



**GREATER BRIGHTON ECONOMIC
BOARD
ADDENDUM**

10.00AM, TUESDAY, 7 FEBRUARY 2023

COUNCIL CHAMBER, HOVE TOWN HALL

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ADDENDUM

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Brighton & Hove City Council

Greater Brighton Economic Board

Agenda Item 20

Subject: Economic Outlook for Greater Brighton

Date of meeting: 7 February 2023

Report of: Chair, Greater Brighton Programme Board

**Contact Officer: Name: Andrew Hill
Email: Andy.Hill@brighton-hove.gov.uk**

Ward(s) affected: All

For general release

Note: The special circumstances for non-compliance with Section 100B (4) of the Local Government Act as amended (items not considered unless the agenda is open to inspection at least five days in advance of the meeting) were that the report was awaiting further input and information from external partners.

1. Purpose of the report and policy context

- 1.1 Since spring 2022, a cost-of-living crisis has gripped the UK, affecting both households and businesses. Inflation peaked at around 11% towards the end of 2022, with the rising costs of energy, fuel, food, and raw materials being the major drivers. The Bank of England raised interest rates to 3.5% in December in an attempt to curb soaring inflation, increasing the cost of borrowing to consumers and businesses with mortgages and other loans.
- 1.2 The rising cost of essentials such as energy and food, compounded by the increase in the cost of borrowing have put a huge squeeze on household and businesses finances. The erosion in household disposable income is the most significant witnessed in a generation. As a result, towards the end of 2022 and now into this year, there have been a series of strikes across a number of sectors, as workers and unions demand pay rises in line with inflation to protect current living standards.
- 1.3 The Government has also confirmed that the current energy support for businesses will end in March with the new Energy Bills Discount Scheme after March offering less support. At a time of soaring energy costs and low consumer confidence, for some businesses this will mean the difference between being able to continue as a viable business or not. Nationally, the number of firms on the brink of insolvency jumped by more than a third at the end of 2022. Further research is required to understand how many businesses in the city region are at risk.
- 1.4 There is also a knock-on effect of the cost-of-living crisis for both businesses and residents in terms of affordable housing. This is one of the most pressing issues affecting those on low incomes as private sector rents have increased and the hike in interest rates makes mortgages unaffordable for many

prospective homeowners. Meanwhile, residential housebuilding in the UK has fallen as the housing market slows down due to inflationary pressures, supply chain disruptions, as well as labour and materials shortages. For employers, the rising housing costs, and lack of affordable housing affect labour market mobility.

- 1.5 As agreed at the October 2022 Board meeting, the Institute of Employment Studies (IES) have been commissioned to conduct research and analysis into the impact of the economic turbulence in Greater Brighton. The research has primarily focused on the impact on businesses and residents associated with rising costs, increasing interest rates and ongoing uncertainty.

2. Recommendations

- 2.1 That the Board notes the findings and recommendations of the report by IES on the current economic outlook for the city region.
- 2.2 That the Board tasks the Greater Brighton Programme Board to look at actions and interventions that can be made by Greater Brighton to support businesses and residents through the cost-of-living crisis, as well as opportunities for economic growth and aligned funding bids.
- 2.3 That Board agrees to set aside circa £20,000 to commission work on a city region dashboard and regional analysis, with specific focus on skills, housing and business support. The expectation is that a quarterly report will come to the Board with an update on the economic outlook with a focus on a key priority area and proposed recommendations for interventions.
- 2.4 That the Board agrees a letter should be sent by the Chair, on behalf of the Board, to the Chancellor and the Secretary of State for Levelling Up, Housing and Communities, calling for more support for businesses in the city region and sustainable funding, to address inequalities and local imbalances within the region, in line with the Levelling Up agenda.
- 2.5 That the Board acknowledges the response from the Secretary of State for Levelling Up, Housing and Communities, attached as an Appendix and welcomes the offer of officials from the Department visiting the city region.

3. Context and background information

- 3.1 Throughout the economic challenges witnessed since last spring, Greater Brighton local authorities and other partners have been doing what they can to support residents and businesses with very limited resources and have therefore targeted the households and residents most at risk from the cost-of-living crisis. A number of these interventions and initiatives were highlighted in the report that was presented to the Board in [October 2022](#).
- 3.2 Understanding the impact of the cost-of-living crisis and what can be done about it is a clear priority for the Board and its partner members. To that end, at the [October 2022](#) Board meeting it was agreed to commission IES to conduct research and analysis looking at the economic outlook across the city

region. Using a mix of quantitative and qualitative data, the aim was to draw out the likely impact of the economic challenges on our businesses with particular focus on the sectors and geographic areas that are most at risk from rising costs of living. The work involved the three main components below:

- Scoping discussions with leads in each council to understand the approach they are taking now, what analysis they have done, what they plan to do, key gaps
- Discussions with the business community to explore current and future concerns and challenges
- Desk based research and analysis on latest (national) analysis of impacts of costs of living crisis on different demographic groups, sectors, occupations

3.3 The analysis by IES focused on 5 key dimensions:

- Rates of benefit receipt – levels and changes
- Levels of deprivation – from Index of Multiple Deprivation
- Salaries – estimated based on occupational breakdowns
- Housing – prices and tenures
- Employment risks – those industries most/least at risk from economic slowdown

3.4 The IES report presents the national economic picture while focusing on the impact of the cost-of-living on residents and businesses in the Greater Brighton city region. The report recognises that while the impact of the cost-of-living crisis is being widely felt, there are specific groups who are more vulnerable to falling into poverty. The analysis highlights the key geographic areas across the city region that are feeling the greatest impact as a result of rising interest rates and/or low incomes, as well as the impact on those in different housing tenures. The report also provides analysis on the impact on the labour market and risks to specific industries.

3.5 The recommendations included in the report focus on 5 key areas for consideration by the Board. There are two linked recommendations around greater coordination and information sharing across local authorities, to collate data insight and work together to share practice and approaches. It is proposed that this is achieved through a city region economic dashboard and establishment of a sub-group, which are included in the recommendations of this report.

3.6 There is also a recommendation for local authorities to provide targeted, place and group-based support. This builds on the work that is already underway through individual local plans that councils have in place to support their communities and staff through the cost-of-living crisis. The IES report provides useful data and analysis on places in the city region where there are likely to be particularly high levels of need as well as groups who may have

greater or different support needs, like large families, people with disabilities and students.

- 3.7 The report recognises the challenges for the labour market and highlights the risks that could lead to a further slow-down of the labour market. It is recommended that joined-up work with local services such as job centres, community organisations, as well as colleges and training providers, could support people into employment. Employers can directly support staff by providing information and advice on money as well as signposting to tools for financial planning and making discretionary financial support available to staff.
- 3.8 This snapshot analysis from IES provides insight on the current impact of the cost-of-living crisis across the city region. The next step will be to request that the Greater Brighton Programme Board use the analysis to develop immediate actions and interventions that can be made at a Greater Brighton level to support businesses and residents through the cost-of-living crisis. This may be via establishing a focused sub-group. The group will also be charged with exploring opportunities for economic growth and the potential of aligning funding bids across city region partners.
- 3.9 This work has shown the value of better monitoring the economic outlook for the city region and comparing how Greater Brighton performs against other parts of the country. It is therefore proposed that a basket of key economic indicators is tracked, monitored and regularly reported to the Board going forward. To do this the Board Support Team is going to lead on the development an economic dashboard. The recommendation is that the Board Support Team works with an external organisation with experience in analytics to shape and establish the dashboard, which will then be maintained by the Board officers.
- 3.10 The dashboard will focus on skills, housing and business support, ensuring that interventions can be made as soon as possible to help businesses while taking a longer look at potential challenges in terms of skills and labour shortage and the linkages with affordable housing. A regular quarterly update will be brought to the Board for consideration with the latest data and analysis, allowing for future interventions and action to be determined more swiftly.
- 3.11 The Office for National Statistics (ONS) has also agreed to include the Greater Brighton City Region in its regular annual Regional Accounts outputs. This will provide annual statistics for gross domestic product, gross value added, and gross disposable household income, published in the same datasets currently available to combined authorities and other city regions.
- 3.12 It is vital that the voice of the city region is heard by decision makers in Government and that businesses are represented by the Board at this challenging time. Furthermore, the outcome of Levelling Up Round Two is one of disappointment, so now is the time to call for more support for

businesses in the city region and make the case for sustainable funding, to address inequalities and local imbalances within the region, in line with the Levelling Up agenda.

- 3.13 The Board support team will follow up with the Department of Levelling Up, Housing and Communities (DLUHC) to arrange a visit by officials to the city region and it is included in the recommendations of this report that further letters be sent by the Chair to the Chancellor and the Secretary of State for DLUHC.

4. Analysis and consideration of alternative options

- 4.1 The purpose of the IES Study was to provide rapid information and analysis so that the Board could understand the economic impact of the economic turmoil on the City Region. Only by understanding the impact can the Board make informed decisions around possible interventions.

- 4.2 In order to utilise the findings of the study and make the next step towards developing some interventions, it is advised to bring a group together to do this. The pooled expertise and experience of the group will generate better outcomes than if unilateral decisions were made around the next steps.

- 4.3 The Greater Brighton City Region economy has enjoyed a fairly sustained period of economic stability, buoyancy, growth and in general improving living standards for the majority of residents. However, the current economic situation, which looks set to continue well into 2023, poses a real challenge to this prosperity, both to businesses and residents. It's at this sort of time that the absence of an economic monitoring tool or dashboard is noticeable, but this is going to be remedied in the near future. Once an economic dashboard is in place, the Board will be able to track the performance of the economy and will be able to make informed decisions around what actions can be taken with the latest data available.

5. Community engagement and consultation

- 5.1 The methodology employed by IES to carry out the study involved engaging with local authorities and other partners to understand what work is already being done and assess where the current gaps may be.

- 5.2 Consultation or engagement on any actions or interventions that the Board wishes to make, will be considered on a case-by-case basis, and will be performed where deemed prudent to do so.

6. Conclusion

- 6.1 The research and analysis by the Institute for Employment Studies provides the latest available data and information showing the impact the cost-of-living crisis is having on the city region's residents and businesses.

- 6.2 The development of an economic dashboard and more frequent analysis of the city region economy through key indicators and focused on thematic areas

will enable the Board to maintain a focus on a strategic and coordinated approach to support the city region's businesses and residents through this period of economic turmoil.

- 6.3 The report to the Board in October 2022 marked the start of this process and the economic dashboard proposed will provide a tool to monitor the impact on the city region economy and determine interventions the Board can make going forward.

7. Financial implications

- 7.1 A contribution of up to £20,000 will be made from the Greater Brighton Economic Board operational budget will be made to commission the work on a city region dashboard and regional analysis. This report will be presented back to this Board and any further financial implications addressed at that point.

Name of finance officer consulted: Rob Allen, Principal Accountant

Date consulted 31/01/23:

8. Legal implications

- 8.1 The purpose of the Board is to bring about sustainable economic development and growth across Greater Brighton, including coordinating economic development activities and investment at regional level. The panels referred to above are advisory and non-decision making.

Name of lawyer consulted: Wendy McRae-Smith, Senior Lawyer

Date consulted: 31/01/23

9. Equalities implications

- 9.1 The impact of the cost-of-living crisis on businesses and individuals will directly entrench existing inequalities. The IES study evidences the impact the crisis is having on vulnerable households and the geographic areas of highest deprivation most at risk from current economic conditions.

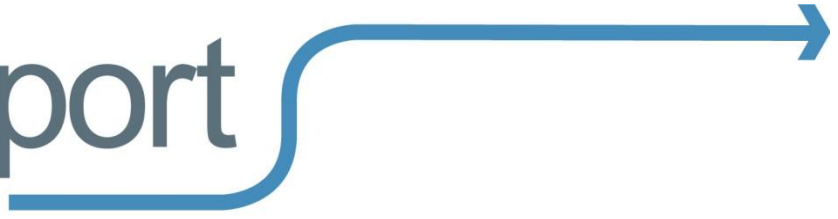
10. Sustainability implications

- 10.1 None directly arising from this report. However, it is noted that the global energy crisis, caused by high energy prices, has contributed to high inflation, pushed people into poverty and slowed economic growth. The current economic and climate crises illustrate the need for rapid progress to a greater supply of clean energy sources and technologies that would protect consumers and business and mitigate if not avoid the upward pressure on fuel prices they are currently facing.

Supporting Documentation

Appendices

1. Institute for Employment Studies report (Jan 2023) - Cost of Living Impacts on Greater Brighton
2. Letter of the 17 January 2023, from the Secretary of State for Levelling Up, Housing and Communities, Rt Hon Michael Gove MP, to the Chair of the Board.



Costs of living impacts in Greater Brighton

Analysis of areas and groups most at risk from rising costs of living

Tony Wilson, Matt Williams, Joe Cook

Institute for Employment Studies

The Institute for Employment Studies is an independent, apolitical, international centre of research and consultancy in public employment policy and organisational human resource management. It works closely with employers in the manufacturing, service and public sectors, government departments, agencies, and professional and employee bodies. For 50 years the Institute has been a focus of knowledge and practical experience in employment and training policy, the operation of labour markets, and human resource planning and development. IES is a not-for-profit organisation which has around 50 multidisciplinary staff and international associates. IES expertise is available to all organisations through research, consultancy, publications and the Internet. Our values infuse our work. We strive for excellence, to be collaborative, and to bring curiosity to what we do. We work with integrity and treat people respectfully and with compassion.

Inclusive Terminology

The terminology used to define ethnicity continues to evolve, as does awareness around gender, cognitive differences and disability. IES seeks to be a learning organisation; as such we adapt our practices in line with these shifts. We aim to be specific when referring to each individual's ethnicity and use their own self-descriptor wherever possible. Where this is not feasible, we are aligned with Race Disparity Unit (RDU) which uses the term 'ethnic minorities' to refer to all ethnic groups except white British. RDU does not use the terms BAME (black, Asian, and minority ethnic) or BME (black and minority ethnic) as these terms emphasise certain ethnic groups and exclude others. It also recommends not capitalising ethnic groups, (such as 'black' or 'white') unless that group's name includes a geographic place. More broadly, we understand that while individuals may have impairments it is society that disables them, hence we refer to disabled people. Not all people identify with male or female and we reflect their self-descriptions in our work and use the term non-binary should abbreviation be necessary. We value neurodiversity. Where possible we always use people's self-descriptors rather than impose categories upon them.

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IES project code: 6299

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1 Background

The Greater Brighton Economic Board commissioned the Institute for Employment Studies (IES) in November 2022 to conduct rapid research and analysis to explore the impacts of rising costs of living on residents of the Great Brighton area. The analysis was intended to explore the risks to residents of rising living costs due to high inflation over the last year but also the potential impacts of rising mortgage interest rates. This report presents findings from the analysis.

1.1 Methodology

The research work by IES has comprised three elements:

- **Discussions with Council and Economic Board stakeholders** – to understand what data and analysis was already in place and could be used to support the work, and to gather insights on costs of living pressures in Greater Brighton. This comprised interviews with Council leads in November and December, alongside discussions with the Greater Brighton Programme Board in November and January.
- **Desk based research and analysis** – comprising a rapid review of evidence so far on costs of living impacts for different groups; alongside new analysis of secondary data sources looking specifically at benefit receipt (specifically, Universal Credit); wages (from the Annual Survey of Hours and Earnings); house prices (from Land Registry data); and household characteristics and occupations (from Census 2021). This analysis looks across the seven Council areas as well as at differences between smaller areas within/ between Councils.
- **Engagement with business bodies**. This element has not (yet) been progressed, so we would suggest engaging key business groups through existing channels over the next month, to test the findings from this paper and understand both any actions that firms are taking and what may help in supporting employers and their workforces.

1.2 The report

Findings from the research are set out below. Chapter 2 begins by putting the wider costs of living crisis in context and discussing what we know about groups that are most at risk from rising costs. Chapter 3 then presents more detailed analysis for the Greater Brighton area, identifying in particular areas where people at risk from rising costs of living are likely to be over-represented. Finally Chapter 4 sets out key conclusions from this work. Making recommendations for Councils and employers was out of scope of this project, but we have nonetheless included some suggestions of areas where the Board and members may want to focus, drawing in part on wider IES work in this space.

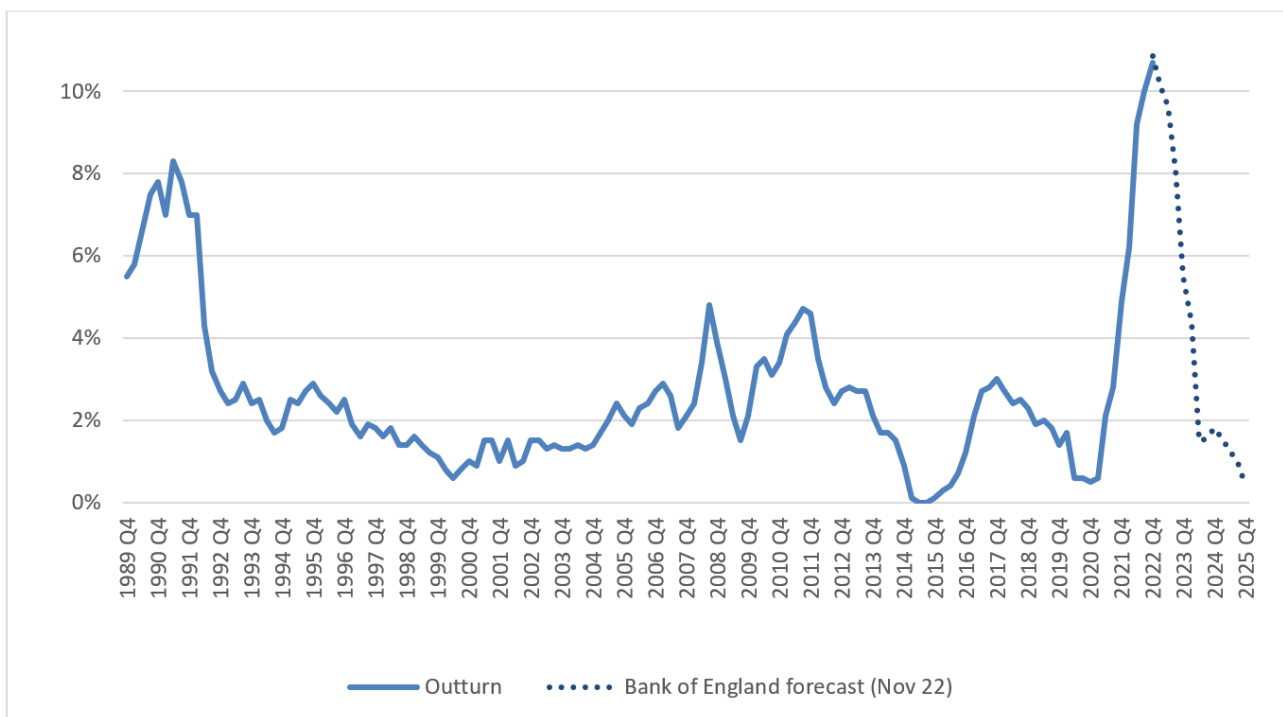
2 The costs of living crisis

2.1 Drivers and impacts of rising costs of living

As Figure 2.1 below sets out, the last year has seen prices rise at a faster rate than at any point in at least a generation. Prices began to rise strongly in late 2021, due to a combination of higher energy demand and supply bottlenecks as economies opened up after the pandemic, and have accelerated further through 2022 with the war in Ukraine and continued wider mismatches between supply and demand.

