A clean growth future

The South-West Natural Powerhouse
Why the South-West can be the UK’s hub for clean growth

The region has huge economic and environmental potential, say Iain Stewart, professor of geoscience communication, and Ian Selby, director of sustainable geoscience

South-West England is a sprawling patchwork of forest and farmland hugging a heartland of granite cliffs and bay beaches. There is a sense of crossing time zones into a slower pace of life. A rural idyll perhaps, and certainly not a technological frontier land. And yet, beyond and below the wonderful “natural capital” of Devon and Cornwall, a renewable energy revolution is brewing - the sleepy South-West is emerging as the UK’s “New America”. Approaches do not allow for towering offshore wind turbines to be anchored to the seabed, as is the case for land-based wind turbines. Instead, floating turbines are being considered. Floating offshore wind farms could use the same infrastructure of interconnectors, oil and gas platforms and pipelines as offshore oil and gas production. This could allow for the development of a new industry with multiple benefits, such as job creation and reduced carbon emissions.

One key feature of the South-West is its geology, which is well suited to geothermal energy. The region’s deep geothermal waters can be harnessed to generate electricity, and this could be a significant source of renewable energy in the future. The UK’s first commercial geothermal power project, called Eden Project, started generating electricity in 2012. Other projects, such as the United Downs Deep Geothermal Power Project, are currently under development.

The South-West is also home to a number of mineral resources, including lithium, which is a key component of electric vehicle batteries. The South-West has one of the highest lithium resources in the UK, and there is potential for the region to become a major producer of lithium. This could provide a significant economic boost to the region, as well as contribute to the UK’s energy transition.

The South-West has a number of other natural assets that could be harnessed for renewable energy, such as wave and tidal energy. This could provide another source of renewable energy, which could be used to complement the geothermal energy production.

The combination of natural assets and mineral resources makes the South-West a perfect hub for renewable energy development. The region’s natural assets and mineral resources could provide a significant contribution to the UK’s energy transition, and could also provide a significant boost to the local economy.
The blue economy

The planet’s oceans must be respected, secured and nurtured, says Mel Austen, professor of ocean and society.

Our oceans are an integral part of life support on the planet. They are crucial to the very air we all breathe and play a key role in defending our natural capital.

The biodiversity of the ocean and its intricate food web provides food security for billions of people worldwide, particularly in countries where seafood from wild capture and aquaculture is the only accessible source of dietary protein. Absorbing human waste – most globalised trade, and our global refuse oceans. They are the transport lifeline for watching smooth seas or crashing waves.

Across the world the ocean supports both now, and for future generations, we must manage our activities in the open ocean areas beyond the jurisdiction of national governments. And our oceans are the new frontier for providing energy security by harnessing renewable energy from wind, wave and tides.

These increasing demands are challenging the biodiversity and natural habitats in the oceans, their so-called natural capital, and the life support systems provided through the ecosystem services and benefits that they deliver.

Both now, and for future generations, we must manage our activities in the ocean globally and locally to safeguard the natural capital that underpins economic and social sustainability. The first pressure to address is climate change, a key focus of the G7 leaders. Associated ocean warming, acidification, and de-oxygenation are already affecting marine natural capital and its functioning worldwide. We can reduce global greenhouse gas emissions, and governments are aware from many of the needs and the innovations to do this, but addressing climate change has to be integrated with addressing the parallel global biodiversity crisis.

We look to the ocean to provide renewable, carbon-neutral energy we are rapidly urbanising the seas and coasts in pursuit of energy with a proliferation of built infrastructure and cables.

Considering the interface of ocean and society, that may not always necessarily be a bad thing, but we should acknowledge what we are doing. This transformation is not too dissimilar from how we have modified natural habitats on land, but that has taken place over thousands of years – through farming, forestry and urbanisation – and there has been a co-evolution to habitats that, by and large, most people like.

Our transformation of the ocean is much more rapid. It also includes opencast mining of precious metals from the deep sea to support our technological innovations; the large-scale harvesting of open ocean species (from fish to squid to Antarctic plankton) that have never been harvested before; and the introduction of noise from the building works associated with offshore renewable energy structures.

