

<p><b>Institution: Bangor University (10007857)</b></p> <p><b>1. Context and mission</b></p> <p><b>An overview of the size, structure and mission of Bangor University.</b></p> <p>The University College of North Wales was founded in Bangor in 1884 as part of a grass-roots campaign to provide higher education in Wales. In 1893 it became one of the three founding Colleges of the University of Wales, later gaining independent status as Bangor University in 2007. Over time, the size and nature of Bangor University have changed dramatically, both locally and in terms of global reach. The University now spans locations across North Wales, with a nucleus in Bangor's city centre, and has a joint campus in Changsha, China. As a key partner of Betsi Cadwaladr University Health Board (the largest health organisation in Wales), Bangor is now a major provider of evidence-based professional training for the NHS, with active plans to develop a new Medical and Health Sciences School. Today, our community constitutes 2,000 academic and support staff and 10,000 students.</p> <p>Bangor's academic structure is organised around three Colleges: Arts, Humanities, and Business; Environmental Sciences and Engineering; and Human Sciences. These encompass 14 academic Schools, complemented by a range of interdisciplinary research centres. This structure fosters collaboration across the disciplines in order to maximise research potential, resulting in submissions to nine Units of Assessment covering the work of 291 Category A staff (an increase of 18% from REF2014). The training of postgraduate research students (984 completions in this REF period, an increase of 18% on a per annum basis from REF2014) is further supported by the Bangor Doctoral School and twelve externally-funded doctoral training programmes.</p> <p>The mission of Bangor University in research is twofold: to enhance the culture, society, health and economy of North Wales and to develop high quality research with global impact in areas ranging from energy to language policy. Underpinning this is a commitment to sustainability and wellbeing, guided by the principles of the Wellbeing of Future Generations (Wales) Act. Our commitment to both locally and globally relevant research and impact is reflected in our staffing. As well as boasting the highest proportion of Welsh/English bilingual staff in Wales, with notable expertise in the history and culture of Wales and the Welsh language, our researchers come from over 30 countries worldwide, and collaborate with colleagues from over 120 nations, with particularly extensive links to North America, Europe, Australia, China, South Africa, and Brazil.</p> <p><b>2. Strategy</b></p> <p><b>Bangor University's strategy for research and enabling and actualising impact (including integrity, open research, and structures to support interdisciplinary research) in the assessment period and for the next five-year period.</b></p> <p><b>REF2021 assessment period</b></p> <p>Bangor University's <b>strategy for research with impact</b> exemplifies the four pillars of the Vision for Research and Innovation set out by the Higher Education Funding Council for Wales: <b>Excellence</b>: an effort to maintain and grow a robust base of high quality research in areas of particular focus; <b>Place</b>: a strong sense of civic responsibility, which informs the formation of partnerships to make a visible and active contribution to Wales; <b>Innovation</b>: acting as a hub for innovation and skills development to transform economic productivity; and <b>Collaboration</b>: working with anchor companies, SMEs, the public, third sector, and education partners, to grow critical mass and extend our national and international reach.</p> <p>Bangor's strategic approach is supported by <b>core organisational structures and processes</b>. The University's Research, Impact, and Innovation Strategy Group is led by the Pro-Vice Chancellor (Research) and includes Directors of Research and Impact from the three Colleges,</p>
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the Dean of the Doctoral School, and research support leads. This group provides strategic direction and oversight of the University's research, innovation and impact activities. It reports to the University Executive, and interacts with each College's research strategy group; these in turn set and deliver on local aims, and manage discipline-specific resources. Research strategy and performance are key priorities in the annual budgetary planning round for the academic domain.

Bangor leverages competitive research and infrastructure funding from the EU, UKRI, the Higher Education Funding Council for Wales, Welsh Government, UK Government, charities, and industry partners with an average of nearly GBP20,000,000 per annum over the REF2021 period. Bangor's research strengths are focused in three main areas in which we have assembled a **critical mass and diversity of research expertise and excellence**:

**Energy and the Environment:** underpinned by fundamental research in the biological, chemical and physical sciences of natural systems, Bangor's work in this area is strategically linked to the engineering of complex systems, modelling, and devices, especially in the area of energy, and to the social sciences, especially in the area of conservation. We address questions like: how can we rapidly pivot to assess the spread of COVID-19 in the UK's cities? How can we effectively harvest energy from ocean tides? How can resilient, productive strains of food crops be identified most efficiently?

