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Annex 3:
Overview of the NWCA's research and innovation assets for Clean and Sustainable Growth

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Asset	Description	Location	Type	EITS	FES	AMCM
Advanced Manufacturing and Research Institute (in planning)	Airbus confirmed it will be the first anchor tenant for the new centre at Airbus Broughton ensuring maximum benefits for the supply chain and wider economic advantages. The Welsh Government is providing £20m pump-priming funding and a further £10m from project partners.	N Wales	R&D/ Skills		✗	✗
Advanced Manufacturing Centre for Skills Development and Employer Engagement	A Lancaster University and BAe Systems partnership to facilitate skills development through cadet, apprenticeship, undergraduate and postgraduate schemes with significant employer engagement at all stages.	Lancs	Skills/ Tech Access		✗	
BEACON Biorefining Centre of Excellence	A partnership between Bangor, Aberystwyth, and Swansea Universities, BEACON helps Welsh businesses develop new ways of converting plant-based feedstocks and waste streams into products which have applications in the pharmaceutical, chemicals, fuel and cosmetic industries.	N Wales	R&D	✗	✗	
Biocomposites Centre	The Biocomposites Centre undertakes collaborative research projects to develop sustainable biobased technologies that will minimise the impact of materials on the environment.	N Wales	R&D	✗	✗	
British Oceanographic Data Centre (BODC)	Hosted by Liverpool University and the National Oceanographic Centre (q.v.), the BODC is a national facility for looking after and distributing data concerning the marine environment.	M'side	R&D	✗	✗	
Built Environment & Sustainable Technologies Institute at Liverpool John Moores University (LJMU)	LJMU has specific strengths in civil engineering (materials technology design and performance, sensor technology for the built environment and life cycle analysis of materials) and water research (waste water treatment, water resource management).	M'side	R&D/ Skills		✗	✗
Centre for Ecology & Hydrology (CEH)	A Government research organization with two centres co-located with NWCA universities (Bangor and Lancaster). CEH is recognized as internationally leading in earth observation, natural hazard management, sustainable energy potential and impacts, informatics and water management.	Lancs N Wales	R&D		✗	✗
Centre for Environmental Biotechnology at Bangor	This facility currently under development will provide state-of-the-art equipment and world-leading expertise for identifying and isolating enzymes in extremophiles (microorganisms that thrive in extreme conditions such as high temperature, salinity, or acidity). The enzymes can be used to transform industrial processes in key sectors of the economy.	N Wales	R&D/ Skills		✗	

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Centre for Global Eco-Innovation (CGE) – see page 20	The Centre for Global Eco-Innovation supports the development of new products and services with environmental benefits. The centre delivers high quality business led research, through enabling enterprises to access the expertise resources and global contacts of Lancaster University and its national and international partners.	Lancs Cumbria M'side Ches	R&D/ Skills		✗	✗
Centre for National Parks and Protected Areas (CNPPA) Cumbria University	An international and national centre of excellence for the transdisciplinary study of national park and protected area management – developing sustainable solutions to global challenges.	Cumbria	R&D/ Skills		✗	
Centre for Offshore Renewable Engineering	The City Region was recently designated with CORE status in recognition of continued potential in the low carbon and renewable sector. Growth is being stimulated through £3.5bn invested in Liverpool Bay.	M'side	Infrastructure Skills Supply Chain	✗	✗	
Centre for Waste Management (CWM) at UCLAN	The Centre for Waste Management (CWM) was established in 2002 to provide a focus for existing waste/environmental research, consultancy and course provision at the University of Central Lancashire. The Centre provides a range of business services designed to increase business efficiency, productivity and improve environmental performance.	Lancs	R&D/ Skills		✗	
Centre for Water Soluble Polymers	This centre at Glyndwr University focusses on the characterisation, properties & application of polysaccharides and proteins (hydro-colloids) in a broad range of industrial formulations including food.	N Wales	R&D/ Skills		✗	
Centre of Excellence in Sustainable Energy	Funding in excess of £50m is being sought to deliver this Centre at Bangor University's Science Park on Anglesey, capitalising on the major investment in nuclear power and, broadening its remit to other technologies and industries.	N Wales	R&D		✗	
Centre of Excellence in Sustainable Food Systems (CESFS)	The Centre focusses on the genetic improvement of crops to address the needs of sustainable intensification, whilst informing conservation efforts within native communities.	M'side	R&D/ Skills		✗	
Centre in Advanced Energy Systems	University of Chester, public and private partners are now jointly investing £17m to develop an internationally recognised Centre in Advanced Energy Systems, including an Intelligent Energy Systems Demonstrator to test new power saving and distribution technologies.	Ches	R&D/ Skills		✗	
cTAP (Collaborative Technology Access Programme)	This £11.4m ERDF funded facility is dedicated to industry collaboration around chemical analysis, characterisation and synthesis; a Quantum Technology Centre leading innovation of semiconductor science and a new Engineering facility with specialist additive manufacturing and design capabilities.	Lancs	R&D / Tech Access		✗	

