# BLUE OPPORTUNITIES FROM THE FUTURE

**Knowledge and tools to inform sustainable growth for an integrated terrestrial, coastal and marine zone economy.**

BLUE FUTURES

Realising East Anglia's blue growth ambitions – from land to sea

Visioning a positive and resilient future for East Anglia's environment, economy and society.

Long term, adaptive thinking which connects activities and systems across land, coast and sea.

Signposting key regional opportunities to 2100 and beyond.

UEA University of East Anglia

MKEN Marine Knowledge Exchange Network

NERC Science of the Environment

# Visioning a sustainable future for East Anglia

## The ‘Blue Futures’ project took a long-term view, connecting land, coast and sea, to visualise and explore some key areas of strategic economic opportunity for the future of the East Anglian region in the UK over the coming century.

Throughout the four stages of the study, participants representing a broad range of public, private and third sector organisations were invited to collectively visualise positive features of a resilient, prosperous and healthy future East Anglia.

A fundamental premise of the Blue Futures project was that social, economic and natural systems must be integrated in strategic planning to deliver sustainable development opportunities for the region. The study demonstrates the value of anticipating and proactively adapting to expected change, whilst nurturing and reducing people’s impact on the natural systems that sustain us.

Blue Futures was a collaborative study led by a research team based in the Marine Knowledge Exchange Network (MKEN) in the School of Environmental Sciences at the University of East Anglia, working in partnership with Blue Ltd., Cefas, Coastal Partnership East, the Environment Agency, the New Anglia Local Enterprise Partnership, OrbisEnergy and the RSPB. This booklet presents a summary of the NERC funded project and its key findings.

**See MKEN website for additional publications and updates.**

**The findings illustrate that East Anglia has great potential to develop its economy sustainably through innovation and integrated thinking, particularly around five key areas of opportunity, listed below and presented in more detail on pages 4-8. Each one traverses the land-coast-sea interface and integrates the core foundations of sustainable development (environment, society and economy).**

- **Natural capital is critical: sustaining our natural capital is an essential foundation for all future opportunity**
- **Innovations in renewable energy: unlocking the potential of on and offshore renewable energy technology**
- **Food & drink futures: regional food stories and innovating to nourish the nation**
- **Leadership in low impact living: Reducing energy, water and waste footprints and new forms of living**
- **Keep visiting East Anglia: enhancing a diverse, year-round visitor economy**

**Hickling, Mike Page**

# East Anglia Today

**We live in changing times, the future is uncertain. Recognising the region's strengths and assets, and anticipating foreseeable challenges in the future are key to preparing for a positive future for people and society, the environment and our regional economy.**

## A diverse region

Distinctive landscapes, fisheries, financial services, agriculture, (offshore) energy, manufacturing, tourism, life sciences, heritage… The region is diverse with a wealth of assets and specialisms. Its landscapes include beaches, fens, forests, estuaries, and The Norfolk Broads, supporting diverse flora and fauna. East Anglia is driving clean growth through offshore renewable energy, is a holiday destination, plays a significant role in feeding the nation, has a thriving ports and logistics sector, is an emerging ICT hub, and more besides.

**A47 and Breydon, Mike Page**

**River Deben salt marsh, Mike Page**

## A changing place

**Impacts of climate change —** climate change presents challenges for East Anglia's people, natural environment and urban areas. Temperature change, shifting seasonal rainfall patterns, weather extremes and sea-level rise will impact all sectors in the future, including our agricultural systems, food and water security, health and wellbeing, coastlines, infrastructure and wildlife and natural systems. Water will be a progressively more stretched and scarce resource. As sea level rises, low-lying coastal areas (including some critical national infrastructure) will become more vulnerable to coastal erosion and flooding, exacerbated by more frequent extreme weather events. There is increasing recognition of need for both incremental and transformative action to extend and join up efforts to mitigate and adapt to climate change, pollution and habitat and biodiversity loss.

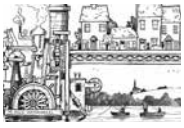
**Social, political, economic and technological shifts —** East Anglia's population is ageing and the region has a growing skills gap, compromising the potential for business growth. The international political backdrop is volatile; Brexit and recent recessions have demonstrated that political, social and economic transformations can bring about huge change and uncertainty. 'Disruptive innovations' and technological advances will continue to impact society, by changing the way we work (e.g. automation in industry displacing human employees), communicate (e.g. social media), travel (e.g. driverless cars), etc.

**Gradual change and sudden shocks —** some future change is foreseeable, but predicting the extent and timing is difficult. Some change will be sudden, unexpected and impossible to anticipate. 50 years ago for example, could we have predicted the embedded presence of online life in modern society? 150 years ago, could we have foreseen the influence of the railways on our infrastructure and urban development patterns?

In a century's time, what might we be celebrating about East Anglia? How will we work and travel, connect with others and spend our leisure time? What foods might we grow and eat? How (and where) will our homes be built, our energy generated, our water cleaned and supplied, and our waste processed? How can we maintain and enhance East Anglia's biodiversity and natural assets?

**How can we progress adaptively, embedding sustainability and resilience to future change into our human and natural systems across East Anglia's land, coast and sea?**

Norwich-based artist Paul Jennings interpreted the project findings and created the cartoon illustrations, which appear in this brochure. They depict some themes and features of East Anglia's positive future that emerged from the study. Paul also illustrated aspects of the Blue Futures 100 year scenarios, developed as a stimulus for visioning a future East Anglia with workshop participants.



# Natural capital is critical

## SUSTAINING OUR NATURAL CAPITAL IS AN ESSENTIAL FOUNDATION FOR ALL FUTURE OPPORTUNITY

'Natural capital' was widely argued by Blue Futures participants to be a critical foundation for sustainable, long-term economic growth and opportunity in East Anglia across sectors. The term describes the array of natural assets (such as geology, soil, air, water) and the ecosystem services that they provide, which sustain and make human life possible. The viability of many activities across sectors is directly dependent upon natural capital (e.g. through food production and water supply). The landscapes, habitats and character of the region sustain biodiversity, attract visitors and underpin a large segment of the region's economy. To continue to be able to utilise natural resources in future, we must seek ways of maintaining and enhancing the region's natural capital assets.

