Realising the East of England's Contribution to Achieving UK Net Zero

This briefing has been prepared for a meeting of the members of the All-Party Parliamentary Group for the East of England.

- The headline outcomes of COP26 (Glasgow, 2021) were the Glasgow Climate Pact of increased emission reduction pledges and the Paris Agreement Rulebook. The finance headlines of Glasgow are not forthcoming, an ongoing issue since 2009
- More locally, UK energy supplies will not achieve decarbonisation without the East of England's renewable energy resources
- The region requires a grid and digital transformation for the necessary electric vehicle and heat pump infrastructure
- As the UK's most vulnerable region to climate change it needs an up-to-date place-based scientific assessment of its adaptation needs
- Decarbonisation and adaptation are place-based more than centrally controlled, requiring additional place-based policy focus
- The Climate Change Committee continues to encourage rapid progress with the best science as evidence to motivate action

Progress since COP26

The headline outcomes of COP26 (Glasgow, 2021) were the Glasgow Climate Pact and the Paris Agreement Rulebook, finalised from COP21 in 2015. The ambition was to limit global warming by the phasing-out of coal, stopping deforestation, speeding-up the switch to electric vehicles, and investment in renewables; adaptation to protect communities and habitats, and monies for climate finance. In addition, the Just Energy Transition Partnership was agreed with South Africa, as a way to design, fund and implement development pathways that are low carbon. COP27 in Egypt differs from previous COPs by being less focused on the global agreement, and more on what nations can implement and achieve. Much of the focus will be on finance, with $100bn agreed annually until 2020, first announced in 2009. $100bn a year was again agreed in Glasgow in 2021. The Egyptian Presidency for COP27 seeks 'a balanced solution to the funding issue', 'a new mindset' and 'avoid backsliding'[1].

UK progress

The UK Climate Change Act 2008 is the basis for the legal duty to act on climate change mitigation and adaptation in the UK's four nations. It commits the Government to reduce greenhouse emissions by 100% of 1990 levels. Established under the Act is the independent Climate Change Committee (CCC) that advises

[1] www.cop27.eg

the UK and devolved governments on climate change progress and strategy. Through the guidance of the CCC, the UK has one of the world's most ambitious climate change targets, amended in 2019 to commit to net zero by 2050. If the UK target is achieved, it will bring the UK two-thirds of the way to net zero CO_2 emissions by 2035 compared to 1990 emissions[2] (and see Figure 1 below). UK ambition on climate policy further increased with the publication of the UK's Net Zero Strategy in 2021 (see figure 2), ahead of COP26. The UK's net zero target is the UK's contribution to the UN Paris Agreement of COP21, which aims to limit average global warming to well below 2°C and preferably 1.5°C.

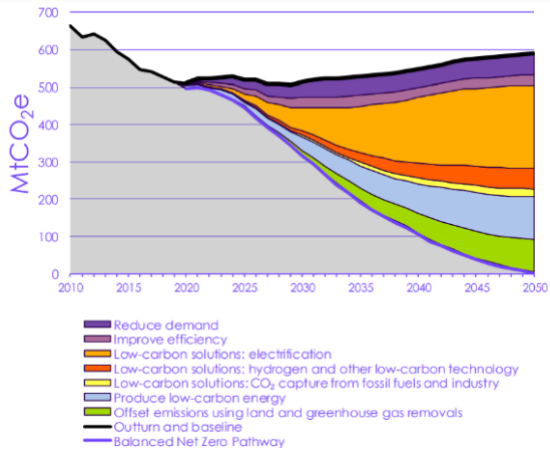

Figure 1 Net zero pathway for the UK showing CO2 abatement pathways. Source The Sixth Carbon Budget p26[3]

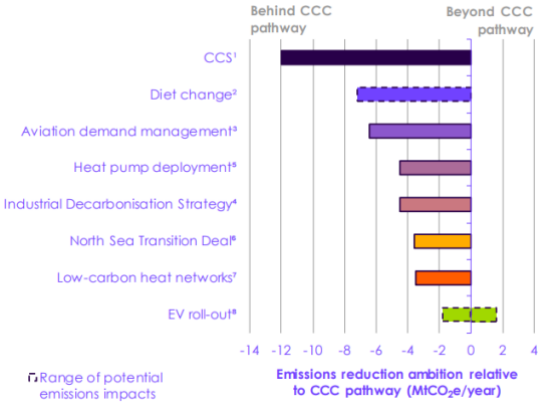

Figure 2 Policy progress on the path to net zero. Differences in stated UK Government ambition compared to CCC net zero pathway of Figure 1.[4] CCS is Carbon Capture and Storage.