**Health, Wellbeing, and Behaviour:** with a focus on the development of empirically-informed, robust and context-relevant interventions, grounded in a fundamental understanding of human behaviour, this research supports health and well-being via impacts on individuals, policy makers and practitioners or through wider culture change. We address questions like: how can we improve conditions in the classroom to enhance learning? How can we use insights from the arts to aid those with dementia? How can we identify and support those with the potential for Olympic greatness?

**Language, Culture, and Society:** addressing the interplay of identity and community from diverse disciplinary perspectives, this research explores the interface between individual and society, and how sense of belonging is accumulated through culture, media, language, and history, and affected by the changing nature of communities and nations, including structures of governance, finance and administrative justice. We address questions like: what is the experience of using Welsh in daily life and how can we support it with technologies for digital language equality? How can the public best hold secretive state and commercial surveillant entities publicly accountable? How does literary and creative output enhance our sense of place as well as promote it to the world?

Three illustrative examples of excellence in Bangor's three major theme areas are: 1) the **Nuclear Futures Institute** has extraordinary facilities that are being used by leading industry stakeholders to aid nuclear technology development. [Funded by the Welsh Government, EPSRC, and the European Regional Development Fund, GBP6,500,000]; 2) the **Dementia and Imagination** project examines ways in which the arts can improve life for people with dementia [Funded by AHRC and ESRC, GBP1,200,000]; 3) the **Emotional AI Lab** examines the societal impact of artificial intelligence in relation to the use of data about human emotion and physiology [Funded by ESRC and EPSRC; GBP800,000]. These examples also demonstrate Bangor's alignment with the **UK Government's "Grand Challenges"** for the areas of Clean Growth, Ageing Society, and Artificial Intelligence.

#### **Structures to support interdisciplinary research**

Bangor encourages the establishment and growth of **research centres and institutes** to facilitate excellent interdisciplinary research with impact and postgraduate training opportunities. Regular oversight by the Research, Impact, and Innovation Strategy Group ensures that the activity of such bodies is aligned with University strategy, and identifies possible synergies and external funding opportunities.

Four illustrative examples of successful interdisciplinary working at Bangor are: 1) the **Sêr Cymru National Research Network for Low Carbon, Energy and Environment** (2013-22), led by Bangor, promotes research into the sustainable use of natural resources. Bangor members of the Network have leveraged over GBP6,000,000 of external funding with multiple partners including Welsh universities and the UK Centre for Ecology & Hydrology, British Geological Survey Wales, and the UK MetOffice; 2) the **Bangor Institute for Medical and Health Research** forms a key component of our partnership with the Betsi Cadwaladr University Health Board and encompasses a range of impact-focused research groups with expertise in evidence synthesis, health economics, mental health, dementia, primary care medicine, clinical trials, and evaluation of complex interventions; 3) the **Language Technologies Unit** pioneers research and development in text and speech technologies, terminology standardization, and other aspects of natural language processing and computational linguistics. Its focus is on Welsh, with close links to the Welsh Government, and on other Celtic languages and multilingual aspects of communication [>GBP1,000,000 in external funding over the REF period]; 4) The **Centre for Environmental Biotechnology**, established to identify enzymes from extremophilic microorganisms for industrial applications, has secured or enabled grant funding of more than GBP6,000,000 from the European Commission, UKRI, Leverhulme Trust, and Welsh Government. More recently, the Centre has significantly contributed to the monitoring of COVID-19 in wastewater and was one of the two initial sentinel COVID-monitoring facilities in the UK.

### Research Integrity

The Pro-Vice Chancellor (Research) is responsible for the overall management of Bangor's research. Our research governance and integrity policies and procedures adhere to Universities UK's Concordat to Support Research Integrity (2012; revised 2019). Bangor's **Research Governance & Ethics Committee** is a standing committee of the University Senate. It sets and monitors strategies and policy on research governance and ethics, and oversees the University's Academic Ethics Committees, which are convened in each College by its Dean. The Research Governance & Ethics Committee also sets policies and procedures for key activities including: studies involving human tissue; use of animals; Bangor research outside the UK; children and other vulnerable participants; and studies involving the NHS. Researchers undertaking studies using sensitive materials are supported with specific policies, procedures, and good practice guidelines.

