

PACEC

Public and Corporate
Economic Consultants

Solent LEP – Innovation Strategy Phase I: Executive Summary



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1 EXECUTIVE SUMMARY

Solent LEP through its Innovation and Business Support Group (IBSDP) commissioned PACEC to provide quantitative and qualitative data to be used to inform an independent and objective Innovation Strategy for the Solent LEP area. The research forms Phase 1 of the Strategy and focusses on the identification of innovation areas as smart specialisms that have the greatest potential for commercialisation and generating economic value in the Solent.

Specific objectives are to confirm and validate areas and sectors with potential competitive and comparative advantages identified by the Solent IBSDP, confirm any other sectors and identify early seeds of expertise that may have potential to create economic value. The strengths are ranked within a UK, European and global context, where possible subject to data availability, mapped to show competitive advantages, and the economic growth potential in the short and longer term.

The core specialism and sectors put forward by IBSDP are marine and maritime, photonics, advanced materials and composites, digital and computer science, aerospace and defence, life sciences, clean tech and creative industries from the Solent Strategic Economic Plan.

The study involved a mixed method quantitative and qualitative approach including a review of a range of relevant innovation and sector specific reports; identification, access and analysis of a series of core, publically available, innovation indicators and in-depth qualitative interviews with 30 key innovation stakeholders from higher education, research centres and industry in Solent. These have provided confirmation of the core sectors and brought initial insights into new emerging sectors and early seeds of expertise. The quantitative indicators used in the study are drawn from the Department for Business Innovation & Skills' July 2015 "*Mapping Local Comparative Advantages in an Innovation Framework and Indicators Appendix*". To ensure that the indicators being used were up to date, the research team consulted directly with the Smart Specialisation Hub and cross-referenced the indicators used in the evidence base against an emerging framework under development by the Hub.

Subsequent sections of the report present evidence on the core sectors that form Solent's innovation eco-system which demonstrates their strengths. Data, used extensively for evidencing smart specialisations at the EU level, is also presented to provide an assessment of the Solent's position in an international context.

1.1 Alignment of knowledge assets to core sectors

The Solent innovation eco-system featuring Solent **universities, research centres and science and technology parks** is critical in helping to identify the key sectoral strengths in Solent. The system is strengthened by good transport connectivity to other areas in the south east including London, the south west, nationally and internationally. There are four universities with strengths across STEM subjects, the arts and creative industries. These strengths are, for the most part, well aligned to both the core and emergent sectors discussed in the report. The key university areas include physics (related to advanced materials, composites and aerospace/defence), computer science and informatics (key for the digital economy and computer science), communications and media studies (for creative industries) and information management across the universities with Southampton University also being strong nationally in electrical, electronic and general engineering (which are important to the marine and maritime, materials and aerospace sectors and technologies).

These sectors have a strong interface with the cross cutting sectors of photonics, advanced materials and composites and digital/computing science in particular which highlights the synergy and critical mass. The wider innovation base also has a series of research centres that are internationally renowned in marine and maritime, photonics, digital, computer science and autonomous systems, forensics, cyber security, advanced sciences, life sciences, immunology and intelligent infrastructure, with other centres planned in cancer immunology, research in infrastructure and cities, as well as a future technologies centre.

These centres and the universities engage to a significant degree with businesses who in turn benefit from innovation support through a strong network of innovation centres, science and technology parks across Solent. Related to these is the SETSquared partnership of universities in the south and south west that provide innovation support for businesses, in which the University of Southampton plays an important part linked to its strong role in university-industry collaboration.

Further education (FE) is becoming a priority in both national government policy, and local government policy for addressing the skills needs of industry. There are over 20 FE colleges in Hampshire and the Isle of Wight, which are integrated within Solent Growth Hub investment and Enterprise Zones in the region. Examples of colleges mentioned in more detail as part of this study include Fareham College (engineering centre of excellence CEMAST at Daedalus Enterprise Zone), Isle of Wight College (centre of excellence in composites) and Portsmouth College.¹

1.2 Business innovation activity and core sectors

As well as the universities, the businesses in Solent play a critical role in innovation, contributing to research and the development of technology, and commercialising technology in products and services for the market. The contribution Solent businesses make is assessed highlighting the core sectors in the study and by benchmarking them against activities elsewhere.