### Valuing natural capital

Incorporating natural capital accounting as part of more holistic assessments of the benefits derived from natural marine, coastal and terrestrial systems; stronger representation of natural capital in decision-making; embedding natural capital in markets to incentivise long-term and sustainable investments; radical structural change to the current economic model of growth.

### Anticipating and managing shifts in regionally important landscapes and ecosystems

Enabling space for natural systems to migrate (e.g. managed coastal realignment, green infrastructure networks, landscape-scale planning). Habitat recreation to deliver ecosystem services such as flood protection (e.g. salt marshes) and pollution mitigation (e.g. reed beds). Enabling mechanisms include partnership working, shared data, joint monitoring programmes.

### Connecting people with nature

Nurturing a greater sense of value in the natural world, and enabling access to nature's health and wellbeing benefits, achieved through: education initiatives (e.g. varying from more funding for forest schools, access to initiatives such as Duke of Edinburgh programme, to total transformation of the current education system); incorporating green space into all new development and in/onto buildings; develop eco-tourism; enabling greater public access to nature, for health, recreation and educational benefits.

### New models of land, sea and coastal management

Working with natural systems to implement resilience to environmental risks (e.g. saltmarsh restoration). Exploring the potential of multi-use systems to protect ecosystem services and/or increase productivity (e.g. mixed-use woodlands, multi-trophic aquaculture, and multi-use sub-sea infrastructure). Regenerative agricultural practices to improve soil health and maintain food production. Strategic adaptation planning at landscape/system scale incorporating multiple institutions and crossing administrative boundaries. Enable land purchase for natural capital schemes.

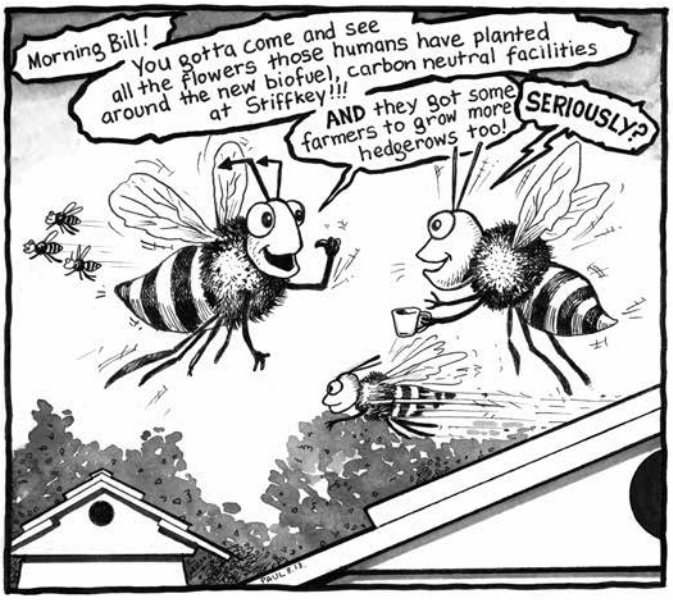



**Illustration by Paul Jennings**

**INSPIRATIONS**

The Suffolk Marine Pioneer takes a joined-up approach to testing new natural capital tools, methods and funding opportunities to deliver multiple benefits.

Wild Anglia is a local nature partnership, which aims to enhance the natural environment, improve society and strengthen the economy of Norfolk and Suffolk through effective partnership working.

The Creating a New Approach to Peatland Ecosystems (CANAPE) project restores and preserves wetlands. It aims to reduce greenhouse gas emissions, and support the creation of local economies based on paludiculture (agricultural products that can be grown on wet land).

Nature for mental health: this connection is advocated by organisations including MIND, and includes initiatives such as eco-therapy and community gardening.

Wildlife Trusts across Britain have worked together to create a proposal for a nature recovery network.

# Innovations in renewable energy

## UNLOCKING THE POTENTIAL OF ON AND OFFSHORE RENEWABLE ENERGY TECHNOLOGY

Renewable energy, particularly the expansion of the offshore renewable energy industry has great potential to bring future economic opportunity to East Anglia, and relates to ongoing (national scale) decarbonisation, jobs and skills development, and regional energy security. Participants in the Blue Futures study noted that a current lack of capacity to service and grow the offshore renewable energy industry is acting as a major constraint on the potential that the region has to exploit current and future opportunity in the sector. Better integration between offshore generation and terrestrial storage and distribution capacity is needed. East Anglia has the potential to become an international leader in offshore renewable energy innovation – developing skills and providing a strong training base will be part of this. Incorporating renewable energy generation into all new developments at household and community scales was also seen as important for a sustainable future.

### Enabling capacity for growth

Infrastructure investment to support and stimulate offshore activity, including electricity grid updating or replacement, and improvements to terrestrial servicing capacity (currently limited by small ports and poor road infrastructure). A major offshore port facility or 'sea station' to increase capacity (improve existing ports such as Lowestoft). Low-impact expansion of settlements to house people employed in offshore industries.

### Anticipating 'tech leap' potential

Ideas put forward for maximising and better utilising renewable energy, including: renewable-powered offshore desalination, floating nuclear units, off-shore hydrogen production, re-use of existing sub-sea infrastructure for a range of purposes, smart boat technology for servicing and transporting personnel, and battery storage technology.

### Co-benefits

Co-benefits associated with a thriving renewable energy industry include: the incorporation of multi-use activities with sub-sea infrastructure (e.g. aquaculture beneath wind turbines); links with tourism and education via visitor centres (including visits to off-shore sites); better air quality, wellbeing, lower cost of living; community energy schemes delivering local energy security.