College Directors of Research report to the Research, Impact, and Innovation Strategy Group on potential research integrity breaches that are either resolved within the College, or formally investigated with support from the University's research office. These in turn are reported in summary form to the University Executive and the University Senate. The University's central Governance Services provides **guidance to researchers** on research governance and ethical issues, and offers training sessions on relevant topics including data protection (GDPR) and safeguarding.

### Open research

Bangor has engaged actively with the **Open Access** agenda throughout the REF period. Since 2014, we have required the deposit of output metadata and full-text versions of research outputs (REF-eligible or otherwise) in the University's public repository. All PhD theses are available through the repository. A University-wide research information system enhances the collection and validation of research records and the dissemination of outputs. The Open Access agenda is promoted in training for staff and postgraduate research students, and through activities during the annual Open Access week featuring external speakers from publishers and HE sector bodies. Bangor also contributes to major international efforts to increase **access to research data and resources**, such as via the openaire.eu site.

### Next five-year period

Bangor University, led by a new Vice-Chancellor appointed in 2019, is developing a new **Strategic Plan** that sets out our institutional ambitions for 2030. Research excellence is the first

of four strategic pillars underpinning the Plan, which will prioritize the growth of research with the potential for transformative impact that is UK-relevant and internationally significant, exploit economies of scale, and maintain academic, financial and operational sustainability. The University has also embarked on a new ten-year **estate strategy** to develop a more modern and efficient estate that is optimised for interdisciplinary research and innovation, including co-location of key facilities to enhance usage across disciplines. This approach will also assist in sharing facilities with external partners, one of the aims of our Research Wales Innovation Fund strategy. An overall aim is to be carbon neutral in our operations by 2030.

Recognising the loss of access to European Structural and Investment Funds, Bangor will continue to pursue **new and diverse income streams for impactful research**, in line with the strategic steer from Welsh and UK Governments and UKRI. The **participation of the UK in Horizon Europe** offers continued opportunities, given the close alignments between Bangor's research strengths and the identified EU "missions" for a low carbon economy and a healthier and more resilient society. Bangor's potential in this regard was underlined by the recent UK **BEIS Science and Innovation Audits** which identify Bangor's significant expertise, facilities, and business partnerships relating to the environment and energy sectors: a North West Coastal Arc Partnership for Clean and Sustainable Growth, and a North West Nuclear Arc, noting of the latter that "nowhere else in Europe is so much nuclear expertise so concentrated, with unparalleled access to a world-renowned skills base and pioneering expertise in nuclear research and development".

Key strategic developments for the immediate future include: 1) our plan, presented to the **Research Wales Innovation Fund** (which will provide GBP7,000,000 to Bangor over the next 3 years) to be the research-led entrepreneurial University for North Wales at the heart of an "innovation crescent" stretching from the Irish Republic to the Northern powerhouse of North West England; 2) three major projects in the UK and Welsh Government funded **North Wales Growth Deal** that will exploit our research expertise and build on earlier strategic place-based innovation investments: Low Carbon Energy, Environmental Biotechnology, and Digital Signal Processing (these projects are all in their first phase, with a total investment of GBP27,000,000); 3) our proposal with Betsi Cadwaladr University Health Board for a new **North Wales Medical and Health Sciences School** which will substantially strengthen our activities in the health and medical sphere, and will facilitate the formation of new multidisciplinary research teams to address the urgent health and social needs of communities across Wales and beyond.

### **Integrity and Open research**

Bangor has embarked from 2020 on new initiatives in these areas. We have begun an evidence-based review of our **research governance**, in light of the changing UK research context and evolving forms of research, impact, and user engagement. This review is aimed at ensuring that our governance policies and procedures continue to capture relevant knowledge and expertise, and to provide timely advice, guidance and resources for our researchers. From 2021, our professional services will include a re-designed Integrated Research and Impact Service for research administration and operational needs, and Governance Services will have an expanded role in revising our research governance framework, developing policies and resources and monitoring compliance. In **open research**, our ambition is to continue to increase awareness and application of the latest thinking on transparent, reproducible, and accessible research. This involves elements such as pre-registration, sharing of data and materials, and intellectual property and licensing. Bangor is moving to Transformative Journal Agreements with publishers that will automatically ensure Open Access compliance.