The evidence base concerning our transformative use of the oceans is developing, but it needs to grow as rapidly as the blue economy that is driving it. The G7 leaders and other policymakers, in addition to business and industry, and environmental managers, can only make decisions based on the best understanding and consideration of all of the trade-offs. Interdisciplinary approaches are the only way to ensure that our global ocean can remain the powerhouse of global sustainability.

Wildlife must be managed carefully

The biodiversity of the ocean and its functioning worldwide. We can work together to develop approaches and strategies that will minimise associated environmental damage, especially at the seabed.

They also need to focus on producing offshore renewable energy structures that can both maximise safe, secure and durable energy production, and enable the enhancement of marine biodiversity and associated sustainable production of food from shellfish aquaculture – and even leisure and recreation via tourism, wildlife watching and sea angling.

Careful design of artificial structures can create habitats that enhance the type of biodiversity naturally found in rocky and reef habitats, including climate-regulating species such as kelp, providing nature-based solutions to the climate crisis. These habitats will be artificial, but so are the generally admired semi-natural grasslands and woodlands that have been carefully cultivated over thousands of years on land.

Should the coastal land and sea are managed carefully, and transformation of, the ocean, we need to ensure that we have genuine and well-managed marine protected areas to enhance biodiversity and maintain ocean resilience in the face of change.

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Innovation must be matched by investment, says Deborah Greaves, head of the School of Engineering, Computing and Mathematics.

The global demand for energy shows no sign of slowing. Across the world, nations are using power for ever-increasing quantities and in new sectors, such as the widespread electrification of transport. But growing awareness of our climate crisis has resulted in national and international agreements around clean energy that will require an investment programme worth around £50bn each year from 2030 to 2050. But, more than ever before, future emissions reductions will require people to be actively involved and that must be embedded throughout policy.

Through its presidency of the 26th UN Climate Change Conference of the Parties (COP26) and the G7, the UK has a once-in-a-lifetime opportunity to be a global game-changer in this field. If it does so, the benefits for not just the nation – but the planet as a whole – could be huge.

The conditions right around the UK coastline – particularly in the Shetlands, Pentland Firth and Orkney, Hebrides, Pembrokeshire, South-West England and the North Sea – remain more than capable of supporting the necessary wave and tidal energy developments. As an early leader, the UK wave energy sector has accumulated considerable experience, expertise and knowledge from the development and deployment of various prototypes and has a strong community of academics and industry. And there are estimates of up to 8,100 new jobs in wave energy by 2040.

To make that vision a reality, we need to cut current technology unit cost, which will – in turn – unlock further investment and development. It is high on the majority of ORE priority lists, while we ourselves are pursuing projects investigating innovative wave energy converter concepts using new materials that can reap the renewable rewards in a cost-effective and sustainable way. Perhaps at the opposite end of the scale is offshore wind. The majority of existing offshore wind turbines are fixed to the sea floor in water depths up to 60m. And such sites are in limited supply. However, there is growing recognition of the need for floating offshore wind technology and the need for government to support its advancement.

In that regard, the University of Plymouth recently secured funding to create the UK’s first Floating Offshore Wind Turbine Test facility to enable physical modelling experiments with wind, wave and currents simultaneously. It will greatly improve understanding of how future technology advances could be impacted by atmospheric conditions, and provide a low-risk environment in which researchers can test new concepts.

Cornwall – which will host the G7 leaders in June – is home to projects fast-tracking and scaling up the development of floating wind energy, potentially creating thousands of jobs and generating hundreds of millions of pounds for local economies.

With the massive acceleration in deployments expected over the next 10 years, it is also essential that we prepare the workforces of the future. So as well as leading the academic and innovation responses for the UK, through the Supergen ORE Hub, we are also using University of Plymouth research facilities and partnerships to educate the next generation of offshore renewable energy engineers.

The Sixth Carbon Budget and Balanced Pathway, recommended by the Committee for Climate Change, would require an investment programme worth around £50bn each year from 2030 to 2050. But, more than ever before, future emissions reductions will require people to be actively involved and that must be embedded throughout policy.

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Professor Deborah Greaves, OBE

PLYMOUTH RESEARCHERS HARNESSING THE OCEANS’ ENERGY

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