It appears likely that inflation may now have peaked, and the Bank of England (and other institutions) are forecasting a fairly rapid decline over the next two years – to around 5.5% at the end of this year and 1.8% at the end of next year. However prices will still be high and rising, and [analysis by IES](#) and others has illustrated with each passing month that wages are falling further and further behind (leading to sharp declines in real household incomes).

Figure 2.1: Consumer Price Index year-on-year inflation: 1989 to 2021, forecast to 2025

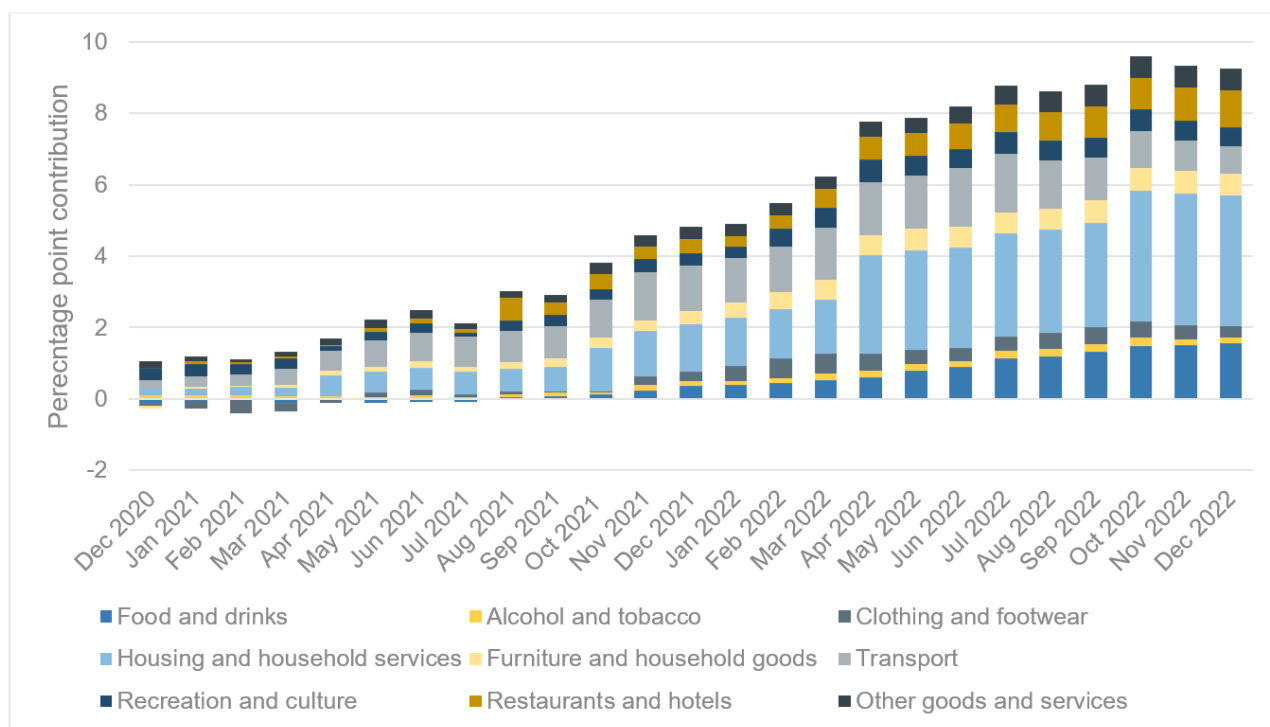


Source: Office for National Statistics – Consumer price inflation; Bank of England Monetary Policy Report

While inflation has primarily been driven by higher energy costs, prices are nonetheless rising significantly across nearly all of the main categories of living costs. As Figure 2.2 below shows, the largest contributor to rising prices has been ‘housing and household services’ (contributing 3.7 percentage points of the 9.2% inflation in the most recent data),

with this category including household energy bills. However food and drink alone are contributing more than 1.5 percentage points to inflation, with restaurants and hotels contributing over one percentage point and transport adding three quarters of a point.

Figure 2.2: Contributions to the CPIH 12-month inflation rate, Dec 2019 to Dec 2021



Source: Office for National Statistics – Consumer price inflation

And the broad-based nature of these rises – across everything that we spend money on – means that the impacts of rising prices on households have been inescapable and have left households across the income distribution (and across the country) facing higher costs and often financial difficulty. This is illustrated in Office for National Statistics data collected through the [Opinions and Lifestyle Survey](#), which in its most recent update (for the period June to September 2022) found that almost half of adults (45%) reported difficulties in paying their energy bills (up from 40% in the previous quarter) with 10% reporting that it was very difficult; while nearly one third (30%) reported difficulties with paying housing costs (up from 26%).

If a similar proportion of Greater Brighton residents were also having difficulties with their energy bills for example, this would be equivalent to around 370 thousand people with as many as 80 thousand people finding it very difficult to pay.

2.2 Key groups at greater risk

While the impacts of rising living costs have been broadly felt, there is also extensive and growing evidence of specific groups seeing greater impacts and being at greater risk of falling into poverty or destitution. We have focused on five broad themes below: those in

low incomes, those out of work, disabled people, larger families, students and those either renting or remortgaging.

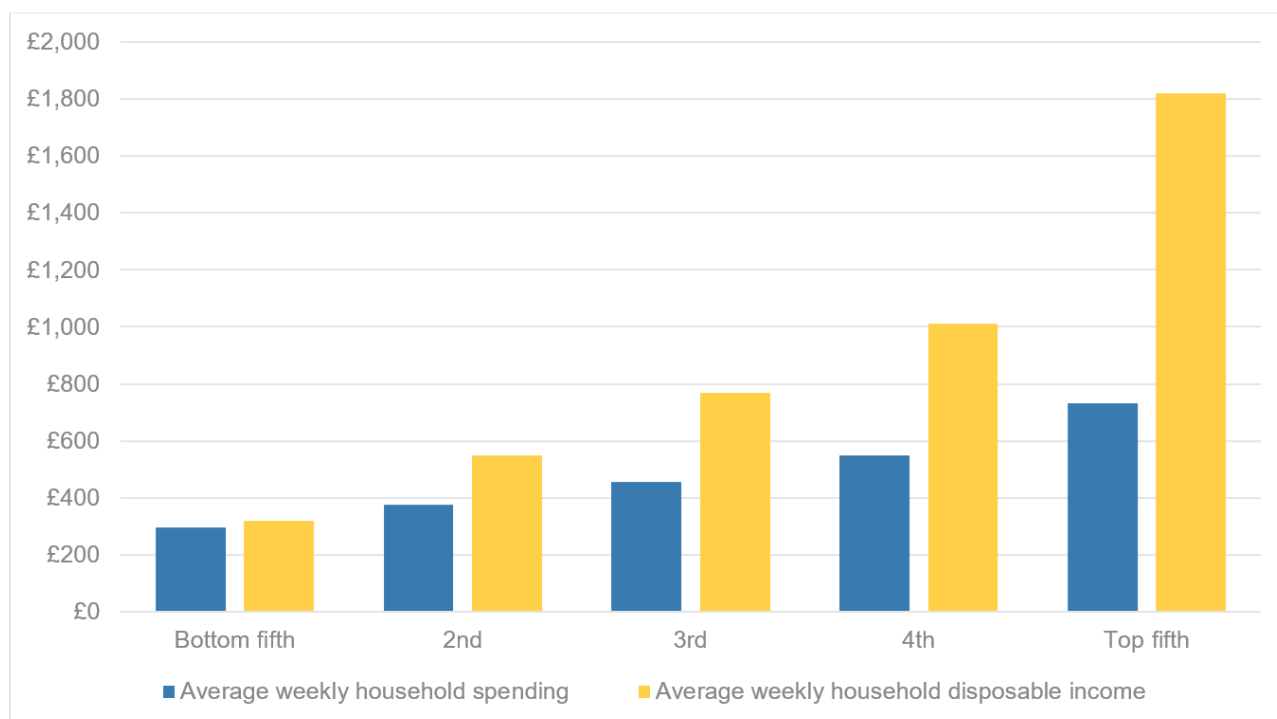
2.2.1 Those on low incomes

Most obviously, households in low incomes are at significantly greater risks from rising living costs than other households (and having a low income is an important driver of higher risk for the other groups described in this section too). There are two important reasons for this:

- First, households with low incomes are far less likely to be able to deal with rising living costs – sometimes because they are already financially insecure or in debt, and often/ usually because there is virtually no breathing space between their income and spending. This latter point is illustrated in Figure 2.3 below, which shows that in 2020/21 low income households had on average just £25 a week more in income than they do in spending (compared with a difference of more than £1,000 a week for high-income households).
- Secondly, low-income households face higher rates of inflation – because they need to spend proportionately more of their income on items that are seeing the fastest rises in prices, like food and energy. For example [Resolution Foundation analysis](#) estimates that the average inflation rate is 11.9% for the bottom tenth of households by income compared with 9.2% for the richest tenth (although the fact that this gap is not wider reflects how broad-based the rises in inflation have been).

All told, the ONS Opinions and Lifestyle Survey found that just over half of those with incomes below £20,000 reported difficulties in paying energy bills, compared with just under a quarter of those with income above £50,000.

Figure 2.3: Average household spending and disposable income by income quintile, 2020/21

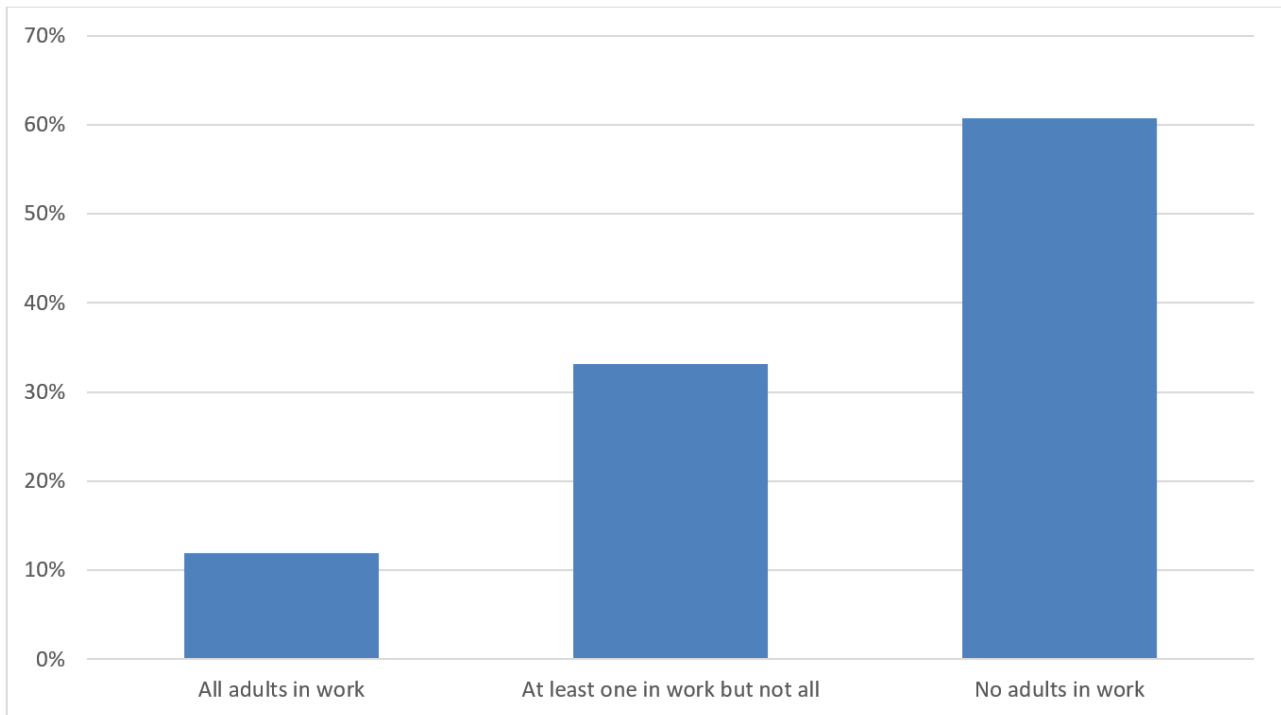


Source: Office for National Statistics – Living Costs and Food Survey

Those out of work

Following on from this, a significant contributor to being in a low income is being out of work. Around a quarter of all of those aged 16-64 are out of work (or 10.2 million people). Of these, around 1.3 million are actively seeking work while 8.9 million are classed as being 'economically inactive'. Within this group, around 2.3 million are students and 1.1 million have retired early, but 2.6 million are out of work due to ill health and 1.7 million are caring for family (usually mothers of younger children). And while economic inactivity had been falling for nearly a decade before the pandemic, it has risen significantly since (by nearly 600 thousand).

Because our benefits system is relatively ungenerous (and some of those out of work are not entitled to benefits due to rules around savings or residence), risks of poverty are far higher in households where people do not work than in households where they do. As Figure 2.4 below sets out, three fifths of all people living in households where no adult works are in relative income poverty compared with just one in eight people living in households where every adult works.

Figure 2.4: Likelihood of being in poverty by working status of adults in household

Source: IES analysis of Households Below Average Income. Poverty definition is below 60% of median income after housing costs.

2.2.2 Disabled people

The ONS Opinions and Lifestyle Survey finds that disabled people are significantly more likely than non-disabled people to be struggling with rising living costs. Well over half of disabled people (55%) are having difficulty affording their energy costs compared with two fifths (40%) of non-disabled people.

Again, this reflects a combination of both higher costs and lower incomes. Disabled people are more likely to face higher costs than non-disabled people generally (with financial support like the Personal Independence Payment only partially covering these needs) and many disabled people will also have higher energy costs and be less able to cut back on heating.

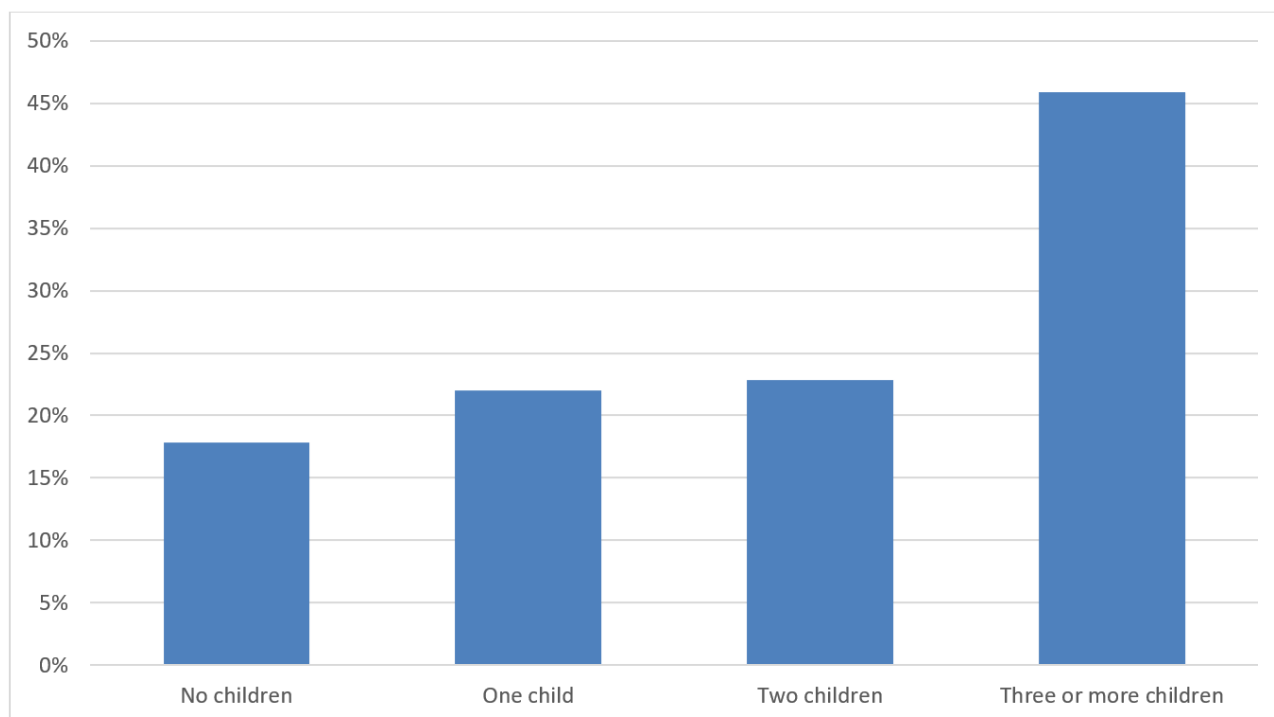
However disabled people are also much more likely to be in poverty than non-disabled people (27% compared with 21%) which stems in part from being far more likely to be out of work – with disabled people two-and-a-half times more likely to be out of work than non-disabled people – and to earn less even when they do work.

2.2.3 Larger families

There is (so far) less direct evidence on the impacts of rising living costs on larger families, however we have included them in this analysis as there are stark differences in the likelihood of being in poverty by family size. Figure 2.5 below sets this out. Nearly half of all people living in families with three or more children are in relative income poverty,

compared with fewer than a quarter of those in families with one or two children and around one in six of those without children.

Figure 2.5: Likelihood of being in poverty by number of children in household



Source: IES analysis of Households Below Average Income. Poverty definition is below 60% of median income after housing costs.

There are many factors behind this, but a key one has been the ‘capping’ of benefits support for those with higher entitlements alongside the removal of financial support for third and subsequent children. The specific risks during this costs of living crisis are twofold, that larger families:

- Will often have higher food and energy costs; and
- Will be less able to cut back without that having harmful impacts on their children.