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Combined Food and Power (CFP) Centre of Excellence	A joint development by Bangor University and the Energy Centre and Eco Park created at Holyhead by the Orthios Group (which will include a 299 MWe biomass power station, the world's largest on-land aquaculture facility and a large indoor vegetable growing hydroponics facility).	N Wales	R&D/ Skills		✗	✗
DEMAND (Dynamics of Energy, Mobility and Demand) Centre	The centre's research focusses on the social science of future energy systems at home, at work and in moving around. Partners include: DECC, Ofgem, Energy Technologies Institute (ETI), Energy Systems Catapult, EDF and the International Energy Agency.	Lancs	R&D/ Skills		✗	
Edge Hill University	EHU has particular strengths in computer and data science, environmental modelling, forest and coastal management and molecular biology as enablers of eco-innovation.	Lancs	R&D/ Skills		✗	
Energy Centre at Thornton Science Park	The Centre promotes the development and exploitation of new energy technologies including new types of photovoltaic solar cells, innovative electrical energy storage solutions, low power motor drives, new algorithms for load balancing on micro-grids and non-electrical energy systems.	Ches	R&D/ Tech Access		✗	
Energy Innovation District	This is the first of its kind in the UK, bringing together generators, energy-intensive manufacturers, innovators and academics to combine forces to create a joined-up solution to the UK's energy challenge.	Ches	Collaboration Hub		✗	
Energy Lancaster at Lancaster University	Energy Lancaster brings together Lancaster University's world leading expertise in a wide range of energy related areas covering the demand and supply of energy. Energy Lancaster is working in partnership with global organisations in the development and management of secure and sustainable energy supplies.	Lancs	R&D/ Collaboration		✗	
Engineering Innovation Centre (EIC) at UCLAN	Within the Lancashire Strategic Economic Plan this £40M+ project develops UCLAN's research, knowledge transfer and training capabilities in Engineering to work with local SMEs and prime the advanced engineering and manufacturing sectors.	Lancs	R&D/ Skills		✗	