Business investment and skills inputs

Solent is ranked 7th against all thirty nine LEPS for attracting Innovate UK funds per full time employee (with strong areas in marine and digital) and the expenditure on R&D per head is some 50% higher than the national average. This and related activity helps to ensure that qualifications and graduate retention is similar to the English average, albeit generally lower compared to south east LEPS.

Business employment inputs

Data on employment shows that of the 440k employees in Solent there are significant skills in the high tech sectors which lead in innovation, namely 35.8k jobs or 8%, especially in the key sectors of computing services, specialist engineering, the manufacture of computers / electronic products, and machinery/electrical equipment, telecoms, scientific R&D and other professional scientific / technical services. The concentration of employment in these core sectors helps to validate the key strengths in Solent has in these sectors. The analysis shows Solent's strengths against other LEP areas in the core sectors of marine and maritime (ranked 4th), aerospace (ranked 3rd) and photonics (also ranked 3rd). The Solent ranks 8th of all LEP areas in the digital and creative industries sectors. While

¹ See <http://www.solentgrowthhub.co.uk/skills-talent-in-the-solent-region/people-skills-employability-colleges>

the region ranks lower in the life sciences (17th) nationally, significant research institutions, recent investment in research infrastructure, and comparatively high levels of future employment, suggest that the life sciences sector is an emergent one for Solent. The advanced materials industry sector ranks lower compared to other LEP areas (34th). In the EU context the LQ concentrations of activity are highest for marine and maritime (water tanks position), aerospace and defence, life sciences (medical devices) and digital industries.

These core sectors, taking a wide definition including the public and private health sectors, account for a significant number of jobs in Solent (c.120k) which underpins their importance. There is a significant number of jobs in the life sciences (including the public health sector), digital and computing, creative industries and marine and maritime sectors, with strong growth in life sciences, creative industries and the digital and computing sciences sectors.

The future prospects for the core Solent sectors look reasonably strong in terms of employment growth up to 2020. The highest growth in jobs is likely to come from the creative industries and life sciences sectors with some 2,800-2,900 jobs in each followed by digital industries at 1,500. In percentage growth terms creative industries, digital industries and photonics will grow more strongly (with 4 to 5%) over the period, although the absolute number of jobs will be lower.

Business innovation activity

Some twenty percent of Solent businesses collaborate in innovation activity which is similar to the nearby LEP areas of Enterprise M3 or Coast to Capital, but lower than the highest areas for collaboration in the Oxford and Cambridge sub-regions. It is higher than the national average for LEPs especially in the North. Solent also has a high level of SME-university engagement relative to other LEP areas near London or in the south east, particularly for research contracts with industry. Within Solent, the Southampton and Portsmouth areas have a relatively high level of patent applications compared to similar urban areas but lag behind neighbouring areas in the south east.

Solent has fewer employees in knowledge intensive businesses (KIBs) compared to England as a whole and other LEPs in the south east which may be a constraint on further growth in the core sectors. It is possible that skills shortages will slow the rate of growth in Solent. Some 38% of employers in Solent have highlighted skills shortages which places Solent in the top ten LEP regions for shortages.

Industry outputs

Underpinning its innovation activity, the Solent economy demonstrates positive features in a national context. Overall productivity in Solent is above the average for England, albeit relatively lower compared to the south east. Business start-up registrations are relatively high in Portsmouth and in districts near Southampton. The proportion of high growth businesses is greater in Portsmouth and Southampton than in similar urban areas elsewhere in the south east and England, and job creation per expanding firm is higher than in other similar urban areas in the south east.

1.3 Sectoral assessments

While the assignment requires a comparison of sectoral strengths within the Solent, the overlaps that exist between sectors and technologies, and the considerable role that cross-sectoral networks will play in any future innovation strategy mean that any comparison between sectors should only form a part of decision-making regarding a future innovation strategy. The synergies across sectors

and technologies presented throughout the report further strengthen any individual sectoral advantages.

The **marine and maritime** sector is the Solent's most obvious, and most significant smart specialisation opportunity. It not only provides the industry and innovation base necessary to be at the leading edge of blue growth opportunities, but also acts as a nationally recognised test-bed for a range of enabling and emerging technologies. Strategic stakeholders were of the unanimous opinion that the Solent's marine and maritime sector, and the innovative technology that can be applied to it, represent a key area of strength for the region.

