

Heart of the South West Local Enterprise Partnership LEP Board Paper agenda item 9b)

Report title:Innovation – Marine and Environmental Science AcceleratorDate:1/7/22Purpose:This paper is for notingLink to LIS:Indicate by bolding which area the paper links to.

l	nclusive Growt	h	Clean growth		
Energy		Engineering		Digital	
Ideas/ Innovation	People/Sk	ills Infrast	ructure Bu	is. Environment	Places

Non- LIS purpose: N/A

Timing: Ongoing

Financial Impact: Proposed investment of £128.3m

Decisions requested: None

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<u>Summary</u>

Proposals for the Marine and Environmental Science Accelerator have advanced, with positive engagement taking place with both ministers and officials. On 22nd July an in person briefing will take place for the region's MPs and other key stakeholders.

The Innovation Board is continuing to advance these proposals in collaboration with the universities.



Background

Marine and Environmental Science Accelerator

Introduction

South West England is home to world leading expertise in marine and environmental science that will enable the UK to lead the green industrial revolution around the world. The Marine and Environmental Science Accelerator will secure the UK's place as a science and technology superpower whilst underpinning national security, energy security, food security and economic prosperity. The evidence is clear: Now is the time to invest in the expertise and facilities in the South West to ensure competitive advantage and global leadership.

With the right targeted support, the Universities of Exeter and Plymouth alongside an extensive range of business partners will enable the government to deliver on every aspect of the 'Ten Point Plan for a Green Industrial Revolution' from Advancing Offshore Wind and Green Ships to Greener Buildings and Protecting the Natural Environment. The Accelerator will deliver a sustainable transition to a net zero economy as well as support many of the government's wider priorities including:

- Grow Research and Development investment outside the Greater South East
- Level up a region with low rates of productivity, pay and higher education supporting new jobs and skills
- Deliver tangible results from the National Shipbuilding Strategy and UK Innovation Strategy
- Boost UK exports
- Capitalise on established South West assets such as the Plymouth & South Devon Freeport, Appledore shipyard and Met Office Supercomputer to maximise commercial opportunities.

Unique Expertise in the South West

Exeter has the UK's top five most influential climate scientists - all in the top 21 in the world - and Exeter is home to more of the world's top 100 climate scientists than any other city on the planet (Reuters Hot List). In total, the University of Exeter has over 1000 research and education specialists working on the environment and climate and has supported thousands of businesses on sustainability and green innovation.

Plymouth University, as part of Marine Research Plymouth, host the largest number of marine scientists in any UK city and have established an international centre of excellence for marine research - number one in the world for impact. Together, the universities and their business partners make the South West the natural powerhouse of the UK with, as yet, significant untapped economic potential.

The Marine and Environmental Science Accelerator will build upon the resources, skills and infrastructure already within the South West to bring in billions of pounds of investment to the UK. The Accelerator has the backing of all the major Devon stakeholders and business partners and will be a major success story for UK PLC as well as a source of national pride.

The Accelerator Proposal

The Marine and Environmental Science Accelerator consists of three interconnected programmes designed to supercharge the south-west and UK economy. Primarily led by the Universities of Exeter and Plymouth, the proposal brings together businesses and stakeholders from across the region to ensure the UK capitalises on the vast new economic opportunities from a changing land and sea.



Ocean Futures: Marine Innovation

For the UK to continue to be one of the great global maritime nations it must be at the forefront of maritime autonomy. This technology will fundamentally change the ocean economy to enable maritime operations to become safer, more sustainable and increasingly efficient – from autonomous vessels to offshore windfarms. To support this transformation a major shift in the way technologies are tested and certified is needed and the Accelerator will support Plymouth's Maritime Autonomy Assurance Testbed (MAAT) to deliver unique competitive advantage for the UK and our international partners.

The MAAT will provide the world's first proven synthetic test environment to establish the UK's global leadership in the development, innovation and commercial realisation of autonomous vessels and related technologies. Operating out of the Plymouth & South Devon Freezone, it brings together world-leading universities, national agencies, global and local businesses, and Research & Technology Organisations.

The MAAT will enable the UK to scale up at pace and dominate in this rapidly growing global market with advantages including the swift and efficient deployment of offshore renewables; better national defence capabilities against external threats; and enabling our trade by sea to be more reliable, cost effective and sustainable.