Net Zero

Net zero is the concept of cutting all CO_2 emissions from humanity for a net zero balance, whereby sources of greenhouse gas emissions no longer pollute the atmosphere with fossil fuel burning, forest clearing and other habitat loss. When there are unavoidable sources of CO_2, such as from agriculture and aviation, those emissions are either captured and stored away (CCS Carbon Capture and Storage), and/or the equivalent amount drawn out of the atmosphere. There are no proven technologies at scale for carbon capture though scientifically it is possible, with financing, regulatory carbon markets and appropriate risk management. The net zero concept arises from the Intergovernmental Panel on Climate Change (IPCC) assessment of what is needed to achieve the target temperatures of the Paris Agreement of 2015. 'Net zero' has though become a simple shorthand phrase for energy saving in policy and business and so is misunderstood in its bold science-policy meaning (See business use of offsets risks delaying net zero[5]). The

[2] https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035

[3] Climate Change Committee (2020) The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero

[4] Reproduced from CCC Progress in reducing emissions 2021 report to Government p25

[5] www.theccc.org.uk/2022/10/13/business-use-of-offsets-risks-delaying-net-zero/

economics of net zero are that it is cheaper to avoid global warming than to pay to fix it later.

Adaptation and Resilience

Despite bold global climate change agreements, average global warming will likely exceed 1.5°C over the next 20 years, shows the IPCC in their 2022 Scientific Assessment[6]. The just published UN Environment Programme 'Mind the Gap' 2022[7] projects a warming of 2.4-2.6°C by 2100, if all nations meet their current emission negation pledges. To keep to the Paris Agreement's 1.5°C aspiration, global emissions now need to halve in the next 8 years, and many country mitigation plans do not begin until after 2030.

If 2.4-2.6°C is the projected lower limit of global warming if all pledges are somehow met[8] this level of average warming brings considerable climate risk at the poles in particular, where warming is more rapid. More locally, the East of England is the UK's region most vulnerable to the impacts of climate change. It is already a dry region with low rainfall and increasing demand for water, and it is well-known for its low-lying land at sea level that is prone to flooding and erosion. It holds critical at-risk nationally important infrastructure of buildings, roads, rail, energy, communications, data. The region's wide-scale agriculture is of course temperature and rainfall dependant, as are its rich biodiversity habitats because of its rivers and fens, and their role in peatland restoration and carbon sequestration. In Norfolk, 18% of employment is related to tourism[9] which exists purely because of its at-risk landscape, coastline, wildlife. Another 2% of jobs are weather-dependent agriculture and fishing.

Health

The UK Health Security Agency reports 2,803 excess deaths of over 65s attributable to the 2022 heatwave[10]. Eight percent of England's over 65s live in the East of England, and by 2041, the population that is 85+ years is predicted to double to 61,000[11]. Health impacts also include lost productivity when there are heatwaves. The East of England is not prepared for the impacts of climate change. Preparedness is largely left to local organisations and communities because there is not a strategic adaptation plan, either nationally or for the East of England. The next National Adaptation Programme is due in 2023, led by DEFRA for England, which gives opportunity for the East of England to work together on its own regional assessment and strategy.

East of England emissions

The East produces 10% of the UK's emissions, the 4th highest emitting region in the UK. This is the equivalent of 5.8 tonnes per person (tCO_2e), a drop of 3.6 tCO_2e since 2005[12], which reflects the overall UK decline in emissions because of the decarbonisation of UK electricity supply, and the cessation of industrial activity (figure 3). Domestic emissions are 4% higher than the England average and Industry (which includes agriculture and landuse) is 8% lower. Transport emissions have remained constant for the East, and for some categories have increased - similar to the rest of England. Gas use has not declined in industry, commerce and households. A lot of rural properties in Norfolk and Suffolk, for example, are not mains connected and are heated by other fuels such

[6] IPCC, 2021: Summary for Policymakers. Sixth Assessment Report of the Intergovernmental Panel on Climate Change
[7] United Nations Environment Programme (2021). Emissions Gap Report 2021
[8] https://www.unep.org/resources/emissions-gap-report-2022
[9] https://www.norfolkinsight.org.uk/economy-and-employment
[10] https://www.gov.uk/government/news/ukhsa-and-ons-release-estimates-of-excess-deaths-during-summer-of-2022
[11] https://www.norfolkinsight.org.uk/population
[12] UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019

as oil or bottled gas. Heat pumps are 3 to 4 times more efficient than gas boilers.