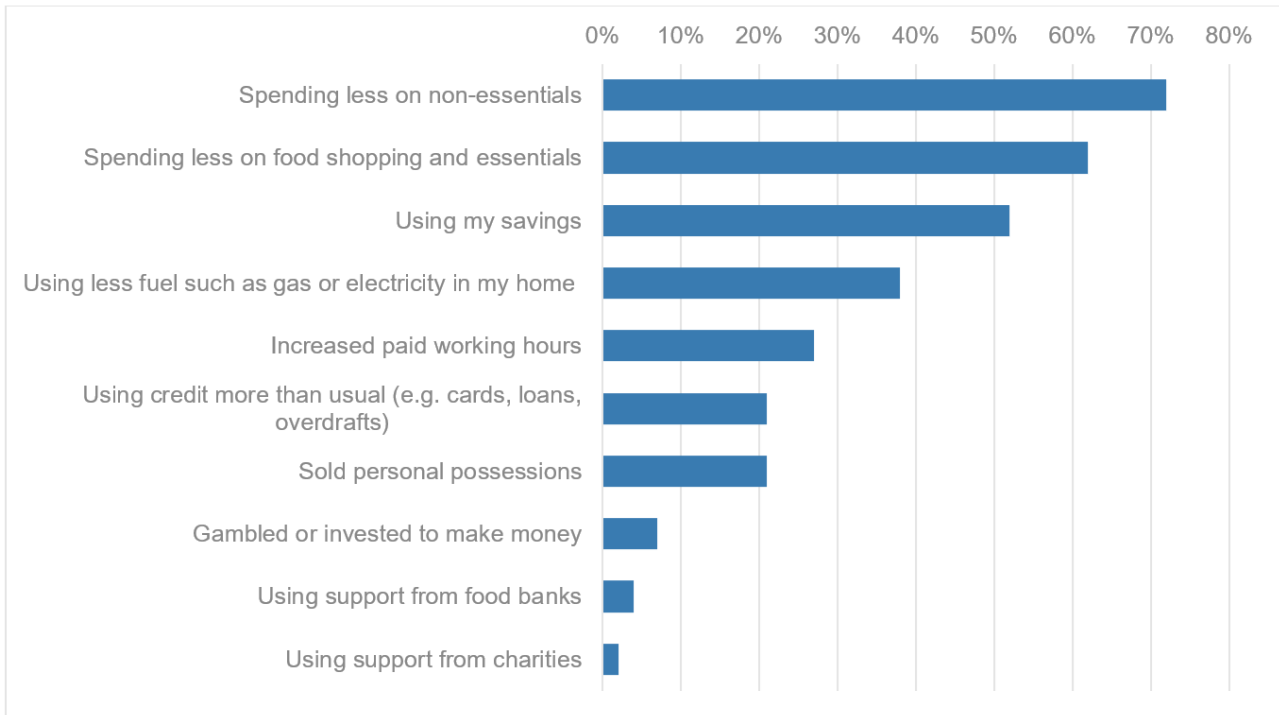
2.2.4 Students

One area where there has been growing focus in recent months has been the impacts of higher costs of living on students. The [ONS Student Cost of Living Insights Survey](#), published in November, found that similar proportions of students to non-students reported that their living costs were rising, but that a slightly higher proportion of students reported financial difficulties as a result. Overall, it found that:

- Half (50%) of students stated that they were in financial difficulties;
- Nearly a third (29%) were just about managing; and
- One in five were either managing well enough (16%) or comfortably off (4%).

Students in general were responding by spending less money, dipping into savings and reducing their energy use (Figure 2.6). However the survey also found that a quarter had taken on more debt.

Figure 2.6: Actions taken by students in response to rising cost of living



Source: Office for National Statistics – Student Cost of Living Insights Study

One important driver of these increased impacts for students appears to be a fall in the relative value of student maintenance support. Student loans are indexed to ‘RPIX’ which is usually higher than CPI, but has fallen behind CPI inflation over the last year or so. As a consequence, [analysis by the Institute for Fiscal Studies](#) has found that “the real value of maintenance entitlements has fallen substantially and is now at the lowest level it has been in seven years. Compared with what they would have been entitled to in 2020–21, students from the poorest families have lost more than £1,000 in maintenance loan entitlement, which is around £250 more than we estimated back in June.”

The IFS analysis emphasises the impact on students from lower income backgrounds, who are arguably least likely to be able to mitigate the impact of rising prices and are the group where future cohorts may be most likely to choose not to enter higher education at all.

2.2.5 Housing tenure

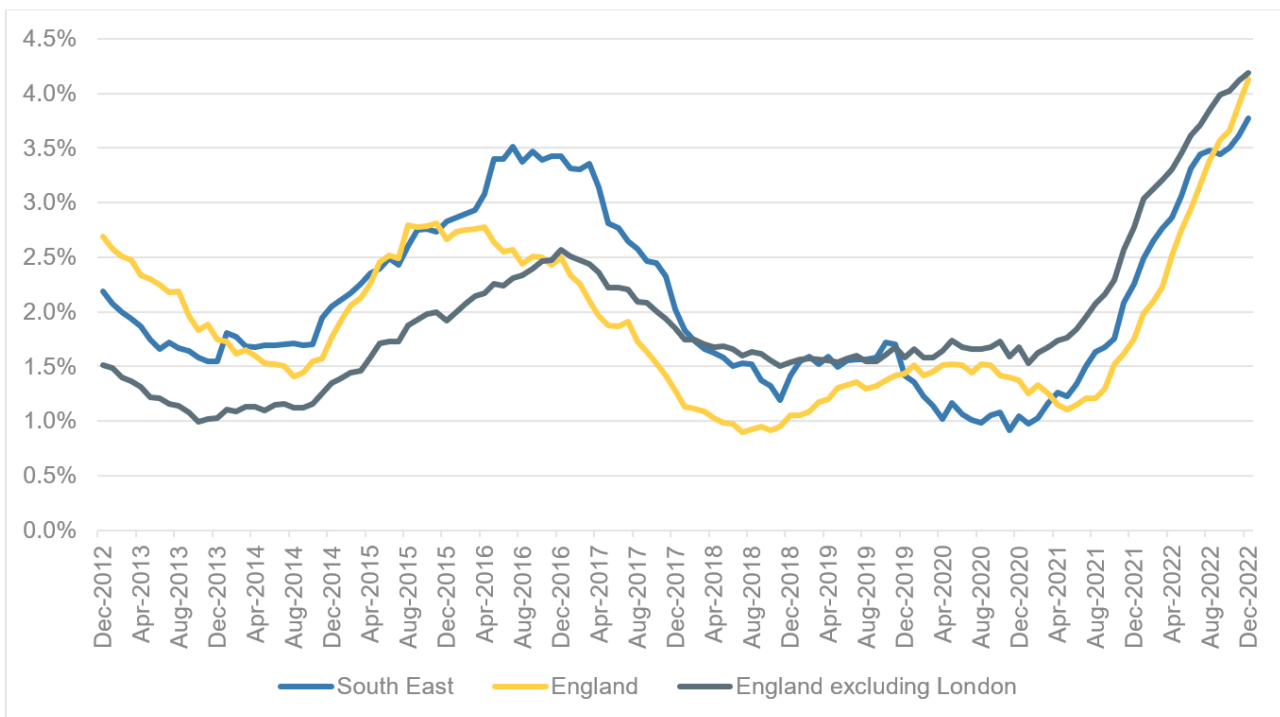
Finally, the costs of living crisis is affecting people in different housing tenures in important and different ways.

First, private renters are reporting greater financial difficulty than owner occupiers – with the Opinion and Lifestyle Survey data finding that 60% are struggling with energy bills

compared with 43% of owner occupiers (and that 11% are behind on their energy bills compared with 3% for owner occupiers).

This will of course reflect the fact that people in private rented accommodation generally have lower incomes than owner occupiers, but it also reflects that costs of rented accommodation are continuing to rise strongly in the South East of England – with the latest ONS estimates showing that year-on-year rent increases are at their highest in over a decade (3.8%).

Figure 2.7: Private rental prices percentage change over 12 months, 2012-2022



Source: Office for National Statistics – Index of Private Housing Rental

However, financial difficulties have been increasing for both owner occupiers and renters, and of course the exceptionally large rises in interest rates during 2022 will lead to very significant increases in living costs for many owner occupiers over the coming years. New fixed rate deals are now typically above 5% compared with around 2% in recent years, and the effects of this will be exacerbated by the fact that mortgage debt is generally far larger now than in the past. These impacts will take time to build though – with the [Bank of England](#) estimating that just over two million mortgages will come up for renewal over the next year.

3 Risks for residents of Greater Brighton

Chapter 2 sets out five themes for understanding where risks of a negative impact are greater from rising costs of living, around low incomes, disability, family size, students and housing tenure. In this chapter we set out analysis on each of these for the Greater Brighton area, looking across local authorities but also within them.

At the end of the chapter we then also look at where there may be greater employment risks from any slowdown that affects in particular high street and hospitality spending.

3.1 Low incomes

Our analysis of low incomes is based on data on recipients of Universal Credit (UC), which is the main benefit paid to households with low incomes both in and out of work. UC has replaced a range of previous, 'legacy' benefits for those out of work, in work and to support with rental costs. To estimate rates of receipt (rather than levels), we have divided the number of people claiming Universal Credit by the Census 2021 estimates for the number of people in that area aged 16-64.

UC receipt is a very good proxy for low income as it has fairly broad eligibility and relatively high take-up. To test this, we have compared in Figure 3.1 below the proportion of people who are claiming UC and are out of work with the average number of deprivation measures per household¹ for every 'Middle Super Output Area' (MSOA) in Greater Brighton. MSOAs are geographical areas that comprise on average around 2,000 households. The result shows a very strong correlation, and so gives us confidence that UC data gives us a good insight into levels of disadvantage and low income.

Figure 3.2 then shows the proportion of the population (aged 16-64) who are claiming Universal Credit. This is further broken down into those who are out of work and those in work. On average 8.6% of adults in the South East (and 10.8% in England) are claiming UC, with a roughly even split overall between those in work and those out of work. Within Greater Brighton, rates of receipt are higher than the wider South East in every local authority except for Mid Sussex, and are highest in Crawley.

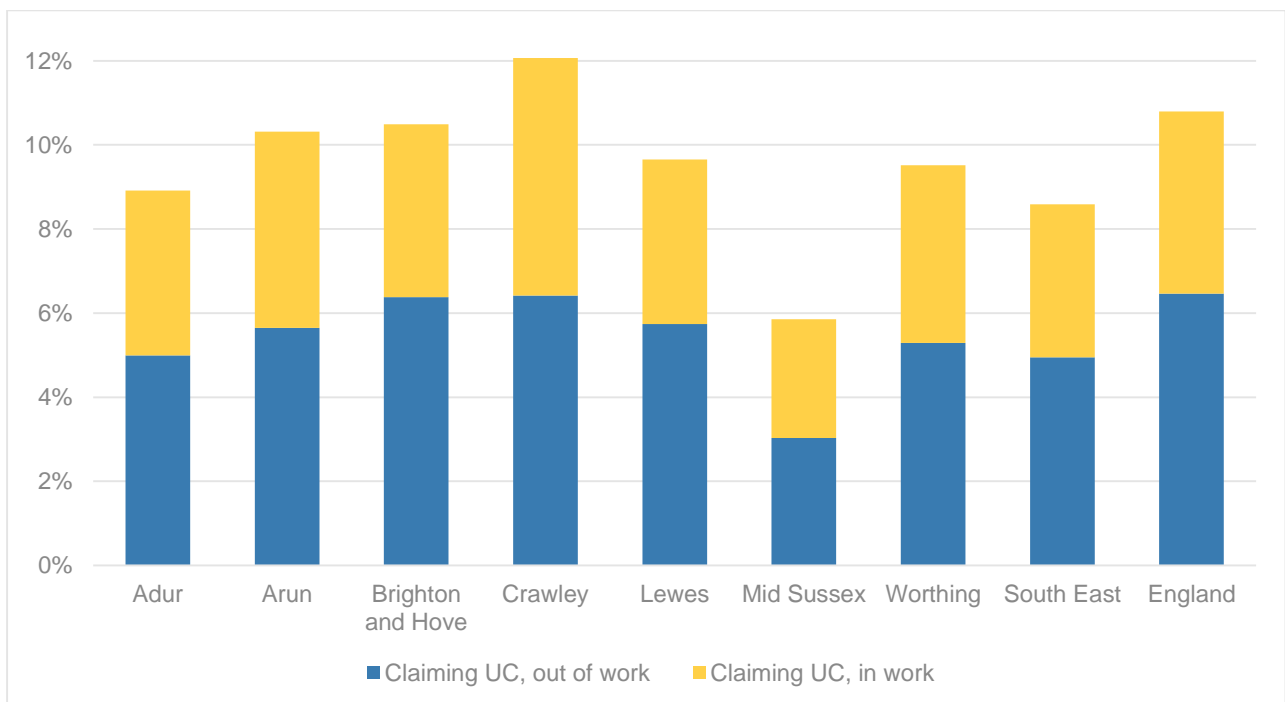
¹ Household deprivation is assessed in Census 2021 against four dimensions: employment, education, health and disability, and household overcrowding. The analysis here presents the mean average of the number of deprivation measures per household within each MSOA area.

Figure 3.1: Proportion of population on Universal Credit and out of work compared with average number of deprivation measures per household – Middle Super Output Area level, Greater Brighton



Source: IES analysis of Stat Xplore and Census 2021 data

Figure 3.2: Share of population (16-64) claiming Universal Credit by employment status

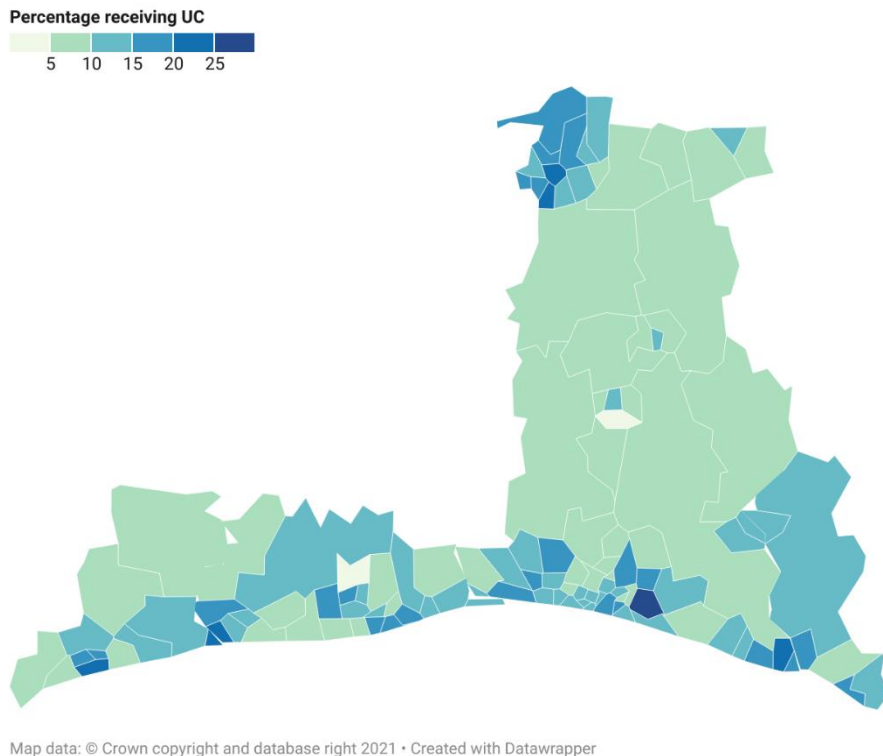


Source: IES analysis of Stat Xplore and Census 2021 data

These broad averages however disguise significant differences in rates of receipt between MSOA areas. The map in Figure 3.3 below sets this out, showing that rates of receipt (and so rates of low income) are generally highest in coastal areas as well as in Crawley.

The highest rate of receipt overall is in the MSOA covering Whitehawk in the east of Brighton (28% of the population aged 16-64), while Newhaven, Littlehampton, Bognor, and the south of Crawley all have rates of between 21% and 24%. The rate of receipt in east Worthing is then just under 20%, with other coastal areas (Shoreham, Seaford and other parts of Brighton/ Hove/ Worthing) all having around one in six adults claiming UC. Haywards Heath, Burgess Hill and East Grinstead have around one in ten in receipt, with areas in lighter green all below 10%.

Figure 3.3: Share of population (16-64) claiming Universal Credit by MSOA



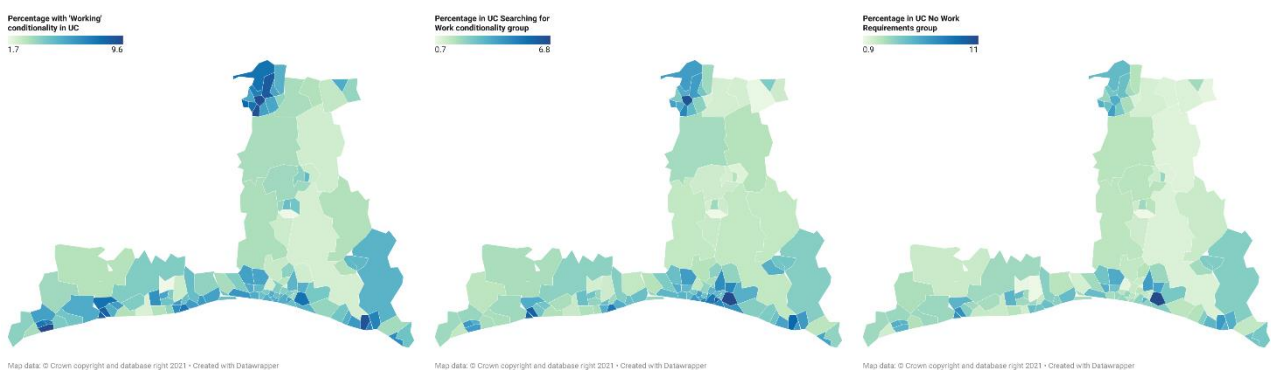
Source: IES analysis of Stat Xplore and Census 2021 data

Figure 3.4 then further breaks down the rates of UC receipt into those who are in work (left hand map), out of work but required to look for work (the ‘Searching for Work Group’ in the middle map) and those out of work and not required to look for work (the ‘No Work Requirements’ group in the right hand map – this group mainly comprises people with significant health conditions or disabilities).

This does show that there are slightly different patterns of receipt between these three groups and across areas:

- Receipt of UC for those in work is particularly pronounced in parts of Crawley, Bognor, Newhaven, Littlehampton (in each case, around 9% of all adults are in work and on UC), with the east of Brighton and east of Worthing all also relatively high (8%);
- The ‘Searching for Work’ group is highest in central Crawley, Brighton (east and central), Newhaven and Bognor (all around 6-7% of those aged 16-64), but is otherwise below 2% across most of the city region; and
- The ‘No Work Requirements’ group is typically 5-7% of the population in more deprived areas and 2-3% in other areas, but rises to 11% in east Brighton/ Whitehawk. Overall, across the region, there are more people in this group than ‘Searching for Work’, illustrating that most of those on UC and out of work are significantly disadvantaged.

Figure 3.4: Share of population (16-64) claiming Universal Credit by MSOA – working (left map), ‘Searching for Work’ group (middle), ‘No Work Requirements’ group (right)



Source: IES analysis of Stat Xplore and Census 2021 data

In addition to those in receipt of UC, many households also continue to receive ‘legacy’ benefits where their circumstances have not changed since UC rollout began. The most common of these is benefits for incapacity (again, those with long-term ill health). There are typically around 3-4% of adults on these benefits, but this rises as high as 11% for those in east Brighton. Overall, three fifths of all residents of the main east Brighton MSOA are claiming either Universal Credit or a legacy benefit.

Changes over time

The pandemic has led to significant increases in Universal Credit receipt, partly due to the effect that it had on employment and incomes but also because it accelerated the ‘migration’ of claimants from legacy benefits to UC (as any changes in circumstances meant that legacy claimants had to apply instead for UC).