Delivering on Government Priorities

The Marine Innovation programme will support the delivery and success of a number of cross-cutting government priorities and strategies. It will:

- Create a reliable and internationally recognised assurance capability on maritime autonomy that will enable agile regulatory development and shape future international standards. This capability will underpin successful international collaborations and trade opportunities for the UK, particularly with the US and Asia. MAAT's work will also complement and support the Royal Navy's deployment of autonomous technologies, helping the UK counter future threats. It will deliver economic growth and a strong defence to underpin a successful Global Britain.
- Utilise the Plymouth Freeport to create the world's leading Maritime Innovation Hub that will drive investment in Research and Development as well create highly skilled jobs across the South West making a significant contribution to Government's 'Levelling Up' strategy.
- Deliver on the Department for International Trade's High Potential Opportunity in Maritime Autonomy investment programme and capitalise on the uniquely assembled private and public consortium in this area – including the Lloyd's Register - to ensure the UK is a science and innovation superpower and leader in the maritime services sector.
- Enable faster expansion and more cost-effective delivery of offshore renewables, directly supporting the Government's net zero and energy security ambitions. Translating maritime autonomy research and development into wide-scale deployment will be critical to the success of the UK's maritime and renewable energy industries.

Global Leadership on the Ocean Economy

The Marine Innovation programme will create a global centre of excellence for the testing, development and manufacture of autonomous, digital and clean ocean technologies to support the rapidly growing ocean economy. The OECD predicts that the Ocean Economy will double between 2010 and 2030 to \$3 trillion, with key growth opportunities in high-value marine manufacturing, offshore renewables, marine autonomy and aquaculture.

The UK will lead the world on:



- Ocean Autonomy marine autonomous systems for applications in defence, offshore renewable energy, aquaculture and the wider ocean economy.
- Digital Oceans transforming our understanding of the ocean environment and safeguarding future maritime operations with integrated digital marine communications.
- Maritime Net Zero safe and secure maritime operations that will enable a variety of alternative energy sources bespoke to vessel type and operation.

Boosting the South West Economy

- The marine innovation programme based at the Plymouth and South Devon Freezone will support increased exports and foreign direct investment based on new technological development.
- The South West will become a global centre of excellence leading the transformation to a cleaner safer and increasingly digitally enabled, autonomous maritime sector.
- The Accelerator will create a framework and environment for SMEs and business clusters to create new technology and services for established end-user needs leading to high-productivity growth. It will also provide an anchor for high productivity regional jobs and skills.

A Sound Investment

A strong public and private consortium is already in place which has developed over a decade with a track record of successful collaboration in research, science and innovation. With a commitment to enhanced cooperation, additional investment and further government backing, this partnership is ready to step up and firmly establish the South West as a global centre of excellence based at the Smart Sound Plymouth.

Over 30 organisations in the Future Autonomous at Sea Technologies (FAST) Cluster including major businesses such as Babcock, Thales, MSubs will guarantee a rapid and strong return on investment. The Accelerator will also draw in a wider, world-class ecosystem of SMEs and micros alongside assets from across the South West, including but not limited to: the UK Hydrographic Office, Met Office, National Physical Laboratory, the Marine Biological Association, Plymouth Marine Laboratory, the Universities of Plymouth and Exeter, South West Science Parks, Enterprise Zones and world-class ocean technology test facilities across Cornwall, Devon, Somerset and Dorset.

The South West has over 400 years of ocean heritage and innovation and as one of England's designated Freeports is an established international maritime technology hub. Plymouth is also one of the few European ports with littoral deep sea ocean access without being overly congested by shipping and has the largest naval base in Western Europe with unique capabilities. It is the UK's first marine Enterprise Zone and National Marine Park and the Smart Sound testing range makes Plymouth Sound the most surveyed and digitally connected stretch of water in the world.

The University of Plymouth has world-leading Maritime Cyber Threats research and the new Cyber-SHIP Lab and the UK Maritime Autonomy Centre already delivers complex systems trials, including the unique Maritime Mine Countermeasures system. Over £18m investment in marine business support mechanisms across Devon and Cornwall has taken place since 2017 and further investment will simply enable faster growth.