**Scroby Sands wind turbines, Mike Page**


**Illustration by Paul Jennings**

### Skills development

Linking existing and emerging networks of knowledge and expertise more actively with mainstream education (talks in schools, field trips, work experience placements); links to regeneration activities (funding community infrastructure and events); and, creating more industry apprenticeships and other types of training schemes.

**INSPIRATIONS**

OrbisEnergy is an innovation and incubation hub for the offshore renewable energy sector. Home to 72 tenant businesses, it aims to maximise the supply chain opportunities for SMEs associated with the rapid development of offshore renewables in the North Sea.

A post-2030 North Sea wind power hub has been proposed for Doggerbank. It would include infrastructure and interconnectors to enable the international trade of offshore wind power.

Community Energy England supports and aims to accelerate the transition to a fair, low carbon and community-led energy system. Community Power Cornwall is an example of a co-operative that delivers community energy projects.

# Food and drink futures

## REGIONAL FOOD AND DRINK STORIES AND INNOVATING TO NOURISH THE NATION

East Anglia has a thriving food and drink industry, with great potential to expand. Innovations in agriculture, aquaculture, fisheries, and food and drink processing will increase efficiency, reduce the environmental impact of current practices, and build resilience in future production. Diversification and the identification of emerging markets as consumption and climate patterns change will be important. New forms of land and sea management for food production, and regional food stories were topics that participants returned to repeatedly in the Blue Futures study. As environmental, economic and political conditions change, having foresight in terms of the types of suitable (and popular) crops and emerging fisheries of the future will stand the region in good stead.

### Innovation in agriculture

Improve the efficiency of terrestrial food production. Thinking innovatively about land management and future food production (farm management for wider societal and environmental benefit). Incentives for practices that maintain and improve soil quality, water efficiency, pollution reduction and carbon storage. Urban farming includes vertical, indoor, underground hydroponic food production, and community farms. Combine food production with other land and sea activities.

### New foods from the sea

Sustainable local fisheries based on an ecosystem approach. Greater exploration of the potential for regional aquaculture; farming marine algae and seaweed for agricultural fertiliser, food supplements, ingredients in processed food, cosmetics, animal feed, etc. Better monitoring of species shifts and emerging fish/marine stocks as sea temperatures change. Linking marine food production with existing infrastructure such as shellfisheries, and wind farm sub-structures. Multi-trophic aquaculture/fish-farming systems.

### Diversifying food and drink production

Develop new food trends, e.g. marine algae for nutrition and health, crop diversity and production of niche food and drink such as sparkling wine. Research into increasing yields and crop resilience in a changing climate. Seek co-benefits of food production, such as community gardens for mental health, carbon capturing crops, etc. Establish local trading systems and networks.

### Regional food stories

Celebrating current and future regional food and drink, such as Cromer crab, and local beer, and more actively exploiting the associated tourism potential. Popularising regionally abundant food products such as Herring.

**Barton Broad, Mike Page**


**Illustration by Paul Jennings**

**INSPIRATIONS**

Companies around the world are developing innovative applications for marine or terrestrially farmed algae, including health supplements and low emission transport fuel. Research is being conducted by organisations including Cefas and the Scottish Association for Marine Science on the potential for seaweed farming in the UK.

Many examples are emerging of innovations enabling underground and vertical urban food production, using technologies such as hydroponics and aeroponics, including in the UK.

NFU Mutual has signed up celebrity farmer Jimmy Doherty based in Suffolk, to help growers and livestock producers plan diversification activities to support their businesses after Brexit.

RegenAG UK is an organisation that connects farmers, smallholders and other parties with experts in regenerative agriculture (using farming principles that work with nature to build healthy soils and agro-ecosystems) through training and collaboration.

# Leadership in low impact living

## NEW FORMS OF LIVING AND REDUCING ENERGY, WATER AND WASTE FOOTPRINTS

Mainstreaming low impact practices to reduce the region's environmental footprint and build resilience to future change are key concepts in the Blue Futures study. All sectors including housing, transport, waste, food production and packaging, manufacturing are relevant. Participants felt that the region could exhibit strong leadership through demonstrations of good practice, in sustainable building and efficiency in business practices, and lobby for national and international action (e.g. raising building standards, pricing of unsustainable goods and services such as air travel and resource intensive foods and clothing).

### Advancing design and build quality

Become a regional lead in decarbonising existing housing stock and driving higher (national) energy and water efficiency standards in new buildings. Social design in new developments to integrate community facilities and services (including public transport), and housing for the demographics of the future, e.g. design for the elderly and dementia. Bioclimatic design (design and construction methods based on local climate).

### Promoting a regional circular economy

Developing circular practices within business activities to reduce waste, pollution and improve water and energy efficiency. Region becomes a trailblazer by initiating a region-wide circular economy. Policy drivers, pricing signals and education programmes to discourage unrestrained consumerism. Local trade of goods and services.

**INSPIRATIONS**

The Norfolk Rivers Trust Water Sensitive Farming initiative delivers on-farm measures at a catchment scale to improve the quality and resilience of the surrounding water environment. The Suffolk Holistic Water Management project, manages water to maximise economic and environmental benefits and minimise flood risk.

The University of East Anglia's Enterprise Centre was the first large commercial building in the UK to achieve the Passivhaus standard. It also considered the carbon impact of construction by using local products. Other examples of building for the future include floating homes and dementia-friendly design.

Bernard Matthews' Big Green Plan aims for the company to become the UK's greenest farmer, becoming carbon neutral by 2020, zero waste to landfill, reducing packaging and water usage. Adnams Ltd. have a holistic sustainability strategy and programme focussing on carbon, waste, water and biodiversity that has delivered clear commercial benefits and engages with suppliers and partners to achieve sustainable change in the industry.

The Lammas project in Wales pioneers an alternative model for living on the land, empowering people to explore a one-planet lifestyle.

Greater Manchester mayor Andy Burnham has launched a Green City Region plan. It aims to make Manchester one of the leading green cities in Europe, including an aspiration to be carbon neutral by 2038.