Figure 3.5 below shows the change in rates of receipt of UC between February 2020 and November 2022. There are two maps, with:

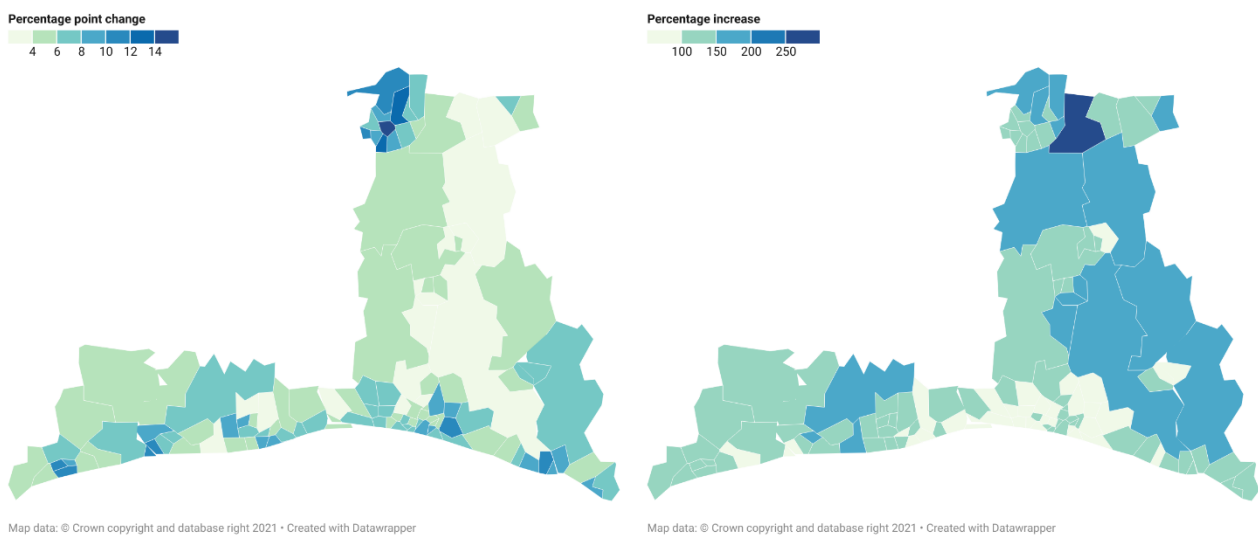
- The map on the left showing the percentage point change, i.e. how many more people per hundred residents are now claiming UC; while
- The map on the right shows the percentage change, so the rate of growth in the UC population overall for that area.

This illustrates that the largest growth per capita (the left hand graph) has been in areas that have the highest rates of benefit receipt overall. Growth has been particularly strong across Crawley (up by 12 to 14 percentage points), which may reflect the particularly significant impacts of lockdowns on the Crawley economy and Gatwick airport. Coastal areas around east Brighton, Newhaven, Littlehampton and Bognor have all seen growth of around 11 percentage points.

However looking at percentage growth, the biggest changes have been for areas with lower UC receipt pre-pandemic – with rates of UC receipt 150-200% higher across most of Mid Sussex, Lewes and Arun. However this growth is from a low base – so for example in the MSOA which has seen the highest percentage growth (northern Mid Sussex, around Turners Hill), UC receipt has grown by 250% but from 1.9% of population pre-pandemic to 6.6% by the end of 2022.

In areas with higher rates of pre-pandemic receipt, rises are typically below 100% – although Crawley does see strong growth in both percentage and percentage point terms.

Figure 3.5: Change in Universal Credit receipt, Feb 2020 to November 2022: Percentage point change (left hand map) and percentage change (Right hand map)



Source: IES analysis of Stat Xplore and Census 2021 data

Taken together, this UC analysis confirms that areas with the highest rates of low income – and so likely among those that will be most significantly affected by rising costs of living – are in deprived coastal communities and around Crawley.

However, the analysis suggests that there are different patterns of disadvantage across areas – with for example Crawley seeing very significant growth through the pandemic

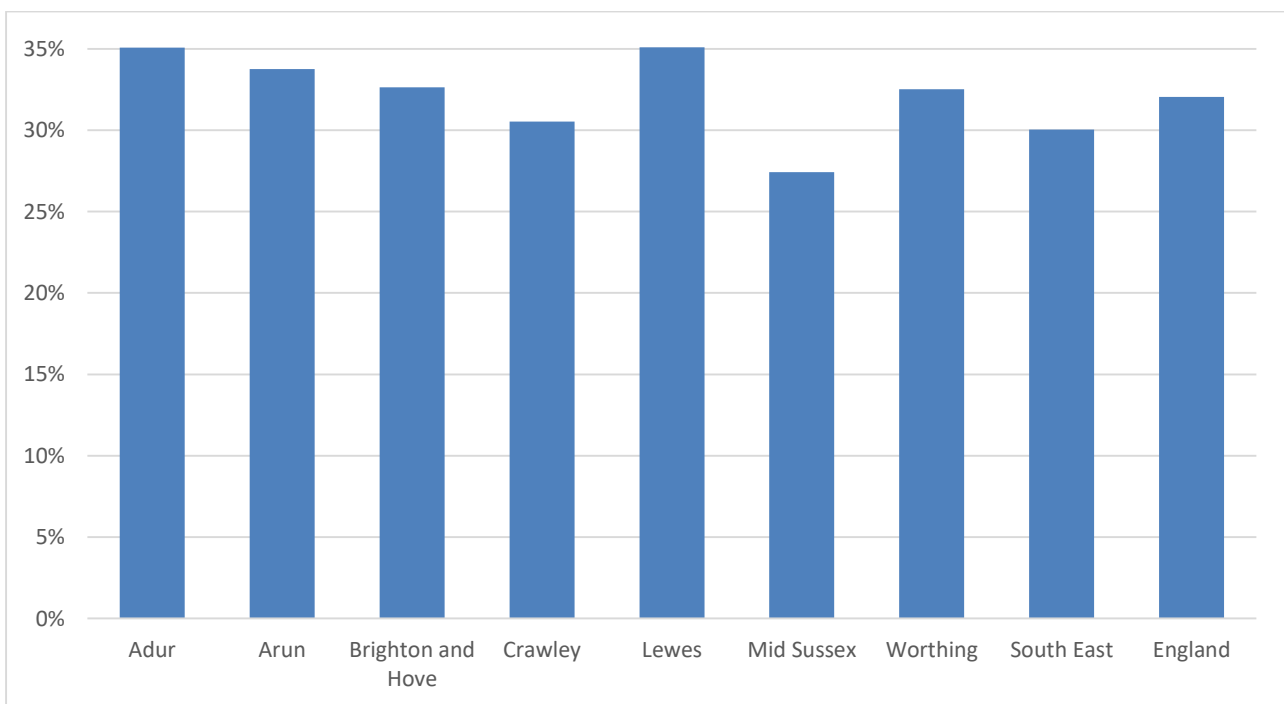
and also very high rates of low income in work; while many coastal areas have particularly high rates of people out of work with long-term health conditions.

Importantly, the analysis also shows that areas with generally lower rates of UC receipt have seen those caseloads grow more quickly than in more ‘disadvantaged’ areas. Across many more rural areas, rates of benefit receipt remain relatively lower but have often trebled between 2020 and 2022.

3.2 Disability

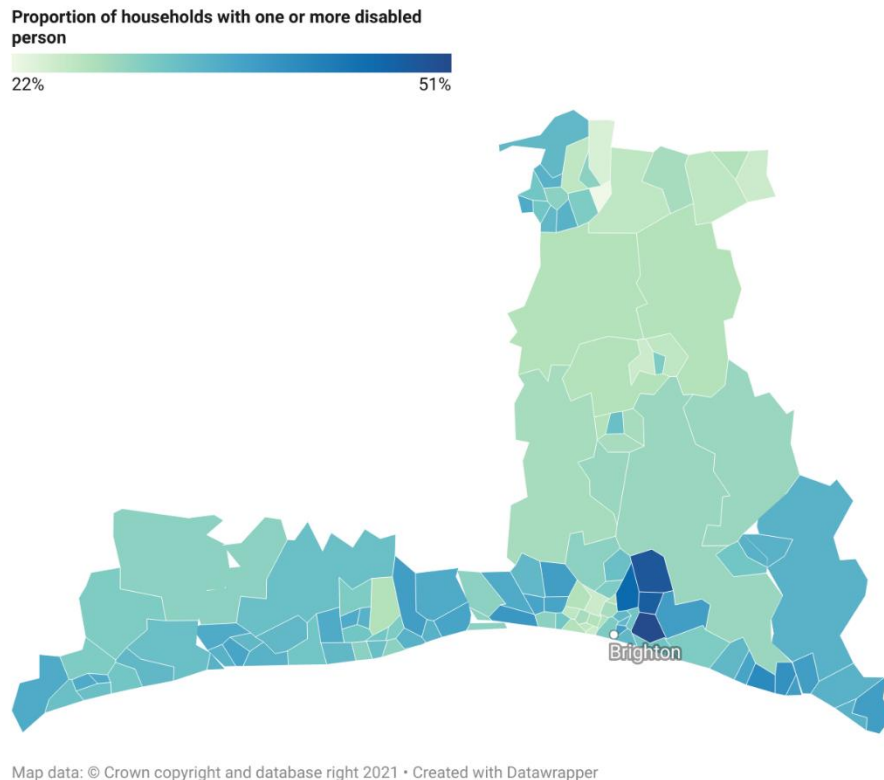
Figure 3.6 below shows the proportion of people who live in households where at least one person is disabled. These rates are fairly consistent across local authorities, with almost all in a range between 31% and 35% of residents (the exception being Mid Sussex, where just over a quarter (27%) of residents live in households with at least one disabled person).

Figure 3.6: Proportion of people living in households with at least one disabled person



Source: IES analysis of Census 2021

Looking at MSOA level, however, does identify a number of local areas where a particularly high proportion of people live in households with at least one disabled person – around half of residents in areas of Brighton around Whitehawk, Moulescoomb, Falmer and Coldean; and around two fifths of residents in Newhaven. Prevalence of disability is generally higher in more deprived coastal areas and around Crawley than elsewhere in the city region. This suggests that in these areas there are likely to be more residents at risk of negative impacts from costs of living increases.

Figure 3.7: Share of households with at least one disabled person by MSOA

Source: IES analysis of Census 2021

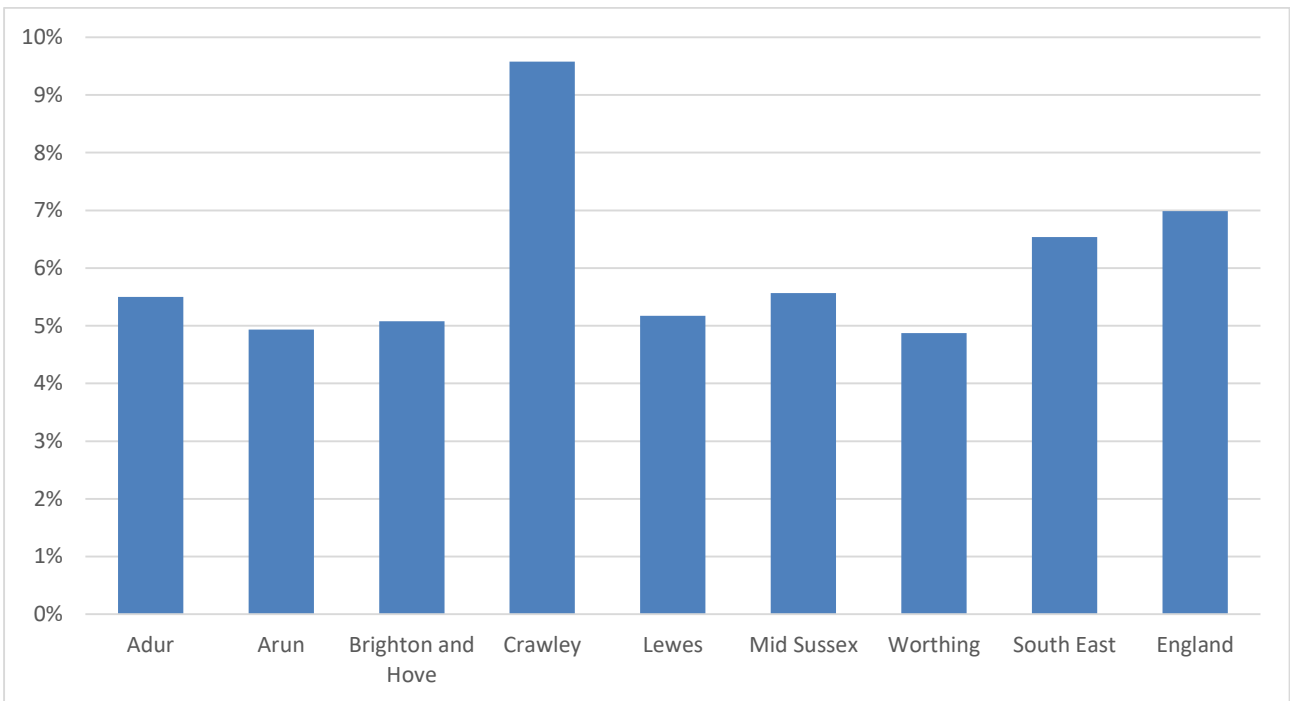
3.3 Family size

To identify areas with larger families, we have used Census data on the number of people living in households and calculated the share of residents who live in households with five or more members. This would be consistent with couple families with three or more children, however it would exclude some large lone parent families (e.g. a lone parent with three children would not be included), while it would include some non-families like larger student households.

The results are shown in Figure 3.8 below. Shares of residents living in larger households are generally around 5%, which is lower than the averages for England (7%) and the South East (6.5%). However the very significant exception to this is Crawley, where nearly one in ten (9.6%) of residents live in a household with at least five people in it

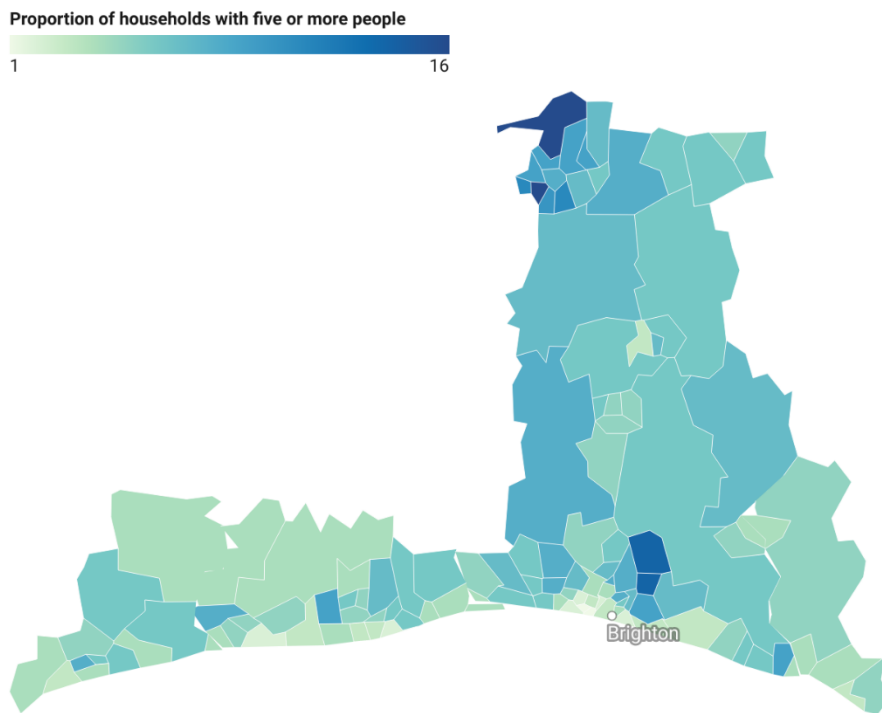
Looking at MSOA level, larger households are by far most common in the north and south west of Crawley, around Langley Green and Broadfield respectively (one in six residents, or 16%, live in large households in both of these areas). There are also high proportions in the east of Brighton, at about 14% in both Whitehawk and Falmer – although the latter very likely reflects the effects of student households/ halls for the two universities. So this suggests that in parts of Crawley and in the east of Brighton we are most likely to see negative impacts for larger families from rising costs of living..

Figure 3.8: Share of households with five or more people



Source: IES analysis of Census 2021

Figure 3.9: Share of households with at least five or more people by MSOA



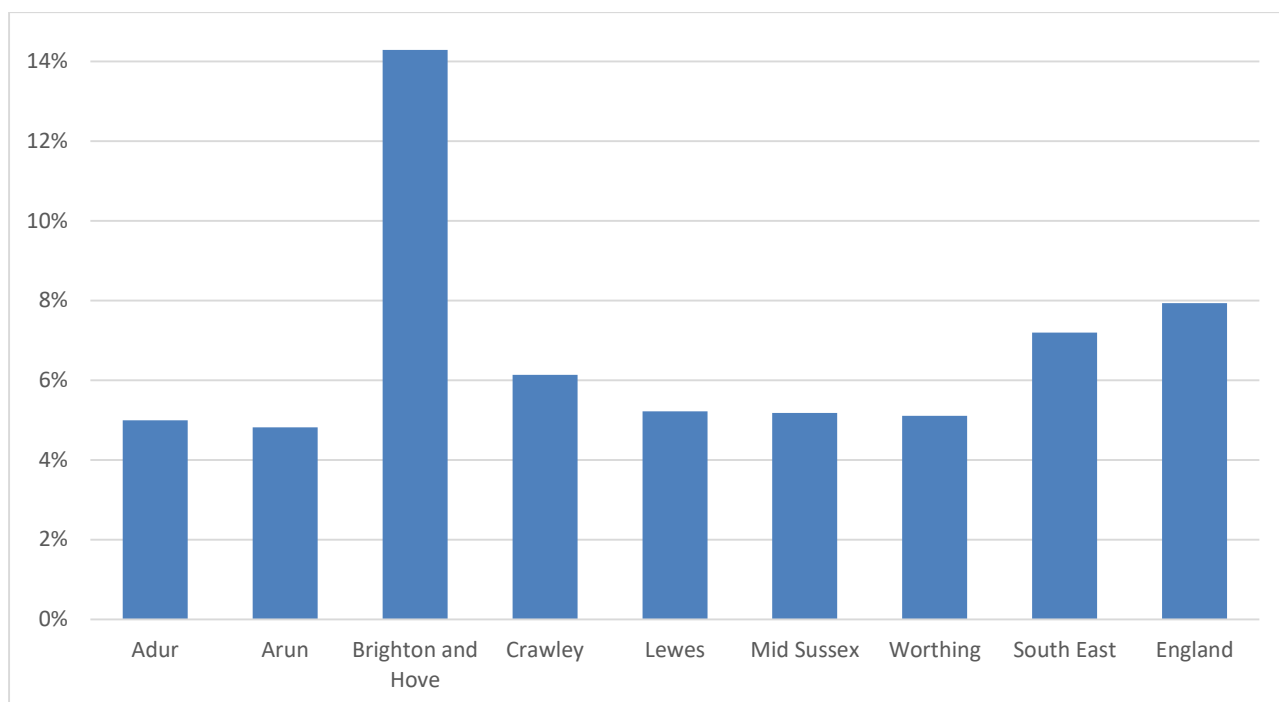
Map data: © Crown copyright and database right 2021 • Created with Datawrapper

Source: IES analysis of Census 2021

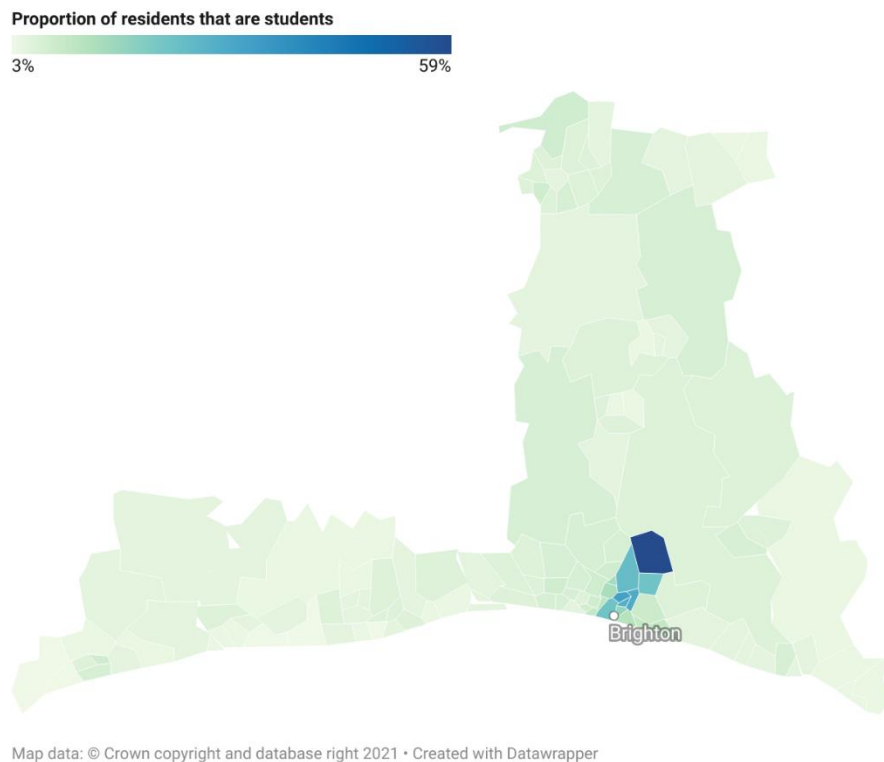
3.4 Students

Council areas in Greater Brighton also generally have smaller student populations than England and the South East, at between 5-6% compared with around 7%. The exception to this however is Brighton and Hove, which has one of the largest student populations in the country at 14.3%. As Figure 3.11 sets out – showing student populations by MSOA – this is (unsurprisingly) most pronounced around Falmer, where three fifths (59%) of residents are students. In other parts of central and northern Brighton, however, often around 25-30% of residents are students.