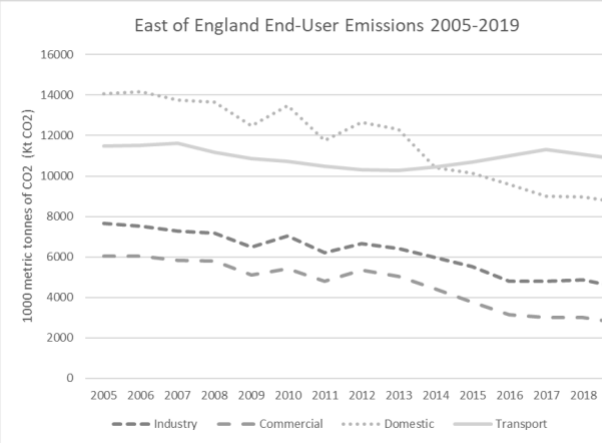

Figure 3 East of England End-User Emissions. Data is UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019

Decarbonising the East

The East of England's North Sea coast is home to 52% of the UK's offshore wind capacity, and some of the world's biggest are being built or are soon to start. The East of England is and will continue to be a power exporting region[13]. Renewable energy capacity in the Eastern Region is 6,269 GW (56 per cent from wind and 34 per cent from solar PV)[14] and see Fig 3 below. National Grid Scenarios project an increase in installed renewable capacity of 10-17GW by 2050. The circuitry infrastructure will need upgrading to allow for renewable electricity to be exported to London and the South-East to prevent overloading and ensure stability of supply to the national grid. The East of England's flat agricultural lands are prime for solar PV, onshore wind and battery storage, all as additional income to landowners as well as contributing to UK security of electricity supply which increasingly includes transport.

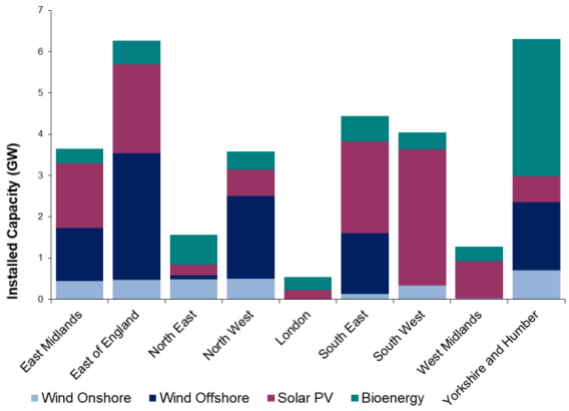

Figure 4 Renewable Energy Capacity by Region. (Yorks and Humber data is biomass being burned at Drax & Ferrybridge Power Stations)

Crop waste is burned to make electricity, or biodigested to become biogas (bioenergy as seen on figure 4). Maize is increasingly grown for biogas. The Soil Association wants to see the end of the double subsidies paid for growing maize for anaerobic digestion[15]. Eastern farmers are more well-known for their sugar beet, processed by British Sugar every autumn. One study shows a reduction in sugar beet yield of 11% by 2050 due to decline in summer rainfall[16]. British Sugar showed that 1g of sugar processing releases 0.6g of CO_2 [17]. A break crop, sugar beet is heavily dependent on pesticides and fertilisers, and its energy intensive processing (and lack of industry) means that the factories are point sources of CO_2 in the Region. Food and farming are hugely important to the region's landscape, soil health and economy. Net zero requires a dietary transition towards eating less meat while maintaining protein intake.

Transport

Forty percent of the East of England's CO_2 emissions are from transport, compared to 36% for England, reflecting the Region's geography and distances. With population increase and the end of new petrol and diesel

[13] NationalGridSo.Com ETYS2021
[14] BEIS (2022) Energy Trends collection 29 Sept 2022
[15] www.soilassociation.org/media/4671/runaway-maize-june-2015.pdf
[16] Okom et al (2017 Impacts of projected precipitation changes on sugar beet yield in eastern England. RMTS
[17] Stevanato et al (2019) Sustainability of the Sugar Beet Crop, Sugar Tech 21

engines by 2030, EV's are forecast to be between 1.2 and 1.9 million, mirroring large increases across the rest of the country[18]. This will be a trebling of energy demand equivalent (figure 4 below), and so at current rates of installation, the provision of electric vehicle charging is slow, both as infrastructure and integrated into the planning requirements of private housing (heatpumps have similar implications for electricity stability at peak times). EVs also require more clean energy and battery storage capacity in the region.