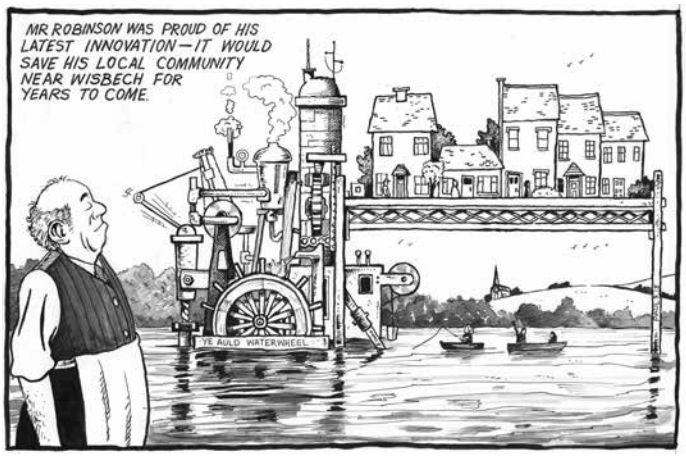



**Illustration by Paul Jennings**

### Transport solutions

Support innovation and uptake of new forms and models of personal transport, mass transport (e.g. driverless buses, smart transport systems). East Anglia demonstrates leadership in decarbonising the transport sector. Cycling and walking infrastructure and no-car zones connect communities and recreation attractions, and are integrated into all new development. Modular/moveable road infrastructure in vulnerable locations.

### Different ways to live

Flood resilient and floating homes, in both urban and rural locations. Offshore living linked to marine hubs and offshore ports. Urban high-density, low-impact living, and off-grid self-sufficient rural communities. Ongoing advances in communications technology reduce the need for business travel.

# Keep visiting East Anglia

## ENHANCING A DIVERSE, YEAR-ROUND VISITOR ECONOMY

Nurturing East Anglia's successful visitor economy relates closely to the other four key opportunities identified by Blue Futures. Of particular importance are the region's natural assets, which are a huge attraction for visitors, and need to be managed wisely to protect the foundation of this opportunity.

### Balancing tranquillity and access

Proactive management of visitor loads and activities at natural sites to maintain environmental quality. Diversify destinations, promote and provide good access and low-impact facilities at alternative sites to take pressure off most popular locations (some coastal sites and particular areas of the Norfolk Broads).

### Tourism infrastructure and servicing

Develop year-round attractions and destinations that will attract visitors during off-seasons and episodes of bad weather. An 'Eden project of the East', or major marine visitor/experience centre. Sustainable transport options and facilities enable clean access (smart transport, autonomous boats and buses, eco-toilets). Natural and heritage tourism infrastructure, e.g. long-distance foot/cycle paths connect natural and regenerated historic sites. Increased capacity for skills training in hospitality and tourism and other emerging labour gaps.

### Diverse regional tourism

**Eco-tourism –** coast and countryside, marine and wildlife visitor centres, innovative buildings, eco accommodation.

**Culture, history and heritage tourism –** making more of Roman history, continue to develop culture and heritage potential, Doggerland and undersea history.

**Food tourism –** celebrating regional foods and produce including crab and herring, beer and wine, anticipating and marketing foods of the future.

**Energy and engineering tourism –** links with major industries in the region (e.g. renewable energy).

**Healthy tourism –** walking and cycling routes, park facilities, sports attractions.

**South Walsham**

**INSPIRATIONS**

The North Norfolk Deep History Coast initiative links local organisations and includes new facilities and educational resources. It aims to attract people to Norfolk's coastline and engage with its ancient past.

The Suffolk Wildlife Trust is developing a Southern Gateway to the Broads, which will create new habitat (through land purchase), facilities (new visitor centre) and help spread visitors numbers across the Broads.

The National Trust's Wicken Fen is one of Europe's most important wetlands; combining a landscape-scale habitat restoration scheme with opening up new areas of land and a mosaic of habitats for visitors to explore.

The Østerild Visitors Centre at the national wind-energy testing site in Denmark was designed to have minimal environmental impact and attracts around 30,000 visitors per year, offering insights on wind energy, sustainable technologies and the local environment. Cley Marshes visitor centre in Norfolk is a local showcase for sustainable design and welcomes over 100,000 visitors per year to enjoy the nature reserve.


**Illustration by Paul Jennings**

# East Anglia's future is bright!

**What might our descendants be proud to say about the region in 2118? What might be the key features of East Anglia's regional identity? The people who participated in the Blue Futures study spoke of their visions for the future and hope that the region will be…**

## Unique and biodiverse

Known for its natural assets, heritage and culture. Many diverse natural habitats and sites of national importance and interest. A popular, year-round tourist destination with an abundance of low impact visitor and recreational opportunities (e.g. electric boat technology).

## A significant renewable energy producer

Diverse renewable energy generation technologies, on and offshore with good integration. Widespread interconnected power markets and advanced battery storage technology are mainstream. An international centre of excellence in offshore renewable energy.

## Resilient

East Anglia's environment, economy and society are diverse and able to buffer shocks and change. Rich in independent businesses and SMEs supported to innovate and thrive. Strong communities, local support systems and social networks.

## Adaptive

Integrated management plans support ongoing monitoring of changing systems. Adaptation initiatives and approaches to preparing for and managing environmental risk and change are mainstream and collaborative.

## Low impact

Consistent regional leadership in decarbonisation across sectors. All developments incorporate local energy schemes, and are highly water and energy efficient with local facilities and green space. Low waste generation and strong progress toward a regional circular economy (circular systems widespread in business practices). Electric, smart vehicles are mainstream.

## A place to learn, rich in skills

Known for the quality of its skills and training base. A region recognised for innovation in education, knowledge transfer and training opportunities, with specialisms in sectors including energy system engineering, and tourism and hospitality.

## Food secure

A vibrant food production mix. Climate resilient agriculture and marine food sources including fish and food from aquaculture. A strong food processing economy incorporating circular systems, which keep energy use and waste at low levels.