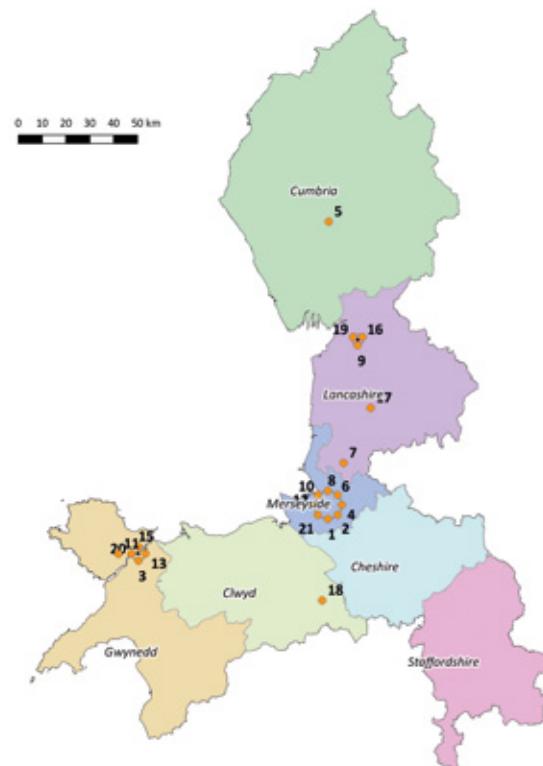
Asset	Description	Location	Type	EITS	FES	AMCM
Environment Centre for Wales at Bangor University	<p>Environment Centre for Wales is a new partnership between the Centre for Ecology and Hydrology and Bangor University.</p> <p>The innovative centre brings together 60 environmental scientists whose combined scientific knowledge and experience cuts across traditional academic boundaries. This new way of working makes significant contributions to solutions for environmental problems.</p>	N Wales	R&D/ Skills			
Glass Futures	Glass Futures connects the glass industry and academia to create an industry cluster to ensure increased productivity and sustainability in the sector.	M'side	R&D/ Skills/ Collaboration			
Hartree Centre	Focused on high performance computing, big data analytics and cognitive computing (including IBM's latest data-centric and cognitive computing technologies), two of Hartree's four key sectors, advanced engineering & materials and clean technologies, coincide directly with themes in this SIA.	M'side	R&D/ Collaboration			
HyDeploy project	This collaboration between Keele University, National Grid plc and Northern Gas Networks aims to deliver blended hydrogen into the existing natural gas grid – the first UK practical deployment of hydrogen onto a live gas network.	Staffs	R&D			
Institute for Risk & Uncertainty at Liverpool University	The University's Institute for Risk and Uncertainty is dedicated to helping people and organisations create a safer world. Our multidisciplinary research team includes experts from architecture, engineering, environmental sciences, financial and actuarial mathematics, computer science, electrical engineering & electronics, economics and finance, social sciences and psychology.	M'side	R&I/ Skills			
Lancashire Energy HQ	A £10.7m dedicated education and training facility developed by Blackpool and Fylde College in collaboration with industry partners. The facility offers energy related training for future employment across all aspects of the energy industry including renewables, nuclear, oil and gas.	Lancs	Skills			
Lancaster Environment Centre (LEC) at Lancaster University	A partnership between Lancaster University, the Centre for Ecology & Hydrology and 25 environmentally focused businesses, is one of the world's largest centres for environmental research and development, with expertise spanning the natural and social sciences, offering balanced perspectives on what are complex societal challenges.	Lancs	R&I/ Skills			
Lancaster Leadership Centre	Based at Lancaster University Management School, the Leadership Centre draws upon the work of many members of the Management faculty in several departments, centres and institutes. More than 80 staff work in the LLC. Their work is pioneering new ways of building leadership capability in organisations across the world.	Lancs	R&D			