At present, approximately 40,000 jobs are provided by the sector in Solent, accounting for 20.5% of GVA and supporting over 3,000 businesses². PACEC's LEP model estimates growth in the marine industry of 3% (equivalent to 500 jobs between 2015 and 2020).³

In terms of industry growth, the overall trend is for growth across several marine and maritime sub-sectors including:

International shipping: increases in vehicle exports from 650,000 in 2012 to more than 1m in 2017), with Solent well placed to support transformative technologies including 'smartship', advanced materials, big data analytics, sensors and communication;

The cruise industry: a 200% rise in passengers locally in the past decade, contributing £1bn to the local economy in 2011 and predicted annual growth of 6% p.a.)

Leisure marine: 88% of businesses in the sector are predicting positive growth and over 34% are reporting increased investment, with increases in exports to countries including Russia, China, Brazil, South Korea and India expected to grow particularly rapidly;

Offshore renewable energy technologies: offshore wind could deliver come £7bn of GVA to the UK economy by 2020/21 (excluding exports) supporting 30,000 jobs;

Ocean space: strong opportunities identified in the Lloyds Register GMTT 2030 report, with the Solent particularly well placed to support the top four transformative technologies in the sector namely advanced materials, big data analytics, autonomous systems and sensors and communications.

Assessed in an international context against other European clusters, the Solent compares favourably as a Blue Growth Cluster. Employment in 2012 was higher than 3 and 4-star rated European clusters such as Zeeland and Kristiansand. Annual growth between 2009 and 2014 in the Solent was just under 3.5%, which again compares favourably to several 3 and 4-star rated Blue Growth Clusters.⁴

The Solent has a long history of research excellence and commercialization in **photonics**. The University of Southampton has been a prominent contributor to the photonics sector for decades, and has recently established a strategic partnership with the Nanyang Technological University in

² Solent LEP, 2015, 'Making Waves: Solent's Marine and Maritime Sector'

³ Including SIC codes that cover both manufacturing and related service and support activities

⁴ Note that the primary source for assessing Solent's sectoral strengths in an international context is the European Cluster Observatory's Cluster Mapping Tool. In some cases the sector definitions used by the Observatory are much broader than the sectors identified by the IBDSP and assessments against EU clusters are therefore not possible for all sectors.

Singapore which is also a leading international contributor to photonics research.

The Solent is an international hub for photonics research and development, as evidenced by the presence of regular international conferences and extensive international academic networks. The Photonics sector is particularly outward in its view of the market, and has established tangible links with other international centres of research and industry. At present, in absolute terms the sector accounts for comparatively fewer jobs than other core sectors. However, the strength of Photonics R&D in the region, and the extensive range of applications that innovative photonics technologies have across multiple sectors of strength make the strong case for ensuring that the research strength remains in the region. In terms of industry, any future strategy could take advantage of the sector's international outlook and research strengths, by seeking to further promote the Solent as an international cluster location – a concept that is evidenced as lacking for businesses in Europe.

The Photonics21 Multi-annual Strategic Roadmap outlines seven innovation areas which have research challenges that can be addressed by photonics technology. These include innovation areas in which the Solent displays cross sectoral or cross technological strength, including: information & communication; intelligent and autonomous systems; and life sciences (nanotechnology).

The Solent's strength in **advanced materials** lies particularly in the development and application of composite technologies. While composites is recognized as a growth industry for the UK as a whole, the advantage within the Solent is not as apparent as it is for other sectors, both in terms of the research and industry bases. The strength of the Solent when it comes to advanced materials, particularly composites, is in its application as an enabling technology across multiple sectors. Any future innovation strategy should therefore seek to maximise knowledge exchange related to composites across sectors, with a specific view to supporting the marine and maritime sector take a leading role in the application of composites technologies across its various sub-sectors. Recent investments in, for example, the Isle of Wight College's Centre of Excellence, and proposals for a large structure composites centre (which would have cross-sectoral applications) align to this direction for composites. By treating composites as an emerging technology, the region should also remain abreast of growth opportunities that are expected to materialize nationally in the medium and longer term (to 2030).

The Solent region has considerable history and research strength in computer science, a **digital economy** that is growing rapidly, prominent R&D oriented businesses involved in developing autonomous systems, communications systems / satellite applications, big data analytics and cyber-security, across multiple sectors. The Solent is also in close proximity to other LEP areas i.e. EM3 which also has research and industry strength in digital technology and computer science.