### **Support for Interdisciplinarity**

Bangor will continue to build on existing **interdisciplinary successes** and develop new ones in response to emerging internal strengths and regional, national, and international research needs. For example, the **Sir William Roberts Centre for Sustainable Land Use**, established in 2018 with endowment funding of GBP500,000, is a bold initiative to generate new thinking on sustainability to promote justice and wellbeing. Bangor's new **Plastic Research Centre of Wales** brings together a multidisciplinary group of academics, students and partners to

investigate all aspects of plastic use, plastic pollution and plastic alternatives, including public perception and acceptance of alternative solutions. And our new **Smart Efficient Energy Centre** is a GBP7,000,000 project that intersects three low carbon energy sectors: ocean energy, nuclear energy, and energy efficient structures, supported by a common technology hub.

### 3. People

**Bangor University's staffing strategy, support and training of research students and, building on the information provided in codes of practice, evidence about how equality and diversity in research careers is supported and promoted across the institution.**

#### Staffing strategy

Bangor University fosters an **inclusive and supportive research environment** that encourages the development of researchers at all career stages. A key driver is the Concordat to Support the Career Development of Researchers. Bangor has committed to the Concordat since 2008 and signed the 2019 revision. Our **Researcher Development and Concordat Group** works with the University Executive to support researcher career development and to develop our Concordat action plans. The group is chaired by a College Dean and includes early career researcher (ECR) and postgraduate researcher representatives. Bangor's **Researcher Development Programme** provides training sessions on topics such as funding opportunities, project development, costing, data management, open access, and media training. Researcher induction sessions are held regularly for new staff members. Bangor's researcher support is recognised in repeated achievement of the European Commission's **HR Excellence in Research Award** (first in 2012 and most recently in November 2020).

Staff members participate in the annual **Performance Development Review** process, providing an opportunity to discuss expectations, training needs, and career development. In January 2020 a new online process was launched to facilitate more effective PDRs. Bangor's **academic workload framework** sets general principles that are followed by each College in line with its own strategic priorities. These principles include recognition of the importance of work/life balance and well-being; attention to diverse working patterns and caring responsibilities; and compliance with legal obligations and equality and diversity commitments.

Bangor's **Early Career Researchers** network launched in 2016 to provide ECR staff with career development support, and a forum in which to make connections and to highlight their needs and views. Example session topics include: applying for research funding; social media; REF; IP and commercialisation; and mentoring. Bangor also actively supports ECRs in pursuit of **external fellowship funding**, such as the capture of 7 Welsh Government funded Sêr Cymru Fellowships. The **Welsh Crucible** is a pan-Wales initiative providing extended workshops for the future research leaders of Wales; more than 25 Bangor researchers participated over this REF period.

#### Support and training of research students

Bangor University's **Doctoral School**, headed by the Dean of Postgraduate Research, is responsible for the systems, policies, and procedures that underpin our research degree programmes. Parity of experience and provision of infrastructure and support are important drivers. There are currently 803 registered postgraduate research students (20% from overseas). Of the students awarded their research doctoral degrees in this REF period, 87% were full time; 58% were externally funded, 23% internally funded and 19% privately funded. Gender parity was excellent: 51% of the cohort were female and 48% male (1% undeclared).

The Doctoral School adopts the Vitae Researcher Development Framework to provide a comprehensive **training and development programme**. In line with the University's **Code of**

**Practice for Postgraduates Who Teach**, postgraduate researchers receive appropriate training before undertaking duties as teaching assistants and are supported to earn an optional *PGCertHE* that provides key skills for future academic careers. The Doctoral School also provides training for research supervisors on effective supervision and on examining [147 and 55 REF-period attendees, respectively]. A University-wide online progress review system (in use since 2016) aids monitoring and supervision of postgraduate research students. Overall satisfaction for postgraduate research at Bangor measured in the **HEA Postgraduate Researcher Experience Survey** has exceeded 80% throughout this REF period.