Figure 3.10: Students as a proportion of population (16+)



Source: IES analysis of Census 2021

Figure 3.11: Students as a proportion of population (16+) by MSOA

Source: IES analysis of Census 2021

3.5 Housing tenure and house prices

3.5.1 Housing tenure

Figure 3.12 below shows the proportions of residents in each Council area who own their homes², rent privately or rent social housing. Rates of home ownership are very high in Mid Sussex, Adur, Arun and Lewes – with all four well above the average for the South East of England. Worthing is more or less in line with the South East average, while Crawley and Brighton & Hove are well below (and below the England average too).

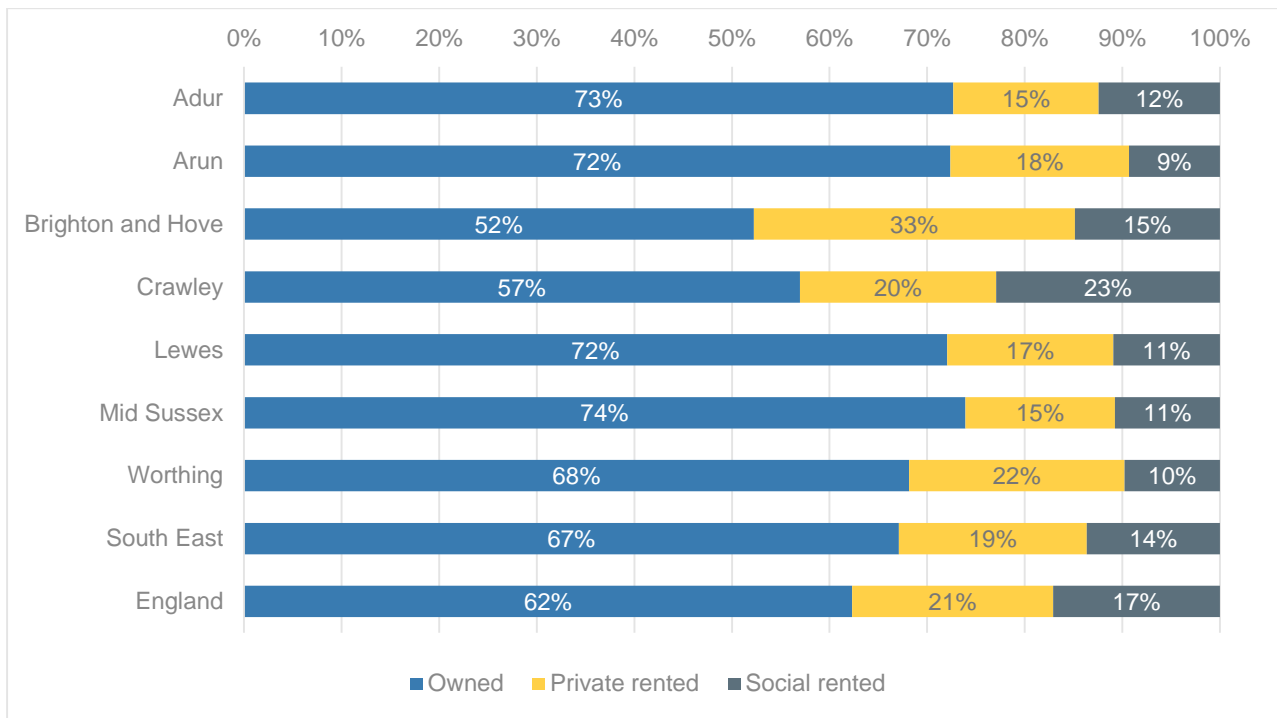
In Brighton & Hove, this difference is mostly explained by the very large private rented sector which in turn partially reflects its large student population. In Crawley, low home ownership likely reflects both its demographics but also its higher levels of disadvantage.

Interestingly, Crawley is also the only area with rates of social housing above the England average (at nearly a quarter of all residents). This likely reflects its substantial expansion as a post-war new town, but allocations policies and housing pressures in recent decades have seen social housing residents become increasingly disadvantaged (and likely an important group in their own right who will be at risk from rising costs of living).

² This category comprises those who own their homes outright, own with a mortgage, or have shared ownership.

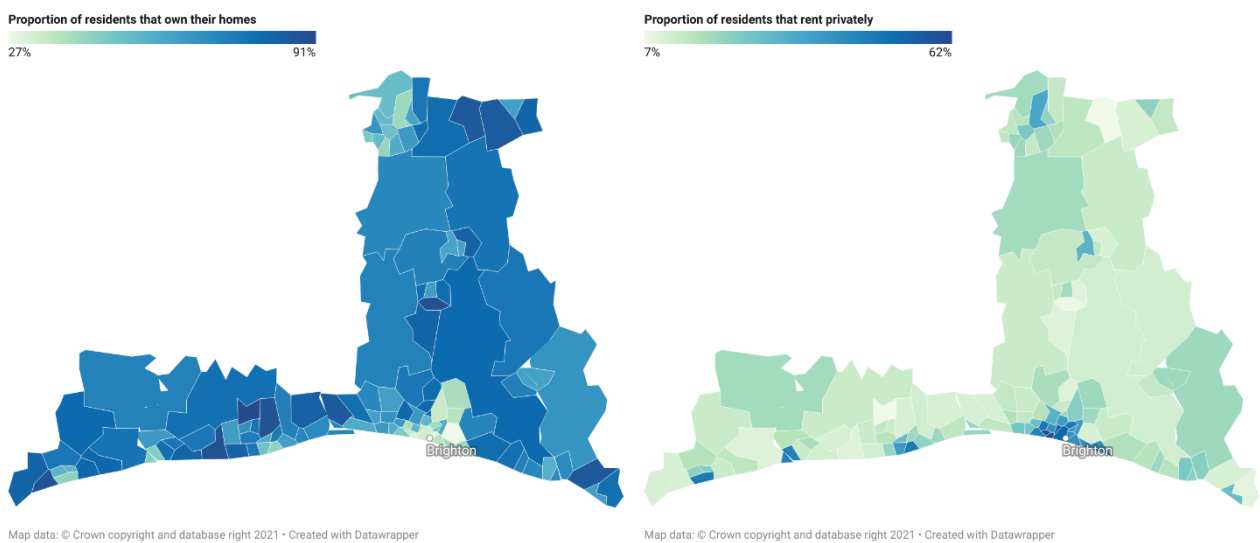
Looking at rates of home ownership and private renting by MSOA (Figure 3.13), we see that rates are highest in affluent suburbs (Findon and High Salvington to the north of Worthing; the south of Burgess Hill, Bishopstone near Seaford); while private renting is very highly concentrated in central Brighton and Hove (above 50%) and in central Worthing, Littlehampton and Bognor (all around 50%).

Figure 3.12: Housing tenure of residents



Source: IES analysis of Census 2021

Figure 3.13: Proportion of residents who own their homes (left) or rent privately (right)



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Map data: © Crown copyright and database right 2021 • Created with Datawrapper

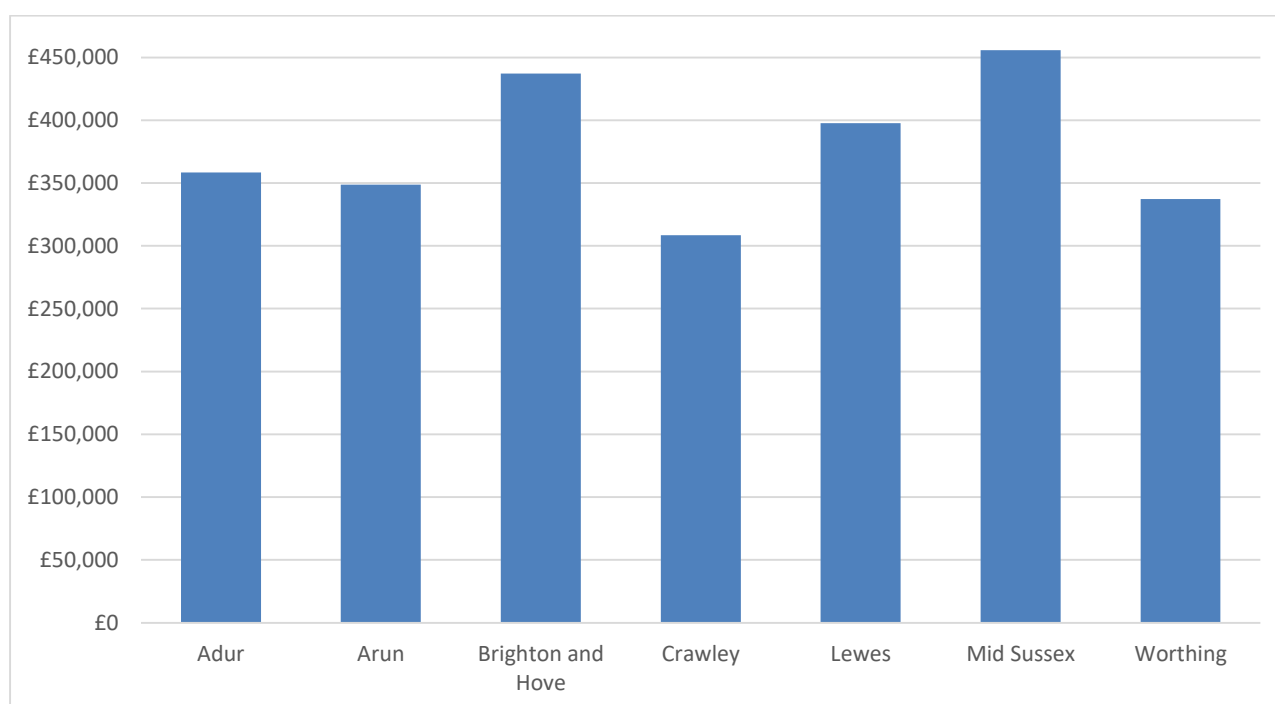
Source: IES analysis of Census 2021

3.5.2 House prices

As noted in Chapter 2, many home owners could face significant impacts from rising interest rates if they need to remortgage in the next couple of years (while many people looking to buy for the first time will likely find themselves priced out because of rising rates). In order to assess where there may be the most significant risks from this, we have analysed Land Registry data on house sales since 2018 and then compared this with estimates of average earnings to assess where housing is more and less affordable.

On house prices first, Figure 3.14 below shows average sale prices for houses by local authority area since 2018. Prices were lowest in Crawley (£308,000) and Worthing (£337,000); and highest in Mid Sussex (£456,000) and Brighton and Hove (£437,000). In other areas, sale prices were between £350,000 and £400,000.

Figure 3.14: Average house prices, 2018-

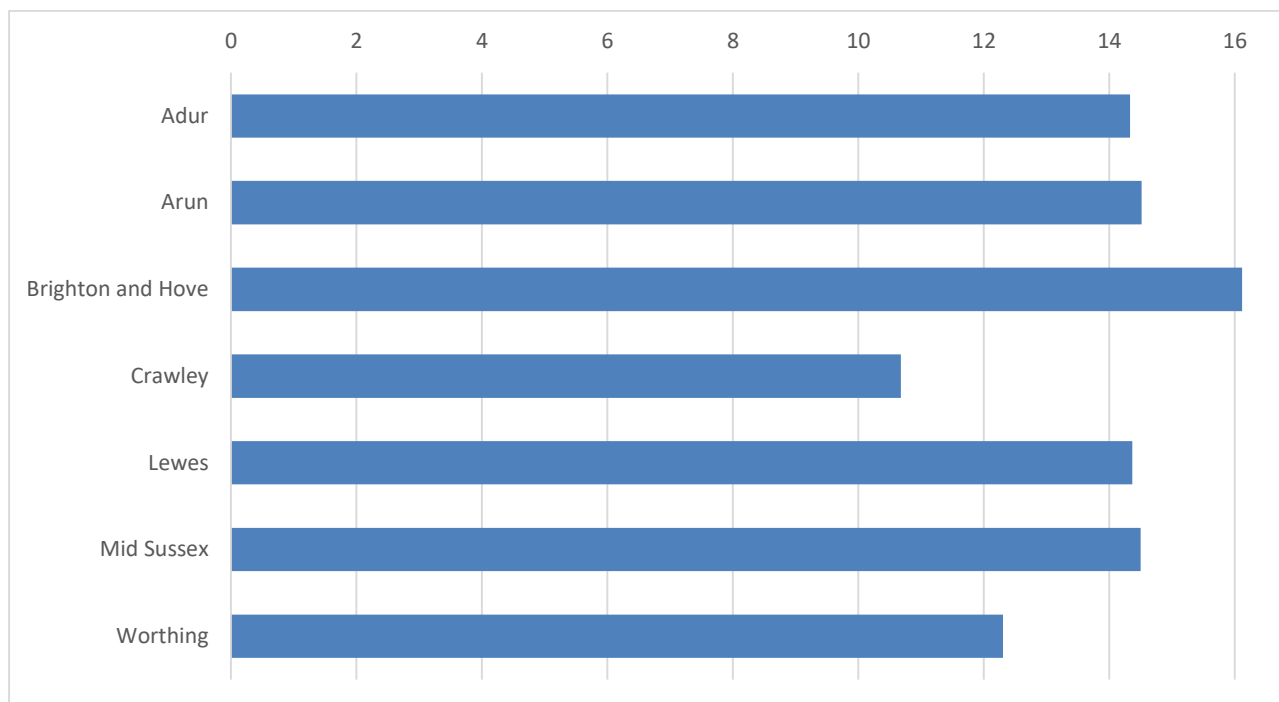


Source: IES analysis of Land Registry

Housing affordability tells a similar story to house prices overall, with Figure 3.15 below showing the ratio of average house prices to the estimated average gross annual earnings for residents (taken from the 2022 Annual Survey of Hours and Earnings).

Brighton and Hove stands out, with house prices around 16 times higher than the average wage. In Mid Sussex, higher wages means that the ratio is lower, at around 14.5 times wages. However the multiple is above 14 across Adur, Arun, Lewes and Mid Sussex. The ratio is far lower in Crawley (10.7 – reflecting both lower house prices and higher average wages) and in Worthing (12.3), which suggests that the potential negative impacts on home owners may be slightly lower in these areas than in others.

Figure 3.15: Ratio of average house prices to median gross annual earnings

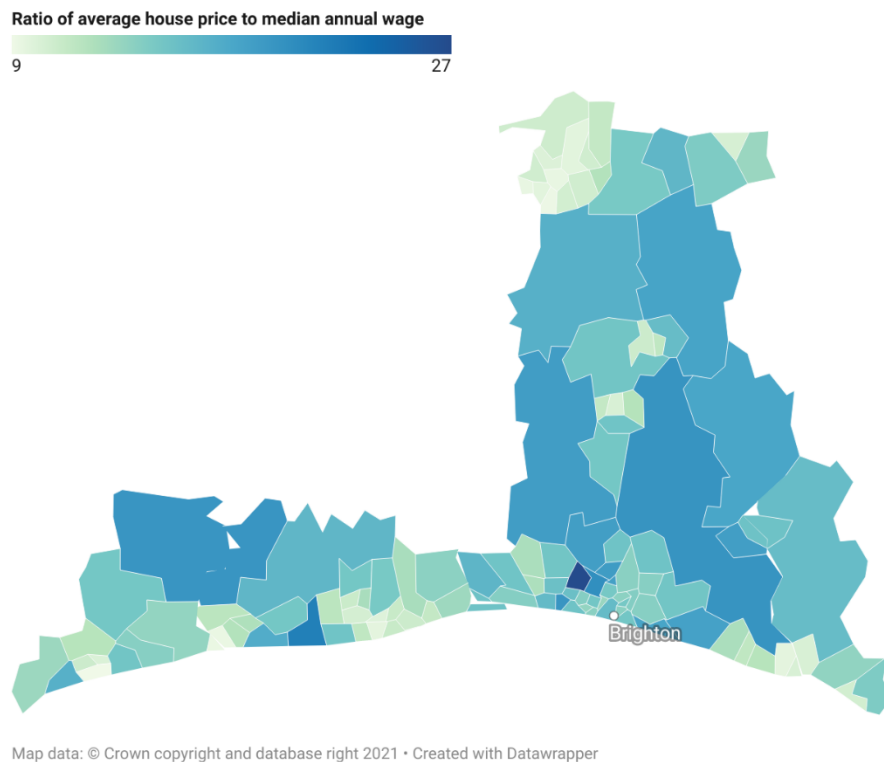


Source: IES analysis of Annual Survey of Hours and Earnings, Land Registry

In order to produce affordability estimates to MSOA level, we have modelled median wages for each Council area, the estimated earnings by occupation for the South East and the occupational profile within each MSOA to generate earnings estimates, which were then compared with house sales from Land Registry data.

The results are in Figure 3.16 below and suggest that there are a number of potential hotspots where house prices are significantly higher than earnings (around 20 times higher and sometimes more) and so where people remortgaging may be at particular risk of financial difficulty. In particular, rural areas of Lewes, Mid Sussex and Arun all stand out; as does the area around Hove Park, and some coastal areas east of Brighton (around Rottingdean) and west of Worthing (around Ferring).

Further analysis on earnings is also set out in the Annex.