## Connected

Integrated infrastructure planning (linking on and offshore activity) and communications technologies enable people and nature to thrive, and support a prosperous economy. Well-networked communities; walking, cycling and smart transport routes. Natural networks and connected landscapes.

## Governed strategically and locally

Planning is strategic, sensitive to the three pillars of sustainable development, and joined-up across institutions with a strong regional vision and leadership. Governance is devolved and local. Data is shared, partnership working is normal.

## Healthy and prosperous

A prosperous region where wealth is valued, measured and accounted for in social, environmental and economic terms. The region's people have a good quality of life with access to good housing, employment, a healthy environment, fresh food, education, health and social care. People live longer, more healthily in thriving communities with a strong sense of place.

# Cross-cutting themes

The project outputs highlight some critically important concepts that were repeatedly discussed by participants throughout the study. They cut across sectors and areas of future opportunity for sustainable economic development in the region.

## True sustainability

A need to integrate and embed environmental, social and economic interests (natural, social, human, manufactured and financial capital) in future planning was strongly emphasised by the participants in the Blue Futures study and not perceived to be mainstream practice. As well as natural capital and biodiversity, aspirations to enhance local identity, quality of life, community wellbeing, and social care were well articulated in the study. Desires for new forms of valuing and measuring wealth and prosperity (not solely based on GDP) to be developed, which recognise whole systems emerged in all phases of the research.

**INSPIRATIONS**

Aylsham in Norfolk is an accredited 'Cittaslow' town – part of a network of towns, which seek to foster economic, social and environmental sustainability. Initiatives range from infrastructure policies to the celebration and promotion of local produce.

The New Zealand Government will be the first in the world to measure success against social, cultural and environmental measures by introducing a tool and framework to include wellbeing as a measure of economic success.

**"I don't think social, environmental and economic interests are thoroughly integrated in policy and planning at the moment at all… politicians focus on the economic and bits of the social but not environmental interests... The big challenge that we have – raising the environmental stakes far higher, addressing them by being clever at how we address other things. If we got that beautiful balance between all three, which is a big ambition, it would be a marvellous place."**

**Blue Futures participant, June 2017**

## Innovation

Innovation is key to making existing practices and assets more efficient and future-proof, driving technological development, developing creative governance approaches, and developing new techniques for delivering adaptation and resilience.

This study emphasises the importance of creating space, opportunity and support for innovation, through investment and demonstration projects to test and share concepts. Participants highlighted the need to have foresight in anticipating disruptive innovations which could drive more sustainable development and understand whom key 'innovators and influencers' are; they felt that the private and third sectors have most scope to innovate, the public sector being so tightly constrained by shrinking budgets and the necessity to respond to basic societal needs. Promoting regional good practice and looking outwards to learn from elsewhere should work in tandem.

## Strategic, adaptive planning

The delivery of sustainable development and resilience is rooted in a process of proactive, adaptive, strategic planning. Presently, different institutions tend to have independent future plans and priorities, operating and responding in disconnected ways. Working collaboratively and in partnerships to develop broad strategic plans were repeatedly noted by participants as mechanisms for accelerating institutional preparedness and capacity for delivering adaptation.

The region can demonstrate some excellent examples of this taking place, but there is further to go. Anticipation and acceptance of change, preparing for an ageing population, transitioning systems after major events (not returning to the status quo), avoiding maladaptation and locking-in risk were strong themes in the study.

**INSPIRATIONS**

Thames Estuary 2100 is an adaptive strategic plan for managing flood risk in London and the Thames Estuary. It recommends short, medium and long-term actions, based on contemporary understanding of predicted climate change and is designed to be adaptable to changes in these throughout the century.

The newly established Broadland Futures Initiative will take a collaborative approach to developing a strategic framework for integrated flood risk management across the whole area; it will focus on planning now for medium to long-term solutions.

**Blakeney, Mike Page**

# Tipping the balance: unlocking constraints on future opportunity

These topics consistently emerged throughout the Blue Futures study as strong present day, barriers and even limits to delivering sustainable development. They are 'see-saw' factors – acting as current constraints but they are perceived to have great potential for unlocking future regional opportunity given investment, national prioritisation and policy support.

## Infrastructure

Infrastructure is critically important for sustainable growth but perceived by participants to be a major present-day constraint. Key problems that are likely to inhibit opportunity and possibly exacerbate risks from environmental change include, lack of integration between types of infrastructure (e.g. offshore industry, ports, and the servicing capacity of the region's main roads), the legacy of old infrastructure which is increasingly not fit for purpose, and reactive rather than proactive improvements to existing infrastructure.

Infrastructure should broadly include transport networks (roads, rail, cycling and walking), ports, shipping, digital and communications, energy (gas and electricity), natural (habitats, green networks), and social (health and social care). More proactive, integrated, strategic planning and infrastructural investment will be critical for unlocking and delivering future opportunity and resilience to change. Multi-functional infrastructure planning can deliver multiple benefits. This includes marrying terrestrial and offshore planning and development frameworks.

## Education and skills

The need for an education system and alternative forms of learning that connect young people with the natural environment, and better capacity to train people to work in regional industries were repeatedly discussed throughout the study. Linking regional industries proactively with schools, developing education and visitor centres, increasing the regional capacity to offer applied skills training and apprenticeships (particularly in engineering) were all hot topics.

**"Infrastructure cuts across everything and covers a wider grouping of activities… health, social care, and communities are infrastructure, but at the moment most of the debate on infrastructure is about hard stuff like roads and schools. When it comes to health it tends to be about a GP surgery or a hospital, it is not about the wider community and its resilience."**

**Blue Futures participant, June 2017**

**INSPIRATIONS**

Forest schools are an emerging educational approach to developing life skills through outdoor, nature-based play and learning.

After identifying a lack of technicians available to maintain its growing offshore wind fleet, E.ON collaborated with the Uniper Engineering Academy to devise an apprenticeship scheme that will deliver a sustainable pipeline of engineers.