The Maritime Skills Academy places industry at the heart of the skills development in the region and enables the shift to a future ocean economy. Local partners such as City College Plymouth is already creating a bespoke facility to deliver new university-level courses on marine autonomy with higher-level pathways. Postgraduate opportunities such as flexible Masters programmes and PhDs through the Doctoral Training College are available through the University of Plymouth, with students hosted at Marine Research Plymouth institutes as well as with maritime industry partners.



Britain's maritime heritage is long, proud and lucrative, but international competitors are investing heavily to try and lead in tomorrow's economy. The UK must seize this moment to significantly invest and build upon a proud maritime past and forge a bold maritime future.

Case Studies

- Cyber-SHIP Lab is a unique, hardware-based maritime cyber security research and development team. Anywhere there is technology and people, there are cyber security vulnerabilities and this includes ship and port systems. Cyber-SHIP Lab evaluates the IT and OT systems across all ship classes and the cyber vulnerabilities around ship/port interactions, autonomous vessels, smart ports and offshore wind developments. The team develop practical research, tools and training in order to improve resilience for the sector. Cyber-SHIP Lab has a research partnership with the Royal Navy and will soon begin working with US Coast Guard Cyber Command. Since commissioning in 2020 Cyber-SHIP Lab has begun collaborations with several industry partners including ABS Group, AMI Marine, Babcock International, BMT, Lloyd's Register, BT; Eaton, Hensoldt, Nettitude and Spirent. [Financial opportunities]
- 2) Submarine Technology Limited (STL) is a consultancy, design and development team specialising in the subsea and offshore industries. The company has been involved in many leading-edge projects within the marine sector such as the development of a ship-based multi-axis robotic arm for autonomous operations. This is an integral part of a new Autonomous Synchronised Stabilised Platform (ASSP) to enable intervention tasks to be carried out from Autonomous Surface Vessels (ASV). Typical intervention tasks include equipment transfer and payload management, survey and inspection, launch and recovery. In the future, ASVs will play a critical role in the inspection, servicing and repair of offshore wind farms and other renewable energy technologies. [Financial opportunities]
- 3) HydroSurv is a Devon-based company working to develop a range of Uncrewed Surface Vessels (USVs) and innovative data capture services that can provide unrivalled and simultaneous surveys of the seabed. Opportunities for marine survey using USVs are growing exponentially across global markets. By leveraging Plymouth's Marine Business Technology Centre support, HydroSurv is able to work with internationally recognised experts in marine science and a substantial fleet of vessels and marine field equipment in the application of autonomous technology to conduct ocean science. HydroSurv recently used this support to perform a ground breaking sea trial to demonstrate the business' latest USV product and data gathering service. The survey successfully proved it could deliver a service with a significant reduction in time, cost, risk and vitally carbon emissions. HydroSurv has created new highly skilled jobs and attracted significant new investment. University of Plymouth graduates are filling these roles as the company creates global impact through international clusters and establishes a new base overseas.

Collaboration between the University and HydroSurv has continued with the award of more than £266,000 from InnovateUK, to use autonomous vessels to provide new means of mapping seagrass beds that are vital to blue carbon sequestration, protection of marine biodiversity and creating the conditions for security of fisheries and ocean food sources. Furthermore, it has led to a strategic partnership between the University and the Royal Navy, to develop disruptive marine autonomy technologies for UK defence. [Financial Opportunities]

4) The Singapore Maritime Agencies have expressed strong interest to collaborate with the MAAT partners, to accelerate their own deployment of autonomous systems in their smart port. Through Lloyd's Register global reach, the MAAT partners have identified Singapore as a high priority area of interest and there has been constructive engagement with the Technology Centre for Offshore



and Marine, Singapore (TCOMS) and Maritime and Port Authority (MPA) to address specific maritime autonomy challenges. This represents a sizeable economic opportunity to connect with Asian markets and is proof that MAAT is already generating international trade opportunities and establishing UK leadership in science and innovation and the development of global standards.

Green Futures: Environmental Intelligence

For businesses and governments to survive and thrive in a century of rapid environmental and climate change, they will need to access decision-critical information and expertise. Transitioning to a successful net zero economy and delivering the green industrial revolution will not be possible without Environmental Intelligence.

Environmental Intelligence (EI) is the integration of environmental and sustainability research with data science, artificial intelligence and cutting-edge technologies to provide organisations with the essential insight to address the challenges associated with environmental and climate change. Environmental Intelligence will ensure that businesses and governments are equipped with the information, tools and skills they need to adapt and compete.

