that the Innovation Strategy for Wales would have on the Welsh language, specifically on opportunities for people to use Welsh and on treating the Welsh language no less favourably than English.

What effects do you think there would be? How could positive effects be increased, or negative effects be mitigated?

## Question 21

Please also explain how you believe the proposed strategy could be formulated or changed so as to have positive effects or increased positive effects on opportunities for people to use the Welsh language and on treating the Welsh language no less favourably than the English language, and no adverse effects on opportunities for people to use the Welsh language and on treating the Welsh language no less favourably than the English language.

## Question 22

We have asked a number of specific questions. If you have any related issues which we have not specifically addressed, please use this space to report them

## How to respond

The closing date for responses is 28 September 2022.

You can respond in any of the following ways:

Complete our [online form](#)

Download our online [response form](#) and email to [innovationstrategy@gov.wales](mailto:innovationstrategy@gov.wales)

Download our online [response form](#) and post to:

Innovation Strategy for Wales  
Second Floor, East Wing, Pillar G10  
Welsh Government

Cathays Park  
Cardiff  
CF10 3NQ

## General Data Protection Regulation (GDPR)

The Welsh Government will be data controller for any personal data you provide as part of your response to the consultation. Welsh Ministers have statutory powers they will rely on to process this personal data which will enable them to make informed decisions about how they exercise their public functions. Any response you send us will be seen in full by Welsh Government staff dealing with the issues which this consultation is about or planning future consultations. Where the Welsh Government undertakes further analysis of consultation responses then this work may be commissioned to be carried out by an accredited third party (e.g. a research organisation or a consultancy company). Any such work will only be undertaken under contract. Welsh Government's standard terms and conditions for such contracts set out strict requirements for the processing and safekeeping of personal data.

In order to show that the consultation was carried out properly, the Welsh Government intends to publish a summary of the responses to this document. We may also publish responses in full. Normally, the name and address (or part of the address) of the person or organisation who sent the response are published with the response. If you do not want your name or address published, please tell us this in writing when you send your response. We will then redact them before publishing.

You should also be aware of our responsibilities under Freedom of Information legislation.

If your details are published as part of the consultation response then these

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- to (in certain circumstances) data portability
- to lodge a complaint with the Information Commissioner's Office (ICO) who is our independent regulator for data protection.

Responses to consultations are likely to be made public, on the internet or in a report. If you would prefer your response to remain anonymous, please **tell us**.

For further details about the information the Welsh Government holds and its use, or if you want to exercise your rights under the GDPR, please see contact details below:

## Data Protection Officer

Data Protection Officer  
Welsh Government  
Cathays Park  
Cardiff  
CF10 3NQ

E-mail: [data.protectionofficer@gov.wales](mailto:data.protectionofficer@gov.wales)

## Information Commissioner's Office

Information Commissioner's Office  
Wycliffe House  
Water Lane  
Wilmslow  
Cheshire  
SK9 5AF

Telephone: 01625 545 745 or 0303 123 1113

Website: [ico.org.uk](http://ico.org.uk)

## Further information and related documents

Number: WG44723

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