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Lancaster Product Development Unit	Bespoke design and additive manufacturing technology expertise.	Lancs	Collaboration / Tech Access			✗
LCR4.0	LCR 4.0 aims to put the Liverpool City Region at the heart of an evolution which is set to transform production in the modern world economy. The initiative helps SMEs explore the potential of Industry 4.0 technologies by providing support ranging from research and development, knowledge transfer and the acceleration of ideas from concept through to commercialisation.	M'side	Collaboration / Tech Access			✗
Lloyd's Register Foundation	Including a base in Liverpool, the Foundation has significant programmes concerned with critical infrastructure resilience. It supports eco-innovation on the coast by combining the positive benefits of offshore energy generation with seaweed production for food, biochemicals and energy.	M'side	Grants for R&D/ Skills	✗	✗	✗
Marine Centre Wales (MCW)	Marine Centre Wales (MCW) is a new national resource designed to meet the need for integration of research, innovation, commerce and policy in the marine sector. MCW provides access to specialist facilities including conference and meeting rooms, offices, laboratories, aquaria and research vessels including the RV Prince Madog.	N Wales	R&D		✗	
Materials Innovation Factory (MIF)	This £65 million partnership between the University of Liverpool, Unilever and HEFCE provides open access to state-of-the-art equipment and world-leading academic expertise to create new materials with step-change functional enhancement in a range of important applications.	M'side	R&I/ Skills			✗
Menai Science Park Ltd (M-SParc)	Bangor University is developing a Science Park on Anglesey to drive growth in knowledge-based science, with an early focus on low carbon energy, the environment and ICT sectors. It includes the installation of a 10MW tidal array (the Minesto Deep Green project).	N Wales	R&I	✗	✗	
National Oceanography Centre (NOC)	NOC is the United Kingdom's centre of excellence for oceanographic sciences and is one of the world's top oceanographic institutions. The NOC undertakes world leading research in large scale oceanography and ocean measurement technology innovation.	M'side	R&D/ Skills/ Collaboration	✗	✗	
National Research Network for Low Carbon, Energy and Environment	Bangor University is home to this pan-Wales initiative funded by the Welsh Government and the Higher Education Funding Council for Wales. The network supports collaborative and interdisciplinary research into the interactions between land, water, the provision of food and energy production.	N Wales	R&D/ Skills	✗	✗	

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Northwest Advanced Manufacturing Research Centre	NWAMRC has emerged from a Wave 1 SIA as an industry focused centre of excellence for innovation, product development and manufacturing skills for aerospace, automotive and energy supply chain. Founding industrial partners include BAE Systems, Siemens, and Cammell Laird.	Lancs	R&I/ Skills		✗	✗
North West Hydrogen Cluster	This brings together Cadent, one the largest chlor-alkali hydrogen producers in the UK, Alstom (who are developing hydrogen powered trains) and the Cheshire & Warrington salt caverns, which have the capacity to store 160 million cubic metres of gas.	M'side	Industry led R&I		✗	
OpTIC – the Optoelectronic Technology Incubation Centre	The Centre, based in St Asaph and owned by Glyndwr University, has become a business focus for a thriving industry focused on photonics and optoelectronic technology, that has emerged from the area's heritage in manufacturing specialist glass.	N Wales	Industry led R&I Cluster		✗	✗
Quantum Technology Centre	The Quantum Technology Centre contains state-of-the-art nanofabrication facilities, supported by molecular beam epitaxy reactors for atomic layer-by-layer growth of semiconductor nanostructures and devices. Fabrication techniques available include electron-beam lithography using a dedicated electron-beam writer, plasma processing and thin-film deposition.	Lancs	R&I		✗	✗
Research Vessel Prince Madog	State-of-the-art, purpose-built research vessel commissioned by Bangor University using a £2.8 million Joint Infrastructure Fund grant. Managed and operated by P&O Maritime Services, delivered and in service July 2001.	N Wales	R&D		✗	
River Eden Demonstration Test Catchment (Eden DTC)	This Defra funded project assesses cost effective mitigation of diffuse pollution from agriculture whilst maintaining agricultural productivity.	Cumbria	R&D		✗	
School of Environment, Natural Resources and Geography (SENRGy), Bangor University	The School has a world-class reputation in research, with particular expertise in forest ecology and management; environmental studies and soil science; agricultural systems; agroforestry; biodiversity conservation; and tropical ecosystems.	N Wales	R&D/ Skills		✗	
School of Environmental Sciences, University of Liverpool	The School of Environmental Sciences studies Planet Earth. Research investigates its core and mantle, through to the dynamic lithosphere and crust and the tectonic processes that are expressed at the Earth's surface in the form of volcanoes and earthquakes.	M'side	R&I/ Skills		✗	
School of Ocean Sciences, Bangor	One of the largest university Marine Science departments in Europe, including purpose-built research vessel Prince Madog.	N Wales	R&D/ Skills		✗	✗