**"SME's are an important feature of the area… What are the future businesses that can support whatever economic future we have? Providing education in advance of the sorts of jobs that we see in the future is an important challenge. Especially with Brexit; around tourism, there could be quite an employment gap because of fewer people from other countries coming to the UK to do the work. We need to pre-empt these things."**

**Blue Futures participant, June 2017**

## Governance and institutions

The notions of sustainable and foresightful decision-making may sound inherently logical. However, in a capitalist society governed by political cycles and facing huge competition for financial resources, the delivery of these ideas is extremely challenging. Short termism and political expediency are major constraints to delivering sustainable development. Many Blue Futures participants noted that current governance arrangements are bureaucratic, stifling creativity and innovation. Our participants spoke positively about:

- The benefits of devolution for delivering regional sustainability
- Joining up institutions to plan more strategically and sustainably (e.g. developing a region-wide strategic framework)
- Identifying local and regional economic powers and tools to maintain wealth within the region
- New forms of local financing for community scale initiatives funded by major regional industries
- Engaging (local) politicians with holistic visions of the future and win-win sustainable development opportunities
- Radical change to our national model of economic growth (moving away from current measures of GDP, which embed consumption).

**INSPIRATIONS**

Coastal Partnership East brings together the coastal management resources and expertise of four coastal local authorities and works in partnership with other organisations including the Environment Agency and the Water Management Alliance to innovatively manage the changing coast of Norfolk and Suffolk.

# Pathways to the future

The Blue Futures methods prompted participants to consider both long-term aspirations for a sustainable East Anglia, and potential short, medium and long-term actions toward achieving these. Together these constitute trajectories or 'pathways' that give a tangible picture of how collective visions of the future might become a reality.

## Steps, leaps and transformations

Some suggested actions were incremental, immediately feasible and/or already happening somewhere, e.g. autonomous electric vehicles, applications for battery storage technology, underground farming, habitat restoration. Others were more transformational, adventurous or futuristic, e.g. fundamental changes to our economic system, nuclear fusion, offshore hydrogen production powered by renewable energy, stringent planning and build standards, large-scale re-wilding.

## Capturing windows of opportunity to do things differently

Being poised to act transformatively at 'critical moments' after disruptive events (e.g. recovery after a major flood event) and at decision points where change can be implemented was noted by the Blue Futures study as being an important element of adaptation planning. The emphasis was on capturing windows of opportunity for actions that build resilience, and to avoid perpetuating status quo arrangements that lock-in future risk exposure and vulnerability.

## Leading the way and learning from elsewhere

Individuals and organisations are rapidly innovating and improving the efficiency and resilience of their practices across sectors. Examples of 'good practice' activities that are already underway can inspire and justify more sustainable development practices in East Anglia; they demonstrate the potential that the region has to be a trailblazer of innovation and good practice implementation and the scope to learn from elsewhere in the UK and abroad. A few examples are included throughout this booklet.

**"Political expediency is rife. There is almost an apathy because it is such a huge issue… We do what we can but that is reactive and not looking at things strategically or proactively."**

**Blue Futures participant, July 2017**


Illustration by Paul Jennings

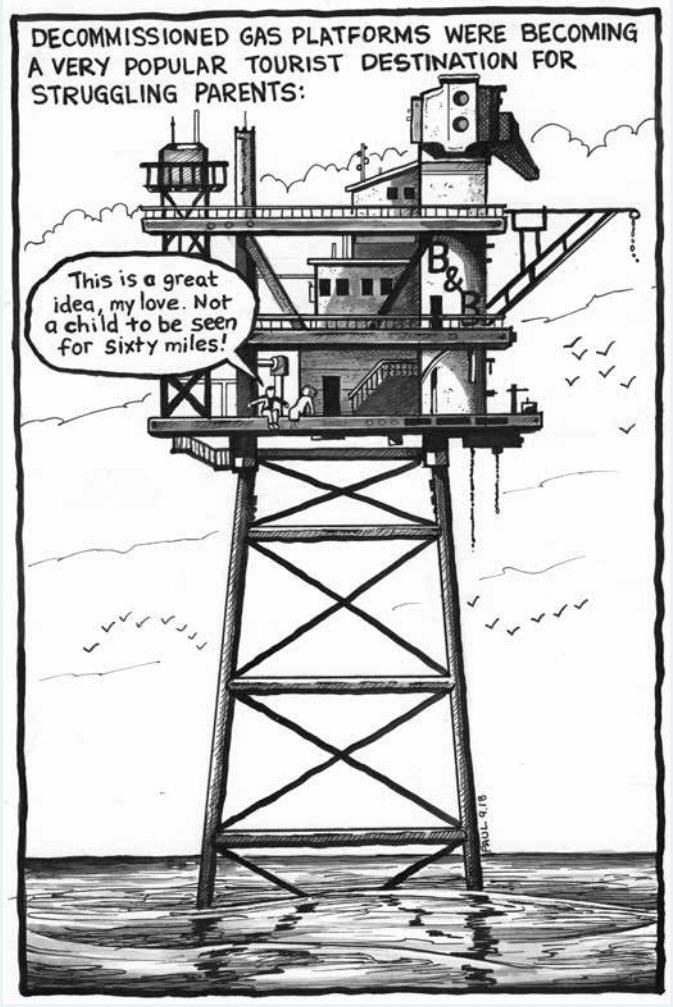



Illustration by Paul Jennings

**"I believe sustainability needs to be integrated, understood and fully embodied on a political scale."**

**Blue Futures participant, July 2017**

# Looking to the past, to inform the future.

During the first phase of the Blue Futures research, a '100 year futures' workshop explored the notable events, key investments, and other changes experienced across East Anglia's land, coast and sea in relation to the past and future of the East Anglian region. The timeline below presents just a selection of the hundreds of significant and expected events and changes that our participants shared.

The exercise highlighted the powerful legacy that past events, decisions and development patterns have had, on current and ongoing activities across the region's terrestrial, coastal and marine zones. It demonstrated the importance of foresight and embedding sustainable development in future decision-making, planning and investments, as well as the challenge of dealing with future uncertainty.