Figure 3.16: Ratio of average house prices to median gross annual earnings by MSOA

Source: IES analysis of Annual Survey of Hours and Earnings, Land Registry

3.6 Classifying areas by risks from low income and/or rising interest rates

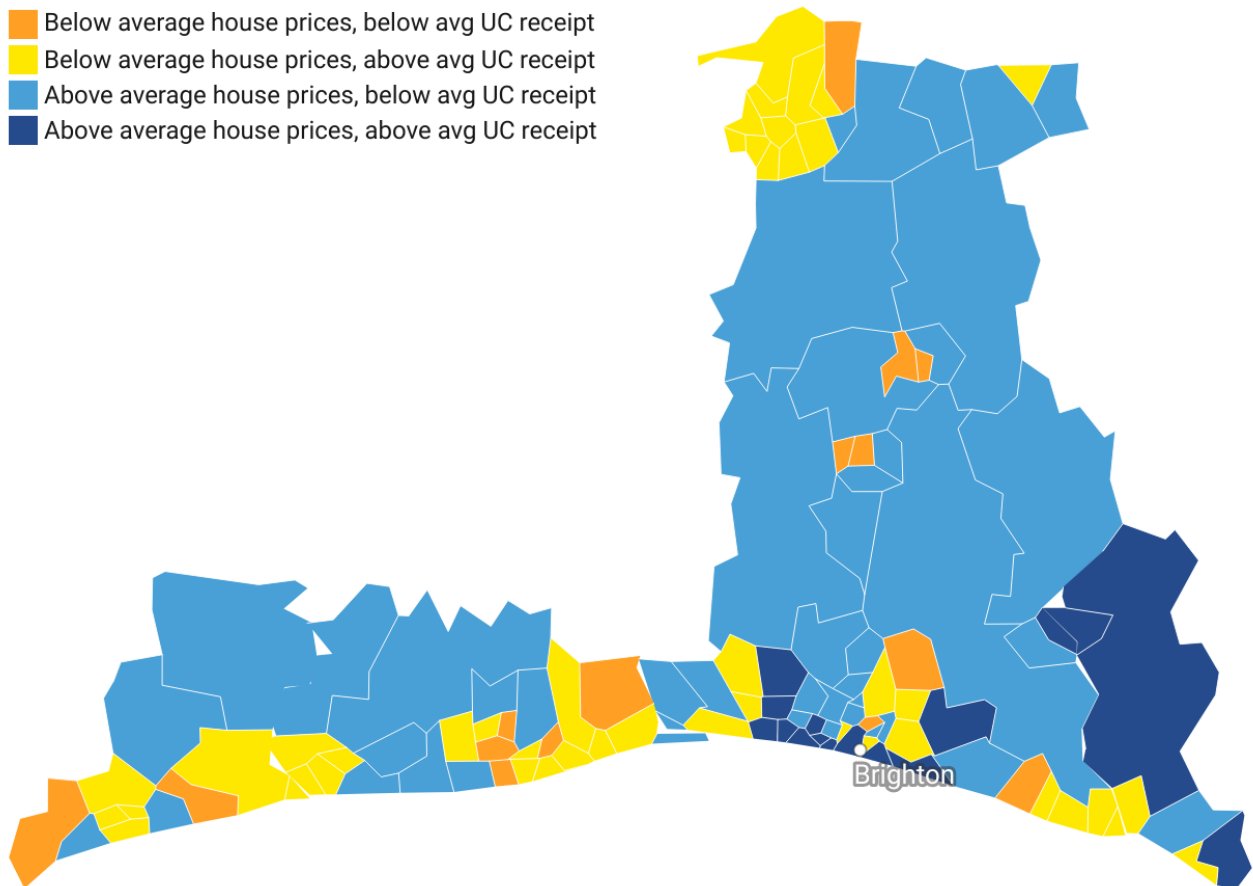
The cost of living crisis is being driven now by two distinctly different shocks: rising prices (particularly for energy and food); and rising interest rates (particularly affecting home owners with large debts). So we can combine the analysis set out in this chapter to classify MSOAs by whether their residents are likely to face greater or smaller effects from these two factors.

Specifically, we can use **rates of Universal Credit receipt** as a proxy for being most impacted by rising prices; and **housing affordability** as a proxy for being at most risk from rising interest rates/ remortgaging. By using these two variables and grouping areas according to whether they are above or below average, creates four groups, with the results set out in Figure 3.17 below:

- Those that have **below** average house prices and **below** average rates of UC receipt – and so are likely to be less significantly impacted by the costs of living crisis (shaded **orange**);
- Those that have **below** average house prices and **above** average rates of UC receipt – and so likely to be more impacted by rising inflation but less impacted by rising interest rates (shaded **yellow**);

- Those that have **above** average house prices and **below** average rates of UC receipt – so likely to be more impacted by interest rates and less so by inflation (shaded **light blue**); and
- Those that have **above** average house prices and **above** average rates of UC receipt – with these areas likely to see greater impacts from both rising inflation and rising interest rates (shaded **dark blue**).

Figure 3.17: Classification of MSOAs by whether house prices and rates of UC receipt



Map data: © Crown copyright and database right 2021 • Created with Datawrapper

Source: IES analysis of Annual Survey of Hours and Earnings, Land Registry

Looking across the city region, the results above suggest that:

- Unsurprisingly, given the other analysis in this chapter, coastal deprived areas, most of Crawley and east Brighton/ Whitehawk are more at risk from rising prices than from rising interest rates;
- More rural areas, and some more affluent coastal areas, appear to be more at risk from interest rates than inflation;
- Central Brighton and Hove and parts of Lewes (including the town itself) appear to be at risk from both rising prices and rising interest rates; while

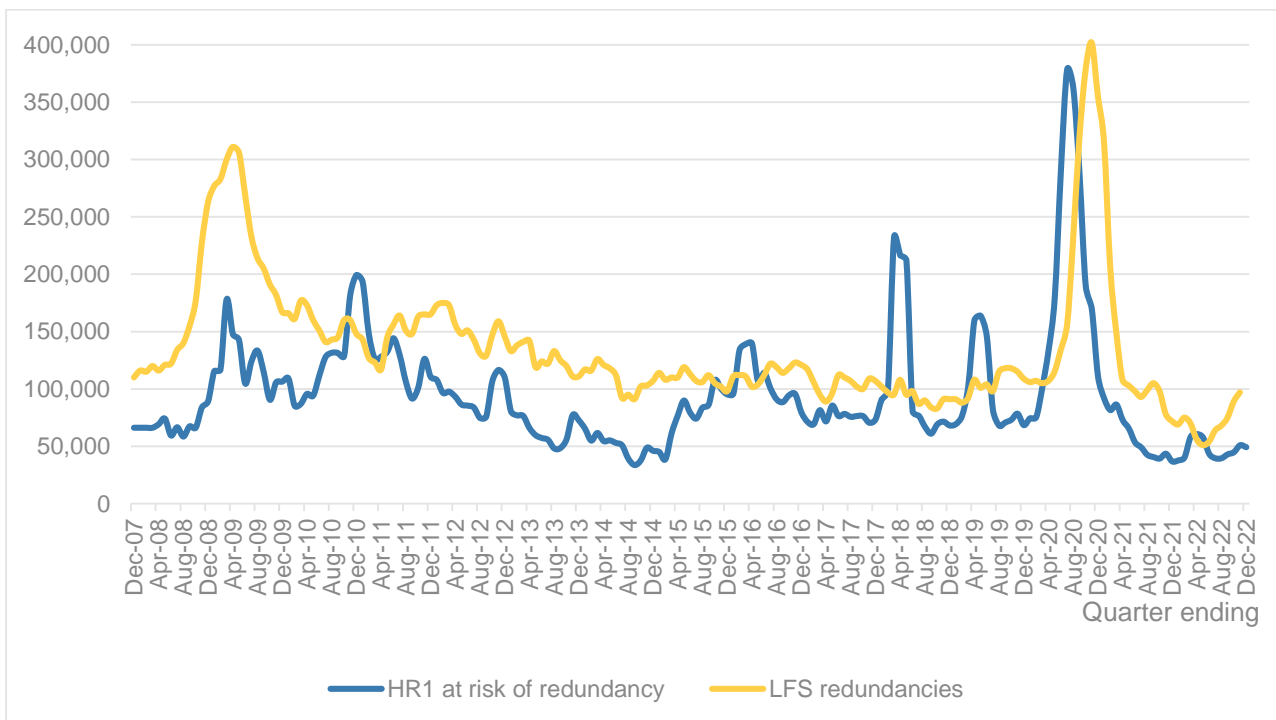
- A small number of areas – like central Burgess Hill, central Haywards Heath, parts of Worthing and Falmer – appear to be less at risk than other areas on both dimensions.

3.7 Employment risks

Rising living costs and interest rates are also contributing to a wider slowdown in the economy – with weak consumer spending and business investment, alongside negative consumer and business confidence. This means that there are greater risks in the next year that we may see higher redundancies, fewer vacancies and rising unemployment.

There are some signs – albeit early – that this slowdown may already be starting, with the monthly IES [labour market briefing](#) highlighting a worrying uptick in redundancies and shorter-term unemployment, and a fall in vacancies. This is most clearly seen in redundancies, which have virtually doubled since the early spring (but from a very low base – the yellow line in Figure 3.18). This is being driven by hospitality and retail, which along with leisure and tourism are the industries where we would expect to see negative impacts from a slowdown in spending (and which were also significantly harmed by the lockdowns during 2020/ 2021). The graph below also shows that official notifications of redundancies (via ‘HR1’ forms) remain very low, which could suggest that these increases are being driven by smaller firms that are not required to notify the Insolvency Service.

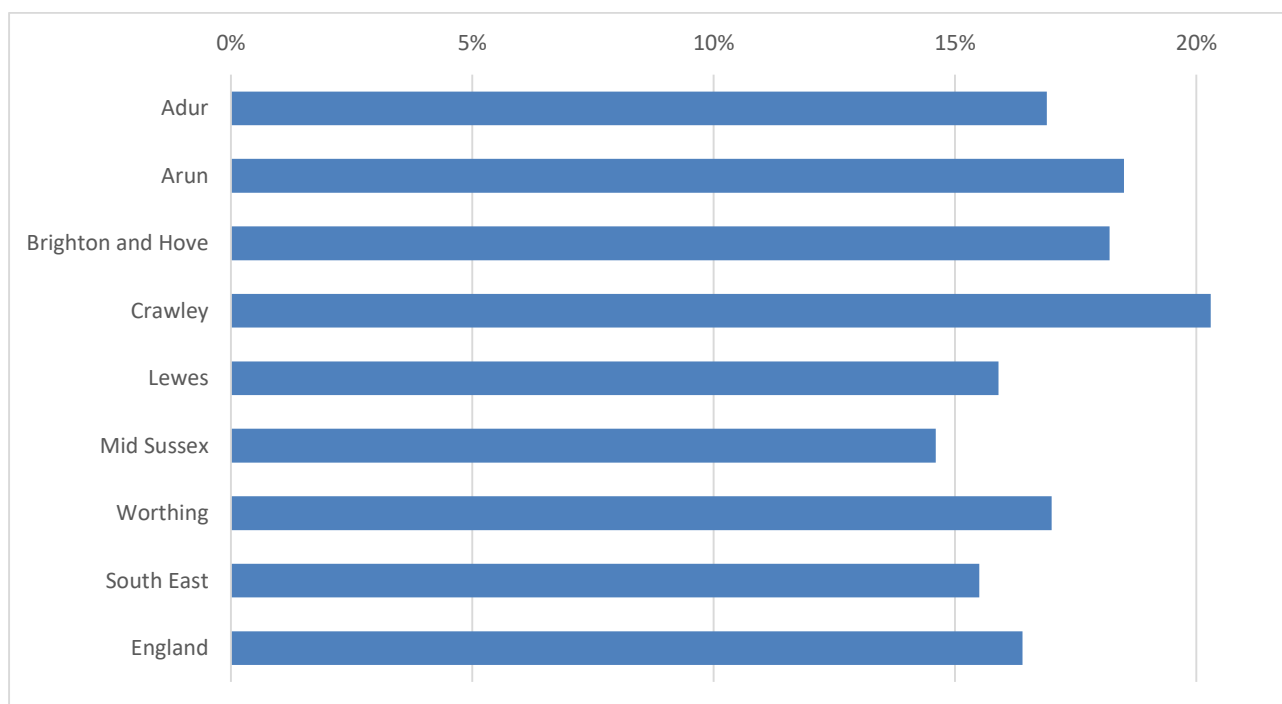
Figure 3.18: Quarterly number of employees notified as at risk of redundancy (HR1 forms) and reporting having been made redundant (Labour Force Survey)



Source: IES analysis of Insolvency Service and Labour Force Survey data

We have therefore also looked at the proportion of employment across the city region that is in hospitality, retail and leisure³ and so may be at greater risk during a slowdown. This is shown in Figure 3.19 below. This suggests that every area except Lewes and Mid Sussex has combined employment in these industries above the average for the South East, with this highest in Crawley at just over 20%. Underneath this, high figures in Crawley, Arun and to some extent Adur are driven in particular by having high levels of employment retail and customer services; while Brighton and Hove is over-represented in hospitality and leisure jobs.

Figure 3.19: Proportion of those in work with jobs in retail, hospitality or leisure

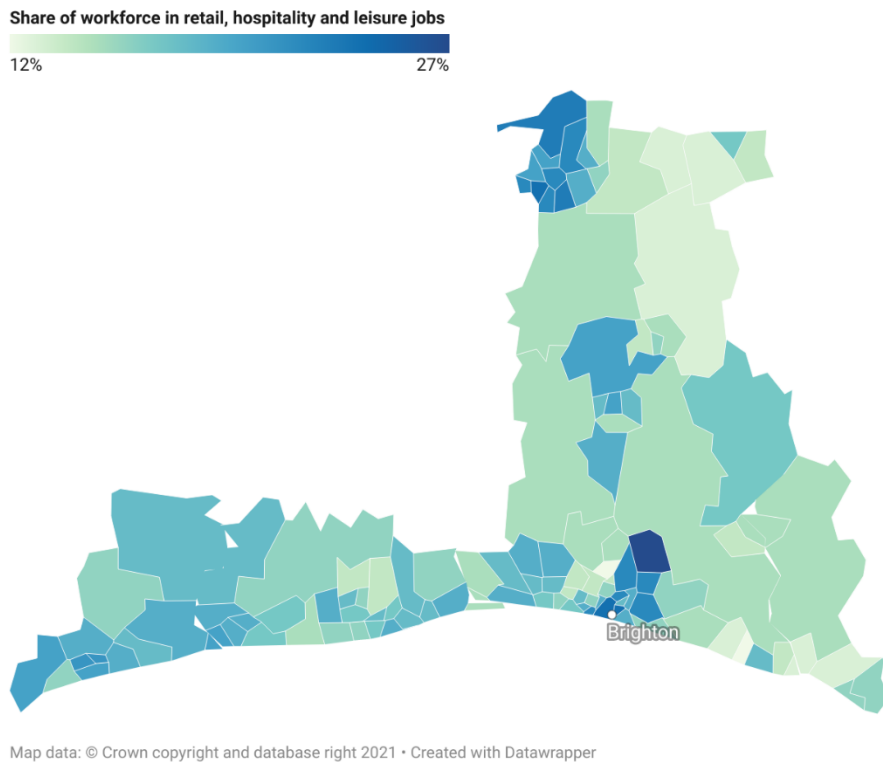


Source: IES analysis of Census 2021. Figures show proportion of those in work who are in one of thirteen occupations at three digit SOC code level that are predominantly retail, hospitality and leisure jobs.

Repeating the analysis to MSOA level (Figure 3.20 below) we see that employment in these occupations is particularly high around Brighton and Hove and Crawley (at around a quarter of the workforce, and highest of all in Falmer, likely reflecting student jobs), but is also very high in parts of Worthing and Adur, around Littlehampton, Arundel and Bognor, and in and around Burgess Hill.

³ Specifically, we have looked at Census data on detailed occupations, and combined thirteen occupations at the three-digit Standard Occupational Classification (SOC) level which are predominantly retail, hospitality and leisure jobs.

Figure 3.20: Proportion of those in work with jobs in retail, hospitality or leisure



Source: IES analysis of Census 2021. Figures show proportion of those in work who are in one of thirteen occupations at three digit SOC code level that are predominantly retail, hospitality and leisure jobs.

4 Conclusions and recommendations

The analysis set out above shows that we are experiencing a hit to our living standards that is unprecedented in at least a generation and that is already causing hardship and difficulties for many people. Applying national estimates to the Greater Brighton area, there may already be as many as 80 thousand people finding it very difficult to pay their energy bills, and are likely hundreds of thousands experiencing some difficulties.

However while these impacts have been broadly felt – inflation and interest rates are rising for everyone – there are clear groups at great risk of hardship severe difficulties. In particular we identify five key groups:

- Those with low incomes, and particularly those households where there are adults out of work;
- Disabled people – reflecting lower household incomes, higher living costs, and more difficulties in reducing spending;
- Larger families – due to cuts in social security support, often higher living costs and less ability to mitigate price rises;
- Students, where in particular students on low incomes have seen maintenance support decline in recent years;
- Many of those renting privately in areas where rents are rising faster; and
- Homeowners who need to remortgage, particularly in areas where house prices are higher and earnings lower.

Looking across the Greater Brighton area, our analysis finds that there are a number of areas where risks are far greater across many or all of these dimensions – in particular around the east of Brighton (Whitehawk, Moulescoomb and Falmer), much of Crawley, and across many disadvantaged coastal areas like Newhaven, Littlehampton, Bognor and parts of Worthing.

However we also find that many areas that were less ‘disadvantaged’ before the pandemic have seen more significant proportionate rises in those out of work and/ or on low incomes – particularly across more rural areas of Mid Sussex, Lewes and Adur. Rates of low income are still lower in these places than in some more disadvantaged areas, but have usually more-than-doubled and often trebled since the pandemic. So there may be more disadvantaged households in areas with less capacity to identify and support them.

At a more detailed level there are some different patterns of risk across the city region, with for example a much higher proportion of larger families in parts of Crawley; and much higher rates of private renting in larger towns and urban areas (unsurprisingly).

Importantly, we also find that risks around housing affordability for those (re)mortgaging are often most pronounced in more affluent areas where house prices are higher but also in some cases wages are closer to average – with hotspots in rural areas of Lewes, Mid

Sussex and Arun. However there are also significant risks in Brighton and Hove (particularly around Hove Park and some coastal areas east of Brighton) and in the west of Worthing (around Ferring).

Looking ahead, there are relatively high rates of employment across the city region in retail, leisure and hospitality – with this particularly pronounced in Crawley, but high too in Arun, Brighton and Hove, Worthing and Adur. There are risks therefore that a wider economic downturn affecting these industries could be felt harder within the city region than elsewhere – although so far, unemployment remains very low and vacancies high, even if there are some very early signs of the labour market slowing down.

Finally, it should be noted that while this analysis is useful in giving some indications of how different areas may be differently affected by rising costs of living, it should nonetheless be stressed that the impacts of the cost of living crisis are being broadly felt, and that there will be people at greater risk across all areas. This analysis merely shows us where those risks may be highest and where there may be more people facing hardship or difficulties. Any response therefore needs to be similarly broad based.

4.1 Recommendations

As noted, making recommendations for future policy or practice was out of scope for this rapid research project, however we have set out below some potential areas for focus.