The Solent's strengths in digital technology and computer science are viewed by many external stakeholders as under played in a national context. A business briefing held by Solent LEP as part of this evidence gathering exercise brought representatives from EM3, and notable representation from businesses representatives in the sector. The potential for applying the Solent's strengths in digital technology and computer science, particularly in the provision of marine and maritime, and life sciences data services is vast. Furthermore, the evidence regarding sectoral employment and GVA suggests that the digital sector in the Solent is burgeoning in its own right. Any future innovation strategy should seek to make most effective use of the Solent's high quality digital and computer science research base, including internationally recognized Open Data Institute.

Assessed in an international context against European clusters, the digital economy in the Solent has one of the highest location quotients in the UK. Digital Industries are recognized internationally as a particular strength for the British economy relative to other European countries. Only regions in southern Germany and Benelux have comparable strength in digital industry clusters.

The **aerospace and defence** sector has a long-term presence in the Solent. However, in terms of smart specialisms the opportunities are mostly concentrated in space and defence, via companies such as Airbus Space and Defence and Roke Manor. The UK's Strategic Defence and Security Review (SDSR) in 2015 has led to a further £12 billion in funding for defence contracts over a 10-year period, including investment in unmanned air systems and cyber capabilities. A forecast of employment in aerospace & defence in the Solent estimates notable growth between 2015–2020 of 3%, or 400 jobs. The UK Centre for Maritime Intelligent Systems (CMIS) established in Portsmouth is the first policy step in developing the UK's capability in maritime mission systems.

There is significant growth potential highlighted in national and international studies on **life sciences** sub-sectors such as orthopaedic devices, medical technology and medtech. Solent has a comparative advantage in these sectors, which are emergent in the region, and therefore present future opportunities for growth. Life sciences in the Solent are expected to present substantial employment opportunities, and significant new research infrastructure in the Cancer Immunology Centre present important opportunities for advancing life sciences as a smart specialisation cluster.

German states, Switzerland and Ireland have the highest concentration of economic activity in medical devices in Europe. Germany's share of global exports in medical technology is 14.6%, behind only the USA and ahead of third-placed Japan's share of 5.5%. Assessed in an international context against other European clusters, life sciences in the Solent had fewer employees in 2012 than most other cluster locations (18,100 compared to an average of c.50,000). Growth between 2009 – 2014 was also comparatively modest.

The **Cleantech**, or Greentech sector in the Solent is active and well organized. Future Solent (now Future South) is developing a number of projects that both contribute to the development of a low carbon economy, and allow for the application of a wide range of enabling and emerging technologies. Greentech South is a Technology and Innovation cluster comprising more than 100 members, and is the first Energy and Environment Sector Cluster in the UK to achieve Bronze accreditation under the EU Cluster Excellence Programme. The cluster provides a £4m grant scheme to assist companies in commercializing ideas, and aims to get 200 Greentech apprentices into regional SMEs. The cluster has broad support from local government through PUSH, from the Universities of Southampton and Portsmouth and from the private sector through businesses including IBM and Scottish and Southern Energy.

Assessed in an international context against other European clusters, Cleantech in the Solent compares favourably, with high levels of employment compared to some 3-star European Cluster areas. Annual growth also compared favourably above the majority of 3-star environmental industries clusters at 3.5% between 2009 and 2014.

However, the definition of Cleantech is broad, which presents both opportunities and challenges in relation to any future innovation strategy. In terms of opportunities, the environmental focus for Cleantech businesses provides a common identity, which can, and is already being used to good effect in the Solent by Future South and its Greentech South initiative. Cleantech also provides extensive opportunities to test emerging technologies, including but not limited to low carbon,

renewable energy and composites. Networking activity that has this thematic focus also provides more space to identify the 'bigger picture' societal issues that should inspire innovation, in comparison to sector specific industry networks which are more likely to take a narrower / more technological view of innovation.

1.4 Innovation strengths and opportunities

The assessment validates the priority attached to the **marine and maritime** for smart specialisation. Solent has an undeniable advantage in the UK, and competes strongly in the international context. The marine and maritime sector also presents opportunities for the region to capitalize on a growing market for composite materials, and should also look to bring together expertise from across the automotive and aerospace industries so that opportunities for composites in the marine and maritime sector can be identified and maximised in light of advancements in these sectors.