Asset	Description	Location	Type	EITS	FES	AMCM
Sci-Tech Daresbury	One of two national science and innovation campuses which support scientists, researchers and industry by providing a collaborative environment for cutting edge research, including the Innovation Centre, Vanguard House and the Cockcroft Institute, and two grow-on facilities, Techspace One and Two.	M'side	R&I/ Collaboration	✗	✗	✗
SEACAMS 2	SEACAMS 2 is a £17 M three-year project partnership between Bangor and Swansea universities, part funded by the European Regional Development Fund. The main objective of SEACAMS2 is to assist the development of opportunities in Low carbon, Energy and Environment in the convergence regions of Wales, especially the potential in the marine economy and marine renewable energy.	Wales	R&D		✗	
Smart Energy Network Demonstrator (SEND)	Funded by Keele University, the BEIS, and the European Regional Development Fund (ERDF), SEND will allow Keele University campus to become the largest single, integrated electricity, gas and heat smart energy network demonstrator in Europe.	Staffs	R&D/ Skills		✗	
Stephenson Institute for Renewable Energy (SIRE) at Liverpool University	This specialist energy materials research institute focuses on the physics and chemistry for future energy generation, storage, transmission and energy efficiency. Partner companies include AMEC, AREVA, AWE, EDF, the Nuclear Decommissioning Authority, Rolls-Royce and Sellafield Ltd.	M'side	R&I/ Skills		✗	
Unilever R&D	Currently employing ~1000 scientists at Port Sunlight, Unilever has recently announced the closure of 4 major European sites (including the Rotterdam R&D hub) with the associated 2000 jobs potentially destined for relocation to the UK subject to planned infrastructure investment in the North.	M'side	R&I	✗	✗	
UK Geoenergy Observatory	£31M has been allocated to the British Geological Survey to establish this pioneering system to realise the huge potential of Britain's underground energy resources including carbon capture and storage, geothermal energy, underground coal gasification and underground gas storage.	Ches	R&D		✗	
The Virtual Engineering Centre (VEC)	The VEC is a partnership between, the School of Engineering at the University of Liverpool, the Science and Technology Facilities Council (STFC), BAE Systems, North West Aerospace Alliance (NWAA) and Morson Projects. The centre offers technology development, research, training and knowledge transfer in support of product design and manufacturing innovation to drive global competitiveness.	M'side	R&I		✗	
West Anglesey Demonstration Zone	This demonstration zone is being developed by Crown Estates to encourage and accelerate marine energy technology development.	N Wales	R&I Demonstration		✗	

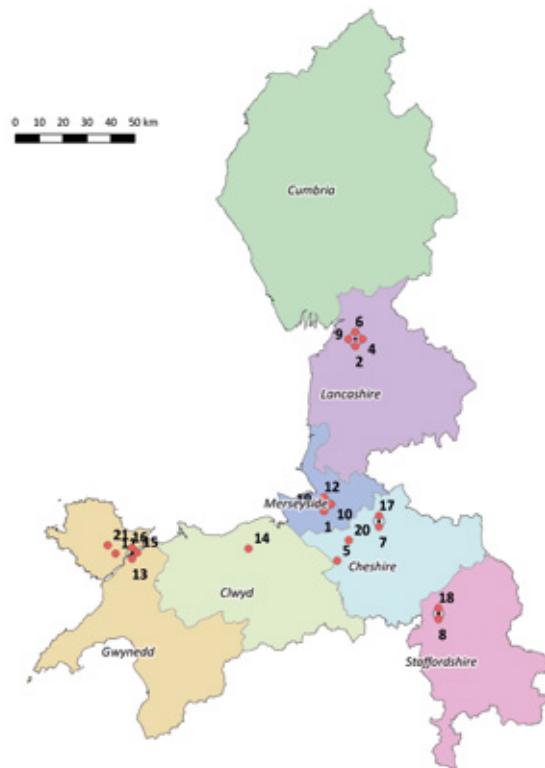
Internationally Significant Environmental Industries Technologies & Services Assets