A key facilitator of Bangor's postgraduate researcher training is our leadership of, and participation in, twelve **Doctoral Training Partnerships, Centres, and networks**. These involve external support from five of the UK Research Councils, as well as the Welsh Government's *Sêr Cymru* innovation and science funding scheme, three EU-funded Initial Training Networks, and the Coleg Cymraeg Cenedlaethol (Welsh National College; invests via studentships and other means to build a sustainable Welsh-medium research base). These centres and partnerships span topics including AI, environmental science, Celtic languages, soils science, nuclear energy, bilingualism, digital imaging, and health care. Finally, the Knowledge Economy Skills Scholarships programme is a pan-Wales initiative led by Bangor and supported by the European Social Fund (2015-2023, GBP56,000,000) that links partner organisations with the Welsh Higher Education sector to undertake research collaborations via a PhD or Research Master's degree.

### Equality and Diversity in Research Careers

Bangor University **values the positive contribution of all its members**. We are guided by the relevant legislation and best practice, and by the Well-being of Future Generations Act's provisions for "A More Equal Wales". A Pro-Vice Chancellor chairs the University's Equality & Diversity Strategy Group, providing senior leadership and a direct line to the University Executive. Bangor publishes its **Strategic Equality Plan** every four years (most recently 2016-20 and 2020-24) and annually reports data relating to staff and students, and progress against the Plan's objectives.

Bangor's commitment to gender equality is captured by our institutional **Athena Swan Bronze Award**, initially won in 2011, renewed in 2014 and in 2018 (valid until 2023). There were seven successful School-level applications during this REF period. Bangor's Athena Swan Working Group identifies actions to embed Athena Swan principles into our activities, reporting to the Executive by way of the Equality & Diversity Strategy Group. Bangor **voluntarily publishes gender pay gap data** annually; the 2020 figures were favourable relative to the HE sector average. In 2018, the University established a network of **Equality Champions** to promote equality in the Colleges and Professional Services.

Bangor's **academic progression and promotion processes** explicitly take into account that individual circumstances (e.g. part-time working, parenting and caring responsibilities) may impact an applicant's career. External assessments are sought for all promotion applications, which are considered by a panel chaired by the Vice Chancellor. Over this REF period, **success rates for promotion** (173 in total) were strong and **gender balanced**: promotion to Senior Lecturer, 67% for female applicants and 72% for male; to Reader, 100% female and 93% male; to Professor, 88% female and 85% male.

Bangor has **supportive policies for staff** including for parental/adoption leave, time off for emergencies, compassionate leave, and flexible working. The University operates an on-campus nursery and staff with children can use the childcare voucher benefit scheme and access more affordable childcare through a salary exchange agreement. University-level meetings are generally held in core hours (10-4pm) in order to allow staff with caring responsibilities to attend.

Bangor established a **staff and postgraduate LGBTQ network** in 2018 to increase the visibility of LGBTQ issues in the workplace, to provide a forum and source of support, and to provide a focus for collaborative LGBTQ-related actions. The network has organised several open Pride events since its founding. Bangor's **Student and Staff Trans Equality Policies** provide guidance for staff on supporting students (including postgraduates) who are transitioning.

Bangor University adopts the principles that the **Welsh language** should be treated no less favourably than English in Wales, and persons in Wales should be able to live their lives through the medium of the Welsh language if they so choose. These principles inform a range of University activities including research, as detailed in our Welsh Language Policy.

#### 4. Income, infrastructure and facilities

##### **Bangor University's institutional-level resources and facilities available to support research and enable and actualise impact.**

Bangor's **Research, Innovation and Impact Office**, overseen by the Pro-Vice Chancellor (Research), provides researcher support including: identifying funding opportunities; supporting the delivery and communication of impact; supporting relationships with business partners; promoting business and enterprise activities; and monitoring research and enterprise expenditure.

The Pro-Vice Chancellor (Research) sits on the University Estate Strategy Group which has **oversight of all major capital investment including research-related infrastructure**. Bangor's **total building space designated for research use approaches 20,000 m<sup>2</sup>**. Examples of our key outstanding resources and facilities for excellent research with impact include the following.