4.1.1 For local government

Based on this analysis, feedback from Councils and wider work by IES, we would suggest five main areas of focus:

- **Local insight and evidence collection.** Many councils are already gathering insight from their own services (including Council tax, housing/ homelessness, welfare support) as well as from wider partners like foodbanks, social landlords, health services and wider voluntary and community organisations. There would be significant benefit in trying to do this systematically and consistently to try to identify earlier where there may be particular groups of residents at risk or when impacts may be changing or becoming more acute. Where possible, there would also be value in Councils working together to share practice, approaches and also insight from this evidence gathering.
- **Targeted, place- and group-based support.** All councils will be looking at how they can provide greater short-term financial and non-financial support to residents, and this research emphasises that there are groups and areas where this support could usefully be targeted – particularly at places where there are likely to be particularly high levels of need, but also at groups who may have greater or different support needs, like large families, disabled people and students.
- **Effective partnership working.** Again many Councils are focused on this already, and looking to work more closely and effectively with community organisations, advice services, social landlords, health services and more. Again this analysis suggests that

there are likely to be particular areas or groups where those partnerships may be most needed; and we would also suggest that there would be benefit in looking to share practice and insights from this work between Councils to help build capacity and capability.

- **Employer engagement.** Linked to this, employers can play a key role in helping to support and refer people who may be facing hardship, and many employers are increasingly keen to do this. We would suggest therefore that there should be specific and discrete approaches to trying to engage and work with employers – with simple communications and resources on what support is available; and direct engagement and marketing, through for example business and industry groups.
- **Employment and skills support.** Finally, given that worklessness is a key driver of low income, and that there are risks of a further slowdown in the labour market, we would argue that there is a need now to look at how we can better join up employment support for those out of work as well as those in insecure or low-paid work. This is made more difficult by the delays to the Shared Prosperity Fund which will eventually fund local employment and skills support, but there may be opportunities in the meantime to work with local services including Jobcentre Plus, the NHS Sussex Integrated Care Board, colleges and training providers, and wider community organisations to map available provision, identify opportunities for funding and/ or collaboration, and look to improve access and support for residents.

4.1.2 For employers

IES work with employers on financial wellbeing and support identifies a range of ways that employers can support and work with their staff, and in particular:

- The importance of **talking to staff about money and finance**, and supporting an environment where people feel able to be open about when they may be struggling or need help;
- **Providing staff with simple guidance, links and resources** that they can use – which is often taken from Council and advice service websites and/ or from Employee Assistance Programmes, but where there are very rarely resources developed specifically for employers to share with their staff;
- **Providing access to specific tools to support financial planning and health checks** – again these are often available through Employee Assistance Programmes where firms offer these, but there are also many free resources from government and charitable advice services;
- Having the **flexibility to provide emergency or discretionary financial support** where people need it – with many of the most effective approaches being low- or no-cost models like pay advances to support with unexpected costs or debts and/ or widening the scope of interest free loans, but can also include hardship funds and support (which can often be in the form of goods and services rather than cash, given the interactions between cash payments and benefit receipt); and

- Having **effective mechanisms to refer and escalate** when colleagues have financial difficulties – in particular from line manager to HR and then to any specialist support that may be available.

However while we have a decent idea of what ‘good’ looks like, this is far from widespread and there are significant challenges in engaging with and supporting firms to do more. So finally, there would be significant benefit in engaging business groups and directly with employers to sell the benefits of workforce financial wellbeing – the business as well as the social case for doing this – and to encourage things like the use of Employee Assistance Programmes, of being more flexible on pay, loans and advances, and of encouraging a culture of openness on financial wellbeing.

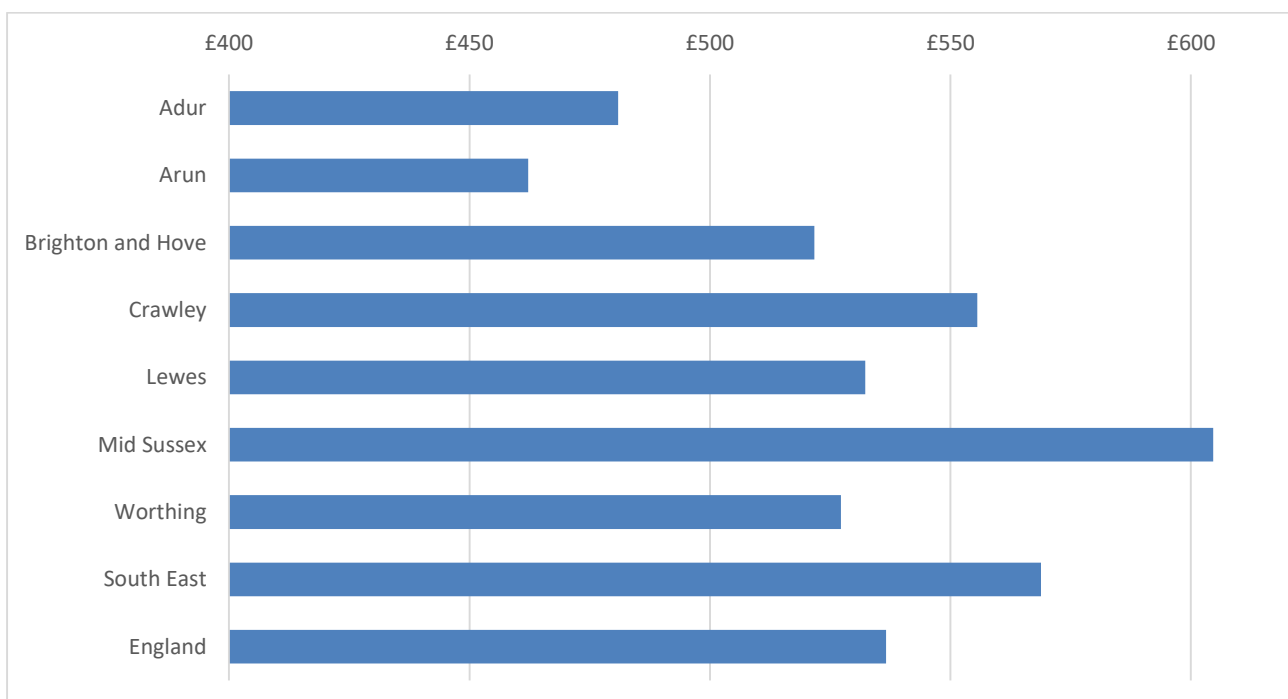
Annex: Earnings by Council and MSOA

Figure A1 below shows that average (median) earnings are generally lower in the Greater Brighton area than in the South East of England, which is consistent with the findings above that rates of benefit receipt are generally higher than for the wider South East. However the earnings figures paint a slightly different picture to those on benefit receipt, with in particular:

- Crawley having relatively high weekly wages (£556, higher than the England average) despite very high rates of benefit receipt – which suggests that the high rates of receipt reflect higher housing costs and/ or higher earnings inequality, which are explored in sections 3.5 and 3.6 below; but
- All areas except for Mid Sussex and Crawley having pay below the England average despite also having below-average rates of benefit receipt (most notably for Adur and Arun). One possible explanation for this could be low paid second earners in better-off households, while student earnings is likely also a contributing factor in Brighton & Hove.

The discrepancies above mean that earnings are a slightly less useful proxy than rates of benefit receipt for understanding low incomes, which can be an issue for employers too in trying to identify which of their staff may be at greater risk of hardship from rising living costs.

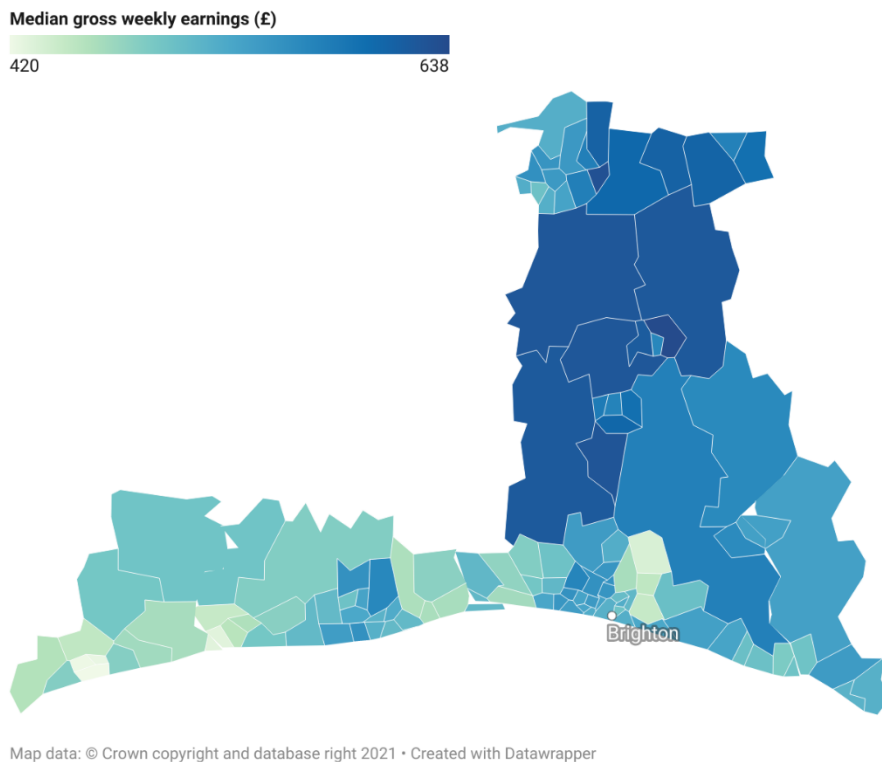
Figure A1: Median gross weekly earnings by local authority



Source: Annual Survey of Hours and Earnings 2022

Figure A2 below shows modelled estimates of wages to MSOA level. This reiterates that median earnings are higher in Mid Sussex and also generally higher in more rural areas, and are lower in some more disadvantaged areas (Bognor, Littlehampton, East Brighton and parts of Crawley in particular. These findings are consistent with the benefits data in Figure 3.3 above. However this also shows that many more urban areas also have residents with closer to average pay but above average benefit receipt (consistent with higher rents).

Figure A2: Estimated median gross weekly earnings by MSOA



Source: IES estimates based on Annual Survey of Hours and Earnings



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January 2023

Thank you very much for your email of 29 September to my predecessor, the Rt Hon Simon Clarke MP, about net zero and an invitation to visit the Greater Brighton Area to meet the Greater Brighton Economic Board. Please accept my apologies for the delay in my response.

The Government recognises the progress that has been made since the City Deal Agreement and the challenges that your residents, along with many others face in tackling climate change and the cost of living.

It is clear your local authority, like others throughout the UK, have and continue to make great strides towards net zero. Local authorities play an essential role in driving local climate action, with significant influence in many of the national priorities across energy, housing, and transport, which will be needed to achieve net zero. Your efforts and actions in developing the latest hydrogen technologies, retrofitting housing stock to make it more energy efficient in the future and restoring the Sussex Kelp Farm are all examples of local action, innovation, and excellence.

On this occasion, I am afraid it will not be possible to visit. However, given there are well established links between local leadership and interventions, climate action and low carbon economic sectors and levelling up, I have asked officials in DLUHC to get in touch to discuss your project developments further, with a view to arranging a visit as soon as possible.

Thank you again for your email.

Rt Hon Michael Gove MP
Secretary of State for Levelling Up, Housing & Communities
Minister for Intergovernmental Relations



GREATER BRIGHTON HYDROGEN STRATEGY

Targeting opportunities for inward investment

Report for: Hydrogen Sussex

Ref. Project number: BHCC-034461

Ricardo ref. ED16777

Issue: 2

30 January 2022

Customer:

Brighton and Hove City Council

Customer reference:

Project number: BHCC-034461

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1. EXECUTIVE SUMMARY

Introduction

This strategy was commissioned by Hydrogen Sussex, with funding from Greater Brighton and Coast to Capital Local Enterprise Partnership. The objective is to provide a strategy that helps the region to decarbonise energy, improve resilience, support and promote a hydrogen economy and attract investment to the area.

Low-carbon hydrogen will play a key role in reaching global and national decarbonisation targets over the coming years, particularly in hard-to-decarbonise sectors such as high-heat industry, heavy transport, aviation, and shipping. Hydrogen adoption can simultaneously improve air quality, support national energy security, and create a green growth opportunity. With \$500 billion global hydrogen investment expected by 2030, there are significant possibilities in this fledgling sector. The UK government recognise this opportunity and are actively investing to foster a domestic hydrogen economy that has the potential to grow to be able to realise global export opportunities.

Regional profile

Sussex has the chance to become a key component of the UK’s developing hydrogen landscape. This study found that the region has a long-standing history of engineering excellence that is continuing to evolve with new technologies and a shift to sustainable energy. Home to several high-profile hydrogen technology companies, this region has the potential to take advantage of the growing UK hydrogen landscape. The private sector and academia have been building on their success from government funding opportunities, particularly in maritime decarbonisation.

The strong local academic sector is increasingly aligned with the needs of energy transition. Until recently, there were no specific courses for decarbonisation. However, a recent win of government funding has allowed the development of a unique course covering hydrogen, emerging fuels, and practical skills at Chichester College. With two well renowned universities supplying relevant and evolving courses to support the energy transition, the region is well equipped to push forward this momentum and provide a solid green skills landscape to support the scale-up of the local hydrogen industry.

It was found that large-scale hydrogen production potential in the region is challenging due to already fully utilised renewable energy as well as land development constraints. However, there is still an opportunity at a more local scale that could further catalyse growth. Shoreham Port has the most advanced project that could become the flagship hydrogen hub for the region. Newhaven port and Gatwick airport also have strong potential to develop into hydrogen hubs due to the enabling infrastructure and variety of local offtakers. Unlike much of the UK, the region already has some active hydrogen consumers.

| Highlights of progress in the Greater Brighton region | |
|--|---|
| Ceres – are a leading developer in high efficiency Solid Oxide Fuel Cell technologies | H2Green – are developing a hydrogen production plant located in Shoreham Port |
| Bramble – are a fuel cell technology disrupter with a unique approach to scalable manufacture | Metrobus – due to receive 20 Wrightbus hydrogen fuel cell single decker buses for their operations |
| Brighton University – have worked with a number of companies in the region to develop their innovations | Ricardo – have built a state-of-the-art test and development centre for hydrogen propulsion technologies |

Table 1 – Examples of hydrogen economy progress in the Greater Brighton region

It was found that local councils share the ambition to develop a local hydrogen economy and that the political landscape is broadly conducive to support this. Hydrogen has the potential to contribute toward the 10 pledges to help tackle the climate crisis developed by the Greater Brighton Economic Board.

Barriers, and how to overcome them

The conversations held as part of this study found that the region is forward thinking in its decarbonisation plans. Most local authorities have already outlined opportunities and proposals within energy plans, with some making mention of the need for hydrogen. Local authorities have a seemingly harmonious relationship with one another and recognise their strengths in certain areas, laying a good foundation for creating an enabling environment for a hydrogen economy.

Through literature reviews of the national and regional policies, alongside extensive engagements with local stakeholders, this study identified the three most prominent barriers for hydrogen roll out in the area to be infrastructure, demand visibility, and policy and regulation at a local level. Infrastructure regularly dominated conversations with stakeholders, the most prominent issue expressed being the lack of existing infrastructure to support new developments, mainly pertaining to the availability of renewable energy, connection to the electricity grid, and connection to water supply. This barrier subsequently causes increased capital expenditure (CAPEX), delayed deployment, and in some cases, the complete abandonment of plans. This in turn links to the barrier of demand visibility. Securing hydrogen off-taker commitment is a new area for most developers in the UK, particularly for green hydrogen. Developing a multi-million-pound project with minimal knowledge of potential local off-takers increases the investment risk, and with higher CAPEX as a result of lacking infrastructure, this risk raises further. Stakeholders, including those with direct interest in developing on-site production, expressed that they have too little clarity of current and potential local demand to warrant high risk investment at this stage. The main reasoning behind policy and regulation at a local level being a barrier for stakeholders consistently related to planning. The lack of existing infrastructure, implications of deploying renewables, and overall uncertainty over planning requirements amongst stakeholders was found to be a considerable issue for the region.

The impact chart below shows the drivers that were communicated that would aid local stakeholders in overcoming the immediate barriers and are placed in order of highest impactful to lowest, as well as easiest to overcome and hardest to. The results are based on the stakeholder analysis conducted throughout this study, particularly regarding the feasibility of overcoming regional barriers.

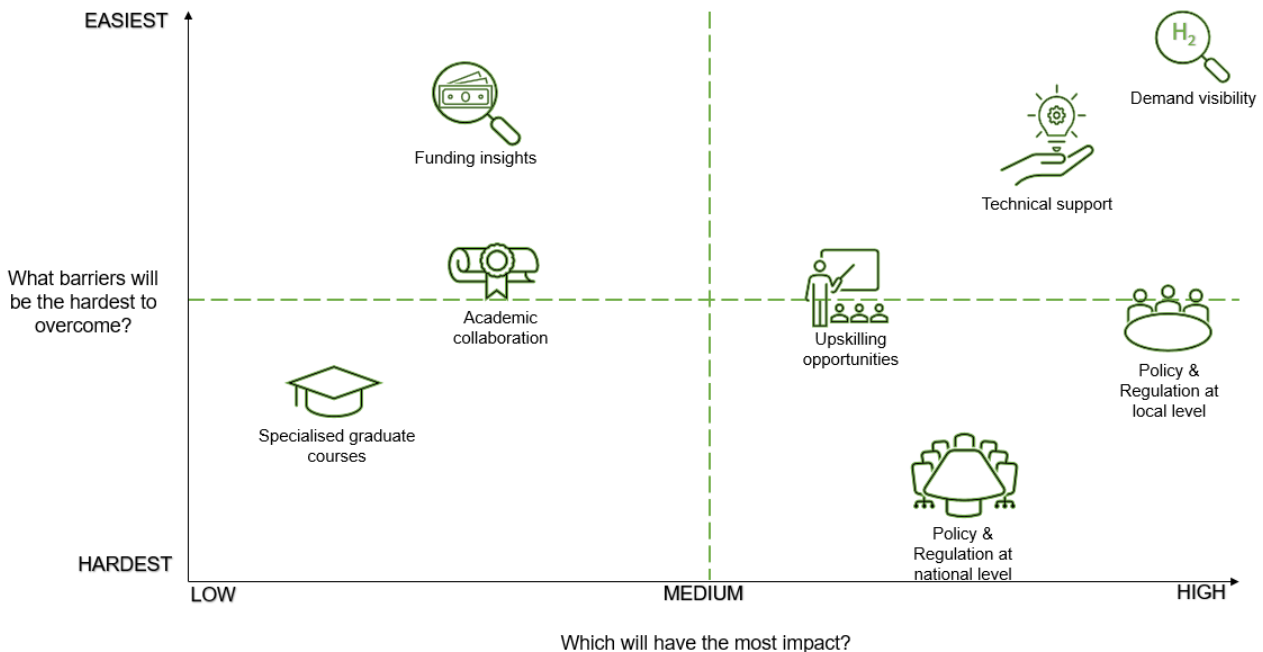


Figure 1 - Impact of the most impactful, and hardest barriers to overcome according to stakeholders

From these findings, paired with additional analysis, 42 actions were identified that from near-term to long-term. These actions should be undertaken to accelerate economic growth in the region by unlocking the local hydrogen economy. Many of these actions will require cross-sector collaboration to ensure success. Combining literature reviews, Hydrogen Sussex’s experience, and Ricardo’s expertise, the actions take a

forward-looking approach and span from 2023-2030 with the ultimate goal of generating economic growth in the region. Eight example actions are shown in the table below, with colour-coding to represent the responsibility for implementation.