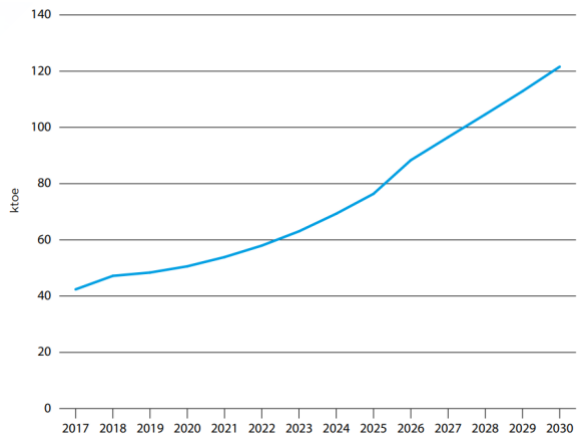

Figure 5 East of England projected electricity consumption by transport. Data from https://www.gsenetzerohub.org.uk/wp-content/uploads/2019/09/LEE-Energy-Strategy.pdf Fig 8

The CCC recommends to the Government that no new roads can be constructed unless they do not increase emissions overall, and public money should not support industries or infrastructure that is not consistent with the net-zero economy or increase exposure to climate risks.19

Coastal flooding and erosion

The most significant risks of flooding in the East are from overtopping or breaching of coastal defences, and surface run-off from extreme rainfall, with 20% of the region being below sea-level. In addition the soft sedimentary coastline is eroding rapidly. The coast is heavily managed and in 2020, under the National Flood and Coastal Erosion Strategy for England, funding for flood and coastal erosion was doubled to £2.5bn 2021-2027. Nonetheless in the East of England many defences have or will be abandoned with widespread use of 'managed realignment' and 'no active intervention' approaches. There is also 'hold-the-line' via hard sea defences or soft beach nourishment for protecting towns such as Felixstowe, Lowestoft, Great Yarmouth, Cromer, for example, and Sizewell power station and Bacton gas terminal. In addition, low-lying areas such as Great Yarmouth could potentially be cut-off in times of flood from landward. 2023 is the 70th anniversary of the disastrous 1953 floods, which gave rise to the extensive defences that protect the East's coastline and communities. High tides are steadily rising and saltwater inundation into the Broads is increasingly common[20]. The highest recorded tide was December 5th 2013. The previous National Flood Risk Assessment 2008 cites 25% of Norfolk properties at risk of flooding, which is 63,284 homes. Regionally up to 11,000 houses on the open coast are threatened by flooding and erosion over this century, if current policies continue[21]. Government is only beginning to consider how to manage this challenge.

Water quality

Annual rainfall is 70% of the national average and less than 20 per cent of the amount that falls in the Lake District. Water abstraction licences are based on a system designed in the 1960s when there was a surplus of water[22]. Damage is being caused to water and water-dependant environments including

[18] Local Energy East Energy Strategy 2016
[19] 2021 Joint Recommendations to Parliament
[20] The tide range at Great Yarmouth has been outside of its normal range for 150 days in the past year https://riverlevels.uk/
[21] Sayers et al (2022) https://doi.org/10.1016/j.ocecoaman.2022.106187
[22] The case for change reforming water abstraction management in England. Ofwat and Environment Agency

internationally important habitats and carbon sequestering peat soils[23]. The rivers and beaches are frequently used for discarding untreated runoff and sewage. Anglian Water is responsible for the highest number of most serious category of pollution incidents, recently rated 2-star by the Environment Agency[24]. If these 14 serious incidents are associated by Anglian Water with downpours and flooding, it demonstrates maladaptation of water services to current weather, showing the critical need to further adapting processes and infrastructure to protect water quality and habitats. For domestic customers, Anglian Water estimates 1200 million litres per day of available water in 2035, compared to 1325 Ml/day now, because of a combination of climate change, environment needs, population growth, and drought resilience, also showing that additional water storage and water transfer infrastructure is needed. Farmers will likely need to swap-out water intensive drought sensitive crops and increase on-farm water storage. (the further detail of water to the expertise of Anglian Water who are presenting at this APPG meeting.)

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[23]Emerging water resources regional plan for the East of England
[24] Water and sewerage companies' environmental performance report 2021