The University of Exeter in partnership with the UK Met Office has the unique capability to provide the data and expertise to support business and governments to make necessary critical decisions. The capability will enable the UK government and businesses to understand the precise environment and climate they will be working in within a 3km radius up to 2070. This knowledge with the right resources will help transform whole industries in the decade ahead and the University of Exeter is perfectly placed to ensure the UK leads the way on environmental and climate solutions.

Environmental Intelligence and Net Zero Solutions Hub

Environmental Intelligence technologies will enable organisations to make smart, integrated decisions based on future climate change scenarios that will maximise financial benefits whilst simultaneously reducing business or service risk.

Led by the University of Exeter in collaboration with the UK Met Office, a dedicated centre of excellence will provide environmental and AI expertise alongside tailored support and tools for critical sectors such as energy, transportation, telecommunications, agriculture, critical infrastructure, and healthcare. Only 11% of UK businesses are currently 'data innovators' and Environmental Intelligence will enable more effective data driven business decision-making.

The hub for Environmental Intelligence and Net Zero solutions will provide essential skills for UK and international businesses to adapt and manage climate risk, open up new opportunities and markets and spearhead the global green industrial revolution delivering a win for both the economy and planet.

The University of Exeter will work alongside organisations to translate the impact of climate and environmental change on their business and international supply chain, develop risk-management plans that build resilience and support transition to new business models.

Sectors that will benefit:

Critical Infrastructure

• The team will utilise climate projections and AI to predict the targeted effects of future flooding on electricity, transport and communication networks, leading to reduced costs through early interventions and mitigation.



• Data Science can be used to integrate weather and climate data with hydrological models to predict flooding and the need for changes in land drainage and where to target investment.

Energy

- Al will be used to predict solar and wind yields for renewable energy under a changing climate and predict the impacts of future extreme weather events on energy system security.
- The team has the expertise to use data science and AI methods to integrate evolving demand patterns with climate uncertainty to inform capital planning and investment.

Insurance

- The team's world class scientists can use climate projections to validate industry catastrophe (CAT) models and quantify the geographical risk associated with natural or manmade catastrophes.
- Al powered storm risk models will produce more accurate predictions of insurance loses and validated weather and climate data can be used to justify insurance claims and pay-outs.

Construction

- The team will use AI powered transportation models integrated with land-use and biodiversity data to optimise the location of transportation hubs, reducing the number of cars on the road and identifying low-impact locations for future housing developments.
- Data science and AI can integrate projections of future temperatures with thermal characteristics of buildings and the urban landscape to determine optimal solutions for heating, cooling and insulation under a changing climate.

Finance

- Data science will provide the information required to protect assets exposed to climate change, estimated to reach up to \$43 trillion by 2100 according to the Economist Intelligence Unit, through targeted predictions that will assess risks and identify future opportunities.
- The team has the expertise to use AI to enable changes in business and operational models, accelerating the switch to a climate-resilient world.

Agriculture

- The team will use data science to integrate historical climate records with crop yields and land conditions to provide a step-change in our understanding of the impacts of future weather on food security.
- Data scientists will integrate data from plant and soil science, economics, consumer behaviour and climate models to develop next-generation models to support resilient agricultural policy.

Delivering on Government Priorities

The hub for Environmental Intelligence and Net Zero Solutions will build on the work of the Joint Centre for Excellence in Environmental Intelligence established by the University of Exeter and Met Office to deliver smart, green, business critical solutions.

The expert team will enable the UK government and devolved nations to deliver on their public commitments - the 25-Year Environment Plan, the 10 Point Plan for a Green Industrial Revolution, Net Zero by 2050 (2045 in Scotland), a 78% reduction in emissions by 2035, the Industrial Decarbonisation Strategy, the National AI Strategy and through regional skills and jobs the Levelling Up White Paper.



Environmental Intelligence will fundamentally support UK economic growth and resilience. It will improve private public sector access to data, evidence, and knowhow to support decision and policy making, derisking Net Zero transitions.

The development of a prototype Digital Twin of the South West using exemplar EI technology is already underway in the South West and can be replicated to benefit all other areas of the UK.