**Pontio Arts and Innovation Centre** (GBP51,000,000, 10,000 m<sup>2</sup>) opened in 2015 following EU and Welsh Government investments, with a brief for impact and community engagement (Pontio means 'to bridge' in Welsh). It houses key research facilities:

- **Pontio Arts:** provides state-of-the-art theatre, exhibition and performance spaces (including Theatr Bryn Terfel) which benefit researchers across the Arts and Humanities by enabling engagement with practitioners and hosting key events crucial for research and impact in creative writing, music, dance and film.
- **Pontio Innovation:** a business development hub (including a Fabrication Laboratory) providing an open venue to develop and exploit innovative ideas on different scales, leading to patent submissions, and the formation of new businesses and services, some of which have set up in Bangor's Menai Science Parc.

**Menai Science Parc:** a Bangor University company aimed at exploiting and commercialising our research to grow the local economy. The purpose-built 5000 m<sup>2</sup> facility (opened 2018; winner of the 2019 Welsh Architecture Award), part-funded by Welsh Government and EU (GBP20,000,000), is located in a designated Enterprise Zone affording tenants tax advantages and other government assistance. It focuses on businesses in the low-carbon and digital sectors and currently has an occupancy rate of over 85%.

**Library and Archives Special Collections** provide access to a wealth of research materials including a world-leading collection of Arthurian literature, the R.S. Thomas Centre, the Stephen Colclough Centre for the History of the Book, and over 250,000 manuscripts and 30,000 books in Welsh. Other **physical collections** include the University's Art collection (one of the largest university collections in the country), as well as ceramics, musical instruments, and materials relevant to zoology, geology, botany, forestry, and ocean science, collections of furniture, archaeological materials, textiles, and social history recordings. In partnership with Bangor University, in 2013 Gwynedd Council obtained a GBP1,400,000 grant from the Heritage Lottery

Fund for a GBP2,600,000 widening access project to renovate the new home in Bangor of the Gwynedd Museum and Art Gallery, *Storiel*.

**Environment Centre Wales:** a partnership between Bangor University and the UK Centre for Ecology and Hydrology that provides a unique and sustainable research environment for over 100 scientists. Shared spaces foster interactions with key research partners and end users. Major research themes include: sustainable agriculture; quantifying pollution and mitigation; and effects of climate extremes and land management on ecosystem function.

**Marine Centre Wales:** a new national resource (opened 2016) designed to meet the need for integration of research, innovation, commerce, and policy in the marine sector. Located on the Menai Strait next to our School of Ocean Sciences, it provides access to specialist facilities of 2,200 m<sup>2</sup> including laboratories, aquaria and the RV Prince Madog, Bangor's **ocean-going 35 m research vessel**.

**Henfaes Research Centre:** 252 hectares for research and teaching in environmental science, agriculture, forestry, hydrology, and conservation. Encompassing diverse environments from shoreline to some of the highest land in Snowdonia, it is one of Defra's key sustainable intensification platform sites, and an Innovation Site for the Welsh Government's Farming Connect programme.

**Magnetic Resonance Imaging Unit:** a research-dedicated, neuroscience-focused 3T MRI system within the integrated Centre for Clinical and Cognitive Neuroscience. Refreshed with a new 3T MRI in 2019, the Unit attracts funding from the European Research Council, UKRI, Leverhulme Trust, Wellcome Trust, and industry partners.

**SupercomputingWales:** a GBP16,000,000 Welsh Government and EU-funded investment, giving researchers and businesses in Wales access to world-class, secure supercomputing technology. At Bangor, the facility supports research in coastal, tide and climate modelling; smart energy; nuclear reactor modelling; and pharmacometrics.

**ESRC Impact Accelerator Award:** Funding of GBP1,400,000 during this REF period provided support for impact activities arising from Bangor's social sciences research, broadly construed, supporting staff at all career levels. The award supported 88 projects and fostered relationships with 244 research end-users from the private, public, and third sectors. Policy and practice impacts, and new relationships, were fostered in areas such as dementia, conservation, dyslexia, homelessness, bilingual heritage guides, and surveillance.

**Treborth Botanic Garden:** 18 hectares on the Menai Strait, comprising native woodlands, unimproved grasslands, and managed orchards. Glasshouses hold special collections, and a herbarium >30,000 global specimens with a particular representation of the flora of North Wales.