Consultation with highly experienced marine and maritime stakeholders in the region has also identified the significance of the value that lies in providing services to the sector by exploiting the region's research strengths in Digital Technology, Open Data and Computer Science. This focus on data analytics for marine and maritime plays to the Solent's sectoral strength, to its current focus on autonomous systems, and the international recognition that the UK has for strength in digital technology and computer science.

The sectoral assessment also identifies **digital industries / computer science** as the second ranked sector, and one which can also be considered to be emerging. The considerable role for digital, open data and computer science technology across existing sectors, the opportunities for collaboration with Enterprise M3, and the strength of the sector in the Solent in its own right serve as justification for the positioning of digital industries.

The current size, and future growth opportunities presented by the **Life Sciences** sector means it also ranks highly. The research base in the Solent has not been as strong historically as it has been in marine, maritime and digital / computer science, however new facilities, notably the Centre for Cancer immunology, suggest that the strength of the research base will increase in future.

The assessment reflects the strong research base in **Photonics** that has long been a strength of the region. International linkages between the University of Southampton and Asian economies means that the sector remains highly relevant, but the size of the sector and consequent scope for economic growth suggest that the primary focus for Photonics should be as enabling and emerging technology across the other sectors noted above. Opportunities for aligning Photonics research capabilities to the emerging opportunities in intelligent infrastructure should be explored as a priority.

There are also wide ranging opportunities for transferring technologies across sectors. Again these opportunities are concentrated within the marine and maritime sector and include low carbon technologies such as application of the Bowman Power ETC system from land-based industry to the marine sector. Knowledge sharing between the automotive, aerospace and marine sectors can advance lightweighting technologies, and applications can be made in the marine and maritime sector, including marine energy where the Solent is seen by national stakeholders as holding comparative strength.

The application of new composite technologies, specifically large structures, are relevant within both the marine and maritime (marine energy) automotive, aerospace and construction sectors. Small scale composite structures also have applications across these sectors, and also in medical

technology / life sciences.

Sensor technologies have applications in both marine and aerospace for autonomous vehicles, medical technology and intelligent infrastructure. Innovation in digital technologies, computer science and data analytics have applications for emerging sub-sectors including cyber-security, forensics, and autonomous systems.

A number of emerging or seed innovation areas were identified through consultation with strategic stakeholders. These included infrastructure as an emerging sector for the Solent, new innovation and seed technology in digital technology / computer science, nanotechnology within the life sciences sector.

“There has been an upsurge in focus on infrastructure, which has its roots in HMT interest in robust infrastructure for renewal and development – both in terms of businesses, but also research in those areas. The University of Southampton is spending £50m in a new infrastructure campus which is nationally supported. There are opportunities to conduct research and generate business across big ticket items like road, rail, water transport, and sewage. The Solent area actually needs investment, so we could be our own customer. The investment in infrastructure is still fairly nascent but is going to happen quite quickly, and there will be some real contracts available, particularly around intelligent infrastructure, monitoring and sensing.”

[Strategic Stakeholder – University]

Strategic stakeholders also identified innovative research and business opportunities within the Solent regarding Block Chain, Distributed Ledger Technology and Crypto-currency. An application to EPSRC is currently being developed by key stakeholders in the Solent to deliver a highly-scalable technical solution for flexible Distributed Ledger Technology (DLT) applications by exploiting cutting-edge and emerging cloud computing, in line with the Government’s recommendations for large scale trials and city-wide application trials. In the sector, Digital South is supporting the development of an Internet of Things, which also generated positive debate at the consultative workshop with businesses.

Desk research and strategic stakeholders also pointed to a host of innovative photonics technologies including broadband fibre based access and in-building networks, and optical interconnects within datacenters; fibre lasers to deliver more efficient, high powered lasers for industrial manufacturing and marine industry applications; new materials for photonics such as nanotube and graphene polymer composites, and metamaterials for use as antenna, absorbers, super-lenses, cloaks and sensors⁵; the use of sensors and metamaterials in autonomous vehicles and intelligent mobility and new devices for nanotechnology to improve diagnostic and interventional methods based on improved multi-band (X-ray, Ultraviolet, Visible, Near/Mid/Far IR, Terahertz) photonics, spectroscopic and endoscopic devices.

⁵ http://www-g.eng.cam.ac.uk/nms/publications/pdf/hasan_bookchapter.pdf