**"It was good to have the space to think on a visionary scale!"**

**Blue Futures participant, November 2016**

# A toolkit of 'futures' methods

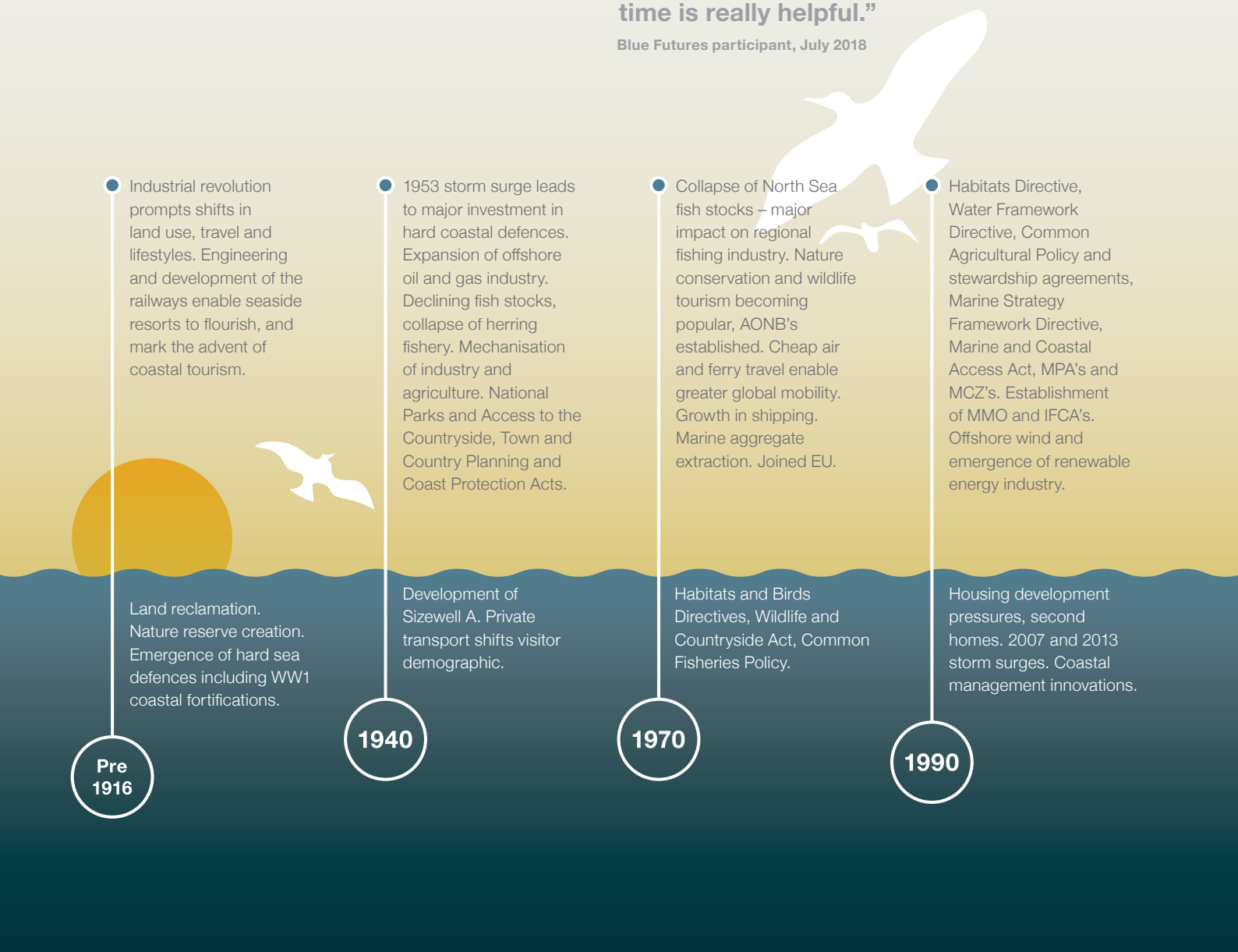
The project employed a creative suite of consecutive methods to help the team and our participants extend our minds across land, coast and sea, and up to a century into the future. Each stage built on the outputs of the previous phase.

As part of this, four contrasting scenarios set in the year 2116 were developed to stimulate our participants to open their minds to a potentially very different regional future environment, society and economy at local to global scales.

The methods prompted our participants to scrutinise the legacy of past events and investment, develop visions of a positive future and to explore key potential opportunities for East Anglia's long-term future, including interim steps toward achieving these.

**"We spend so much time thinking about what immediately has to be done that coming to a session like this and having some processing time is really helpful."**

**Blue Futures participant, July 2018**



**Pre 1916**

- Industrial revolution prompts shifts in land use, travel and lifestyles. Engineering and development of the railways enable seaside resorts to flourish, and mark the advent of coastal tourism.
- Land reclamation. Nature reserve creation. Emergence of hard sea defences including WW1 coastal fortifications.