Asset

1. British Oceanographic Data Centre
2. Built Environment & Sustainable Technologies Institute at LJMU
3. Centre for Environmental Biotechnology at Bangor
4. Centre for Excellence in Sustainable Crop Systems
5. Centre for National Parks and Protected Areas (CNPPA)
6. Centre of Excellence in Sustainable Food Systems
7. Edge Hill University
8. Institute for Risk & Uncertainty
9. Lancaster Environment Centre
10. Lloyd's Register Foundation
11. Menai Science Park
12. National Oceanography Centre
13. National Research Network for Low Carbon, Energy and Environment
14. SEACAMS 2
15. The Biocomposites Centre
16. The Centre for Ecology & Hydrology
17. The Centre for Waste Management
18. The Centre for Water Soluble Polymers
19. The River Eden Demonstration Test Catchment
20. The School of Environment, Natural Resources and Geography
21. The School of Ocean Sciences, Liverpool University

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**Internationally significant assets related
to Future Energy System**
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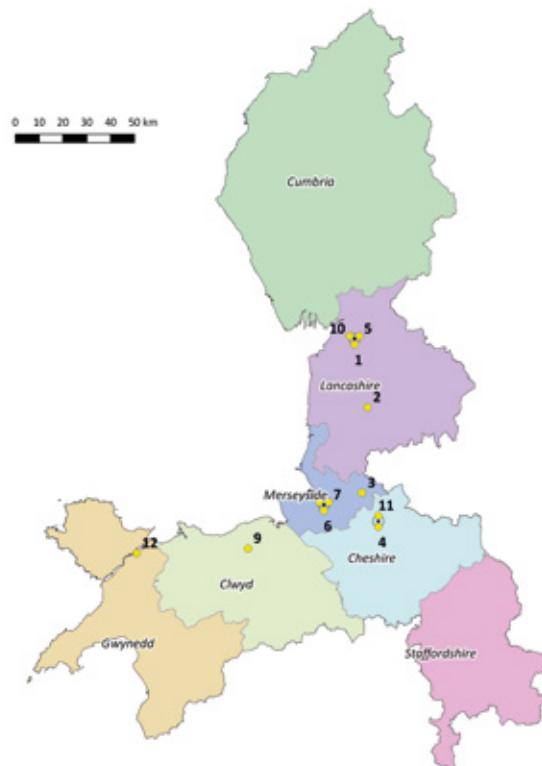
Asset

1. Built Environment & Sustainable Technologies Institute at Liverpool John Moores University (LJMU)
2. Centre for Ecology & Hydrology (CEH)
4. DEMAND (Dynamics of Energy, Mobility and Demand) Centre
5. Energy Centre at Thornton Science Park
6. Energy Lancaster at Lancaster University
7. Hartree Centre
8. HyDeploy project
9. Lancaster Environment Centre (LEC) at Lancaster University
10. Lloyd's Register Foundation
11. Menai Science Park Ltd (M-SParc)
12. National Oceanography Centre (NOC)
13. National Research Network for Low Carbon, Energy and Environment (NRN-LCEE)
14. Optoelectronic Technology Incubation Centre
15. School of Environment, Natural Resources and Geography (SENRGy), Bangor
16. School of Ocean Sciences, Bangor
17. Sci-Tech Daresbury
18. Smart Energy Network Demonstrator (SEND)
19. Stephenson Institute for Renewable Energy (SIRE) at Liverpool University
20. The Energy Centre at Thornton Science Park
21. West Anglesey Demonstration Zone

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Internationally significant assets for Advanced Manufacturing, Chemicals and Materials

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Asset

Asset
1. Collaborative Technology Access Programme
2. Engineering Innovation Centre
3. Glass Futures
4. Hartree Centre
5. Lancaster Product Development Unit (LPDU)
6. Liverpool John Moores University (LJMU)
7. Lloyd's Register Foundation
8. Materials Innovation Factory
9. Optoelectronic Technology Incubation Centre
10. Quantum Technology Centre
11. Sci-Tech Daresbury
12. The BioComposites Centre