Global Leadership on the Green Economy

Bringing together strengths in AI and environment, the UK has a unique opportunity to become the global leader in deploying EI technologies across multiple sectors with knowledge assets which can be licensed and commercially exploited across wider regions of the world.

The team will develop an internationally recognised EI Solutions 'knowledge asset' that positions the UK and South West of England as a global market leader in the provision of environmental intelligence and net zero solutions. It will keep UK expertise at the forefront of global weather and climate science, strengthening our global leadership in this strategically important area and enabling us to develop strong international partnerships with major commercial opportunities.

Boosting the South West Economy

In the first 5 years, through the Environmental Intelligence Innovation Hub, the University of Exeter will:

- Support over 4,000 businesses, including SMEs, to make the transition to a net zero, including new products and services brought to market.
- Provide training and skills support for 2,500 individuals.
- Model and deliver a Green Skills Escalator approach to extend, with partners, delivery of green skills across the region.
- Generate c£300M GVA over a ten-year period and generate over 1,300 new high value green jobs.
- Support regional adaptation to Net Zero, mitigation, transition and positive health outcomes, as well
 as environmental and biodiversity improvements. Working with partners to develop carbon reduction
 targets.
- Contribute to Levelling Up agenda by supporting the South West economy.

Case Studies

The Joint Centre for Excellence in Environmental Intelligence has already developed a Climate Impacts Mitigation, Adaption and Resilience (CLIMAR) framework which uses Data Science and AI to integrate multiple sources of data to quantify the risks of climate change on populations, infrastructure and the economy.

CLIMAR is currently being use in a range of real-world applications:

- Working with a city council on the effects of climate change on urban heat, inequalities between population groups and the efficacy of methods for adapting building stock to keep people cool, and safe, in periods of extreme heat.
- Working with a consortium led by the National Digital Twin Programme and the Centre for Digital Built Britain to develop a Climate Resilience Demonstrator, integrating climate projections with asset information and operational models to assess the future risks of flooding on critical infrastructure including energy, communications and water and sewage networks.
- Collaborating with The Alan Turing Institute, energy futures lab at Imperial College and the Universities of Edinburgh and Warwick to develop robust approaches to decision support under climate uncertainty for energy security and net zero.



The benefit and value of Environmental Intelligence is proven and now is the time to significantly scale up to support businesses and organisations to adapt to a new economic and climate future. The opportunity to invest and lead the world is now.

Key facts on the global economic opportunity

- Capital spending on physical assets for energy and land-use systems in the net-zero transition (2021 – 2050) is likely to be \$9.2t a year, an annual increase of \$3.5t from today and 75% of this spend will be driven through the private sector.
- The transition is estimated to result in a gain of 200m and loss of 185m direct and indirect jobs the great global skills transition.
- Environment goods and services underpin our society and economy: 40% of UK GDP is derived from the natural environment. More than half of the world's economic output – US\$44tn of economic value generation – is moderately or highly dependent on nature, according to World Economic Forum.
- 70 Countries, (80% of Global CO2 & 90% of GDP) have put net zero commitments in place, as have 5,500 companies.

Business Futures: South West Technopole

For the whole of the South West to benefit from the Marine Innovation and Environmental Science Accelerator, the team will set up a new business network and service to enable businesses to capitalise on the opportunities created. The South West Technopole will drive the creation and growth of Research and Development intensive businesses in the region spreading the economic benefits more widely and supporting entrepreneurs in areas of multiple deprivation remote from the major population centres in Plymouth and Exeter.

The Technopole will operate primarily online but also run in-person events to both link-up and enhance the existing entrepreneurial ecosystem. The Technopole will focus on R&D intensive businesses to provide:

- Targeted Business Support advice and support on access to academic expertise, funding and collaboration opportunities - going beyond the broader assistance available to all businesses through the Growth Hub;
- Peer to peer learning sector based communities coming together and making better use of existing groups e.g., South West Defence Cluster, Nuclear South West, Tech South West, Maritime UK South West;
- Events thematic events providing advice and enabling knowledge sharing on issues such as access to finance, business planning, and marketing;
- Funding connection to investors, corporates, Innovate UK and others to draw them into the community and strengthen the innovation ecosystem.

The Technopole will be the vital linchpin to ensure inclusive growth and the delivery of the Government's Innovation and Levelling Up priorities across the whole South West region – not just in Plymouth and Exeter.