**1940**

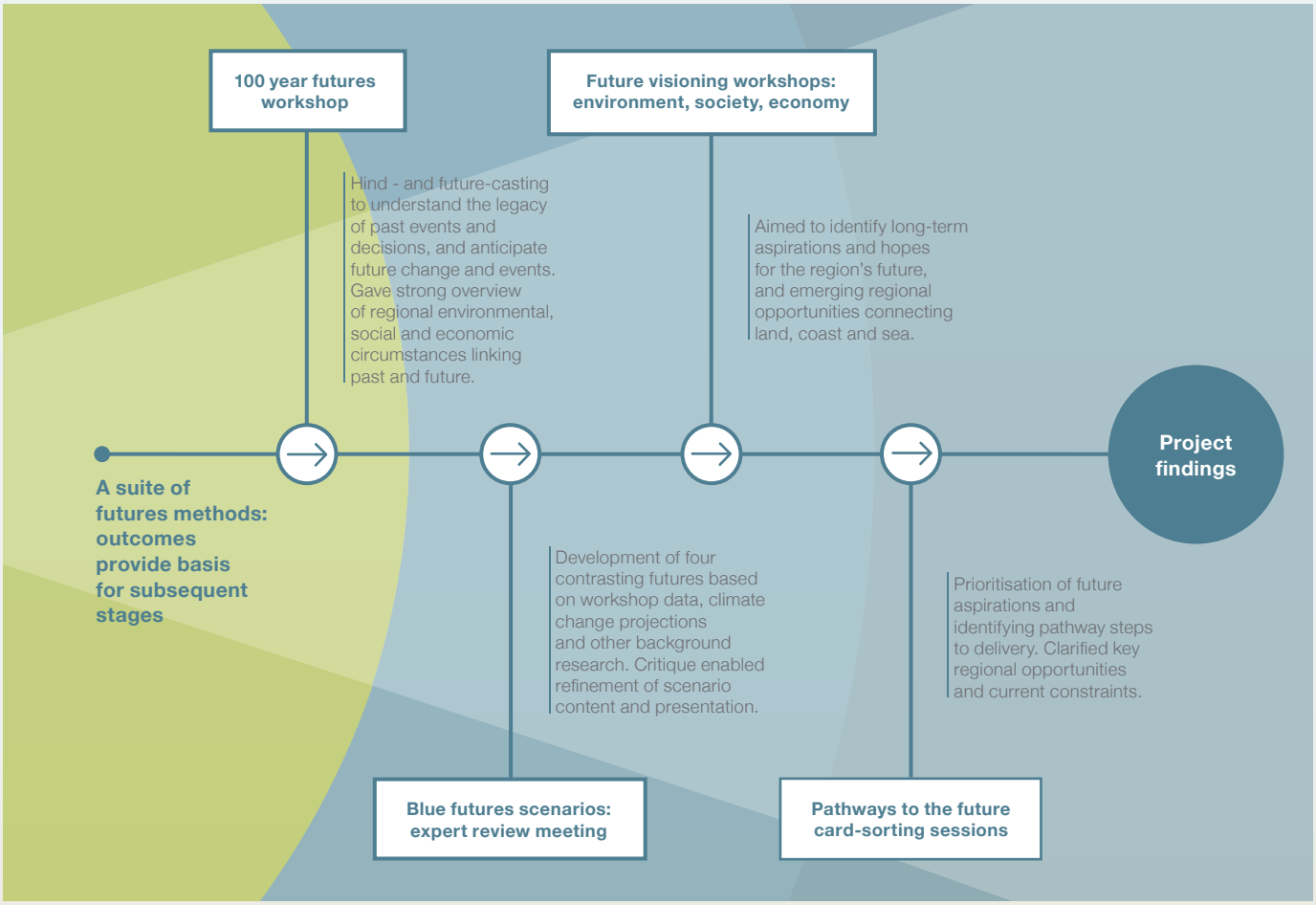
- 1953 storm surge leads to major investment in hard coastal defences. Expansion of offshore oil and gas industry. Declining fish stocks, collapse of herring fishery. Mechanisation of industry and agriculture. National Parks and Access to the Countryside, Town and Country Planning and Coast Protection Acts.
- Development of Sizewell A. Private transport shifts visitor demographic.

**1970**

- Collapse of North Sea fish stocks – major impact on regional fishing industry. Nature conservation and wildlife tourism becoming popular, AONB's established. Cheap air and ferry travel enable greater global mobility. Growth in shipping. Marine aggregate extraction. Joined EU.
- Habitats and Birds Directives, Wildlife and Countryside Act, Common Fisheries Policy.

**1990**

- Habitats Directive, Water Framework Directive, Common Agricultural Policy and stewardship agreements, Marine Strategy Framework Directive, Marine and Coastal Access Act, MPA's and MCZ's. Establishment of MMO and IFCA's. Offshore wind and emergence of renewable energy industry.
- Housing development pressures, second homes. 2007 and 2013 storm surges. Coastal management innovations.




**2016**

Brexit. Political unrest, recession. Social media backlash. Decisions taken about future of vulnerable key coastal settlements and habitats. Resource depletion and competition. Two major storm surges within a decade. Agricultural intensification and diversification. Smart water management. Ecosystem service credit system established, habitat creation.

Marine biofuel exploration. Population growth, ageing, immigration. Oil and gas decommissioning. Sizewell C. Expansion of offshore wind. Growth of carbon market, and CCS.

**2050**

Offshore desalination and hydrogen production. Large-scale managed retreat. Adaptation planning becomes mainstream. Lower carbon society: smart households, low waste. Advances in nuclear fusion. Autonomous underwater vehicles. Tidal energy. Global economic collapse drives community focus.

$CO_2$ emissions peak in 2050. National biodiversity loss, regional improvement. Landscape scale conservation. Shifts in key food crops and role of macro algae for fuel. Mass migration. Regional coastal tourism boom.

**2080**

Nuclear fusion becomes source of low cost energy. Global unrest, resource wars (particularly water), possible WW3. Adaptable society. Norfolk Broads become brackish estuarine habitats.

Expansion of The Wash, flooding farmland. Geo-engineering. Innovations in coastal living. Major storm surge. Changing distribution of fish species.

**2116 & beyond**

Sea level rise 1-2m. Loss of groundwater resources with population increase. Zero carbon hydrogen-based economy. Significant political change.

Decline in key habitats and dominant species change. Innovations in undersea living.

BLUE FUTURES

Realising East Anglia's blue growth ambitions – from land to sea


**CONTACTS:**

**Dr Trevor Tolhurst**
**PRINCIPAL INVESTIGATOR**
t.tolhurst@uea.ac.uk

**Dr Sophie Day**
**SENIOR RESEARCH ASSOCIATE**
sophie.day@uea.ac.uk


**This summary brochure presents highlights of the 'Blue Opportunities from the Future' project.**

See the MKEN website for details of other project publications
https://www.uea.ac.uk/mken/blue-futures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