● Hydrogen Sussex
 ● Public Sector
 ● Private Sector
 ● Academia
 ● Utilities
 ● All

| POLICY & REGULATION | SKILLS | INFRASTRUCTURE | FUTURE SUPPLY & DEMAND GROWTH |
|--|--|---|---|
| Review planning policies to give clear hydrogen-specific guidelines for planning applications <div style="text-align: center;">●</div> | Promote and develop the research and innovation capabilities of the region to increase collaboration capacity <div style="text-align: center;">● ●</div> | Feasibility study to identify the most crucial infrastructure required for initial scale up <div style="text-align: center;">● ●</div> | Identify opportunities for local authorities to stimulate the local hydrogen economy by becoming an anchor demand <div style="text-align: center;">●</div> |
| Encourage and support the creation of incentives to alleviate the socio-economic impact of the energy transition <div style="text-align: center;">● ●</div> | Support the development of engineering-specific upskilling opportunities, programmes, and internships to encourage uptake and develop more skilled workers <div style="text-align: center;">● ● ● ●</div> | Initial investment in supply to build capacities and deploy planned hydrogen projects <div style="text-align: center;">● ●</div> | Communications - Publish case studies and news items on successful projects to raise awareness locally and nationally of action in Sussex <div style="text-align: center;">●</div> |

Table 2 – Ten examples of actions from the action plan

In addition to the action plan, this study includes a route map of goals identifying key milestones to be achieved up to 2030. This route map separates the goals into four strategic themes: Policy and Regulation, Skills, Infrastructure, and Future Supply and Demand Growth. These themes encapsulate the key barriers identified throughout stakeholder engagements and represent the key milestones that would be achieved if each action is completed successfully.

This strategy, its goals, and its roadmap, will support the decarbonisation of the region, attract the crucial investment required to achieve this, and aid the progression of the local hydrogen economy.

Summary

With the correct focus, collaboration and action, the region has real potential to stand out within the UK hydrogen landscape and gain economic and environmental benefits from hydrogen.

2. INTRODUCTION

On 26th February 2021, the energy group Hydrogen Sussex (HS) was launched to promote and support a hydrogen economy across the region by pooling regional expertise and lobbying power. The group grew out of Greater Brighton Economic Board's (GBEB) Energy Plan to drive Greater Brighton's (GB) transition to become a zero-carbon economy and bring inward investment to the region from the public and private sector.

Hydrogen Sussex commissioned Ricardo Energy & Environment, a sub-division of the Ricardo group, to develop the Greater Brighton Hydrogen Strategy. This report is a study developing a foundation of knowledge to inform a strategy tailored to the opportunities presented in the region. It accompanies an activity baseline conducted by Net Zero Associates, and a review of hydrogen strategies from around the world conducted by the University of Sussex.

2.1 OBJECTIVES

The strategy aims to help the region to decarbonise energy, improve resilience, support and promote a hydrogen economy and attract investment to the area. The focus of the strategy is on 'green' hydrogen, produced by electrolysis with renewable electricity. The overarching objectives are to:

1. Encourage and support development of a strong hydrogen sector in the Greater Brighton and wider Sussex region.
2. Secure broad economic benefit from public sector and private sector support for development of regional hydrogen production and use.

The investment proposition will give a clear focus for the priorities for action next 5 years and the pathway to scale up ambition into the future. It will establish a place-based perspective, help key stakeholders understand the opportunities in the region, and prepare the ground for significant funding applications.

Greater Brighton and the wider Sussex area has opportunity to become a leader in the hydrogen economy thanks to access to:

- Key infrastructure including Gatwick airport, Newhaven Port and Shoreham Port
- Engineering leadership with private companies innovating in the hydrogen field
- Research excellence of two universities supporting research and innovation
- Environmentally passionate citizens with forward thinking local authorities

Progress towards a local hydrogen economy has begun. For example: a multi-megawatt hydrogen production electrolysis plant has been announced at Shoreham Port; Brighton & Hove buses are due to receive fuel cell buses; Michelmersh bricks have assessed the feasibility of replacing natural gas with hydrogen in the brick making process; multiple companies are innovating with hydrogen technology as their core proposition.

The heart of this strategy is based on engagement with numerous stakeholders that built an understanding of the landscape as it is now, what is in the way of the development of a hydrogen economy and what Hydrogen Sussex and its members can do to support it to drive economic growth.

This report presents the landscape for hydrogen, focussing on the region, discussion of stakeholder engagement, regional analysis, initial hydrogen strategy including a roadmap and short-term action plan and with it, outlining the role of Hydrogen Sussex.

3. ANALYSIS OF THE REGION

3.1 GEOGRAPHY

For green (low carbon) hydrogen production, location is an important factor. Access to strong renewable energy resource keeps power generation costs lower, which is the key cost component when producing green hydrogen. Solar and wind resource for the region is good but is stronger in other parts of the UK.

The offshore wind farm Rampion is large enough to be considered nationally significant infrastructure. There is a second development for this wind farm planned for 2025-6, which will connect into Bolney substation as per the existing wind farm. The GBEB energy plan suggested that an electrolyser could be sited there, although

there are no identified demand locations nearby other than potential refuelling of passing traffic on the A23. However, considering the relative distance to Gatwick airport, which is expected to be a significant future demand, there may be an opportunity for a direct pipeline. This would be further into the future and requires further analysis and bilateral engagement between Rampion and Gatwick. Engagement with Rampion found that, given the large population supplied by the Rampion wind farms, and the relative lack of other large-scale renewables locally, these wind farms are unlikely to face significant curtailment and will fully contribute to decarbonising the local electricity grid. Therefore, using Rampion to produce hydrogen by electrolysis is not seen as the best use case in the near term.

The region has a large land area of natural capital including the South Downs National Park and High Weald Area of Outstanding Natural Beauty. This is a weakness when it comes to implementation of renewables to co-locate with electrolyzers (which is an economically attractive option to keep hydrogen production costs down). Renewables that are within view of the park are likely to encounter resistance for planning permission. It can be bypassed by locating out of view, but this restriction could cause developers to consider other regions. The rich biodiversity often found within protected parks can also cause issues for environmental permitting. The hilly topography adds further barriers to the development of renewables that ultimately raise costs to the project and therefore reduces the competitiveness of hydrogen production.

Water is critically scarce within the region and hydrogen production through water electrolysis could provide further stress. Best practice is to encourage hydrogen production to target sustainable water sources to protect future water sources and to win public support. The coastal location of much of the region presents an opportunity as any plant located on the coast could install desalination plants and draw on sea water. A study by IRENA showed that using desalination technologies are expected to increase the cost of hydrogen by 4% (IRENA, 2022).

3.2 INDUSTRY, TECHNOLOGY AND RESEARCH & INNOVATION

Advanced engineering and research in the hydrogen space is very well represented in Wider Sussex compared to other regions in the UK. The hydrogen solutions being developed at local companies Ricardo, Bramble, Ceres, NVH Global, Engas, AFC Energy, Flowserve and Cox are ahead of the wider market. The two universities have PhD studies on innovations in the sector. Brighton University has also partnered with companies to win government research funding.

The region has key infrastructure at Gatwick airport, Shoreham Port and Newhaven Port. These locations act as demand clusters that could be attractive for siting a production plant that can minimise costs associated with distribution. In these clusters, heavy transport is the key early opportunity for decarbonisation by hydrogen. The benefit of the three small demand clusters, compared to the UK major industrial hubs such as South Wales or Teeside, is that investment risks can be taken in a smaller and more gradual approach that can be scaled as technologies develop and costs come down. There may also be less reliance on a single large offtaker.

There are few heavy industry opportunities in Sussex, and those that do exist are dispersed across the region. The issue with dispersed industry is that hydrogen will be more expensive for the off taker who may choose to invest in costly dedicated hydrogen production. An alternative could be to receive road deliveries of hydrogen from a regional production facility. However, road deliveries that could be subject to local traffic issues that could prevent fulfilling the need or inhibiting future growth.

3.3 HUMAN RESOURCES

The hydrogen engineering workforce of the wider Sussex region is advanced compared to other regions. The hydrogen solutions being developed at the engineering businesses and universities, are ahead of the wider market and have drawn in expertise from around the UK and the world. This variety of leading companies can attract talent to the region and make it possible for them to stay within the region when switching roles between companies.

When it comes to practical hydrogen skills, the region is at a disadvantage compared to other UK regions, with only those skills associated with the natural gas network. This contrasts with regions with chemicals, oil & gas industries. The workforce from these sectors is seen by stakeholders as relatively easy to retrain into the hydrogen sector.

There are many colleges offering further education across the region. Until recently, there were no specific courses for decarbonisation. However, a recent win of government funding is enabling a unique course

including hydrogen and emerging fuels and practical skills working with electric vehicles. Electric vehicles have the same powertrain technology as vehicles powered by hydrogen fuel cells, so skills in this area will be useful for the future. There are also two universities supplying graduates with specialist skills. Courses from these education centres do not have a focus on hydrogen yet. However, University of Brighton has a strong engineering school and research engineering through its collaborations with industry.

3.4 POLITICAL AND INSTITUTIONAL LANDSCAPE

The political landscape of the region is broadly conducive to supporting a hydrogen economy. The Greater Brighton Economic Board developed their 10 pledges on the environment to help tackle the climate crisis. A hydrogen economy could potentially contribute to four of the ten pledges (in order of relevance to the region):

- Pledge 9: Innovation
- Pledge 3: Zero emission fleets
- Pledge 7: Low carbon heating
- Pledge 2: Water recycling¹

The 2020 Greater Brighton Energy Plan also highlights the potential of hydrogen infrastructure development in the region as part of its energy decarbonisation measures. Hydrogen transport is a key strategic theme, and the development of a hydrogen hub is recommended. A hydrogen hub is a cluster of production and use of hydrogen in a defined area to share infrastructure and minimise transport costs.

At a regional level, West Sussex County Council and five of the seven local authorities in the region have declared a net zero by 2030 target. The commitments show concern for climate change and with it an imperative to act decisively on decarbonisation ahead of the government 2050 target. This is often in their own operations but also in supporting constituents and businesses to do the same.

Many of the economic development and COVID recovery plans released by councils show an initiative to support the development of clean technologies and building back greener. Alongside decarbonisation trends such as behind the meter renewable energy and electric vehicle charging infrastructure, hydrogen could be seen as a solution to support these objectives.

¹ Water for electrolysis can be purified from wastewater sources. Waste nutrients can be captured, contributing to nutrient neutrality regulation

3.5 SWOT ANALYSIS ON REGIONAL POTENTIAL ECONOMIC GROWTH WITH REGARDS TO HYDROGEN

Strengths

- Advanced engineering excellence
- Strides in maritime decarbonisation research
- Engaged local government stakeholders
- Multimodal transport ecosystem: ports, airports, road, and rail
- Active projects and companies already consuming hydrogen
- Further education skills aligning with needs of energy transition

Weaknesses

- Fewer practical skills compared to some other regions
- Constraints around deploying renewables inhibits local hydrogen production
- Limited industrial activity
- Disjointed progress
- Weak knowledge in public sector
- Constrained power grid
- Severe water stress

Opportunities

- Potential for commercialising research into new business ventures
- Key infrastructure could become low risk hydrogen demand clusters
- Environmentally minded and supportive public with a track record of investing in energy infrastructure
- Well-developed supply project at Shoreham Port
- Openly prospective hydrogen demands in the region

Threats

- Manufacturing companies relocating to Solent freeport
- Industry relocating to Southampton to leverage cheaper hydrogen from the proposed UK hydrogen network
- High competition for limited experienced hydrogen engineering labour force
- General risk of hydrogen economy being a bubble
- Private sector averse to take risk on emerging technology without stronger drivers

Figure 2 – SWOT analysis for development of a hydrogen economy in the Greater Brighton region

4. STAKEHOLDER ENGAGEMENT

A key part of this project has been to conduct interviews stakeholder both within the region and with regional interest. In total, 44 stakeholder engagements were held. To synthesise the information gathered during stakeholder interviews, each interview was set a structure best suited to the type of stakeholder and the information required. Though each interview held a unique conversation, the core topics remained constant to ensure the conversation remained relevant and the interviews could be analysed as a whole. In addition to the core topics, stakeholder specific questions were asked to gain a deeper understanding of the barriers faced and drivers required between the different organisation types. Throughout stakeholder interviews, Ricardo remained unbiased and ensured that the structure and manner in which questions were asked had no influence on the response.

During each interview, information was gathered in note form and then transferred into a tailored data collection spreadsheet for further analysis.

Categories of stakeholders include:

- Hydrogen supply project developers
- Hydrogen demand project managers
- Hydrogen economy service/equipment providers
- Key infrastructure managers
- Regional organisations
- Academia
- Local authorities
- Utilities

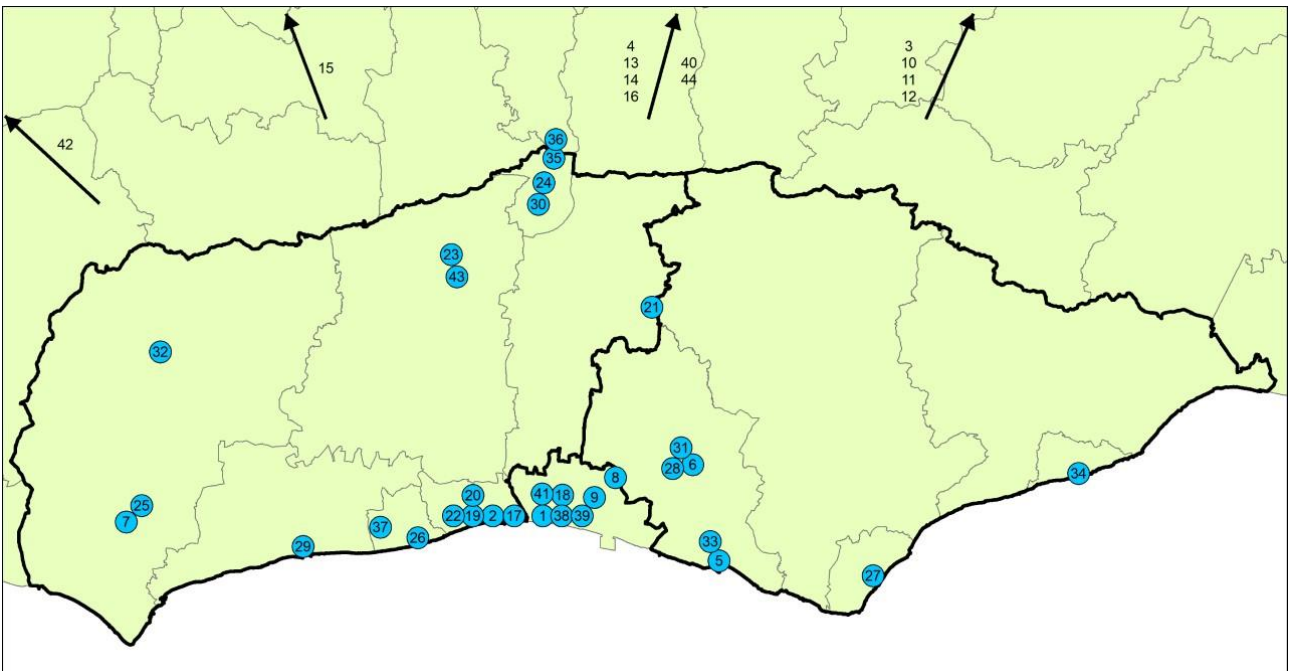


Figure 3 - Map of stakeholders consulted

| Name | # | Name | # | Name | # |
|--|----|-----------------------------|----|---|----|
| Utilities & energy generation | | Academia | | Local and national authorities & public services | |
| UKPN | 4 | Chichester College Group | 7 | West Sussex County Council | 25 |
| SGN | 36 | University of Sussex | 8 | East Sussex County Council | 28 |
| Rampion | 5 | University of Brighton | 9 | Brighton and Hove Council | 38 |
| Southern Water | 37 | Ports & Airports | | Crawley Borough Council | 30 |
| Associations & LEPs | | Shoreham Port | 17 | Lewes & Eastbourne Councils | 27 |
| Hydrogen UK | 13 | Newhaven Port | 33 | Adur & Worthing Council | 26 |
| UK Hydrogen Fuel Cell Association | 12 | Brighton City Airport | 19 | Arun District Council | 29 |
| Hydrogen Sussex | 39 | Gatwick Airport | 35 | Developers | |
| Greater Brighton Economic Board | 1 | Mobility providers | | H2Green | 17 |
| Thames Estuary | 6 | Brighton & Hove buses | 41 | Marubeni | 3 |
| Hydrogen East | 11 | East Sussex Fire & Rescue | 31 | Scottish Power | 15 |
| Coast 2 Capital LEP | 2 | RWE maritime division | 42 | Octopus Hydrogen | 44 |
| Locate East Sussex | 34 | Hydrogen engineering | | Industry | |
| Greater South-East Net Zero Hub | 16 | Ricardo | 20 | Michelmersh Bricks | 21 |
| Land development | | Ceres Power | 23 | | |
| South Downs National Park | 32 | Cox Powertrain | 22 | | |
| Savills | 40 | Bramble Energy | 24 | | |
| | | Engas | 43 | | |

Figure 4 - List of stakeholders interviewed

The findings from these discussions were noted and analysed to develop the context of the region, the level of existing activity, and grasp the barriers that are inhibiting progress. In some cases, the discussions with stakeholders included confidential commercial information, details of which are not included in this report, although they informed the analysis.

4.1 KEY OUTCOMES

Barriers experienced by stakeholders

Throughout the stakeholder interviews held as part of this study, it was apparent that stakeholders face varying barriers to progress effectively or in some circumstances, even at all. Some recurring themes developed across the conversations. The nine most prominent barriers raised are listed in the table below with a description of each.

| Barrier | Description |
|--|---|
| Policy & Regulation at national level | Barriers as a result of national level policies and regulations |
| Policy & Regulation at local level | Barriers as a result of local level policies and regulations (including the planning procedure) |
| Technical support | Absence of support during funding application as well as the lack of knowledge of available funding |
| Funding support | Lack of available funding and subsidies to accelerate deployment |
| Graduate Level skills | Lack of graduate level workers, particularly with practical skills |
| Senior Management | Lack of senior level workers with specific hydrogen expertise |
| Demand visibility | The uncertainty of local demand for hydrogen, both current and forecasted |
| Infrastructure | Lack of physical infrastructure and the related challenges of its absence |
| Hydrogen supply | Difficulty in accessing local hydrogen supply due to availability or cost |

Table 3 - List of barriers to hydrogen in the region

During stakeholder interviews, each stakeholder was asked to discuss the major barriers their organisation face when considering or implementing hydrogen into their business plan. The number of barriers a stakeholder could raise was not limited or set by Ricardo. In some cases, stakeholders expressed their experience of several barriers. As shown in Table 3, nine barriers were consistently raised. The conversations held with stakeholders as part of this study were predominantly near-term oriented and this should be noted when considering the results. The figure below displays the three barriers that were most frequently raised by stakeholders of the region.



Figure 5 - Most regularly mentioned barriers to hydrogen in the region

Infrastructure, the most frequently experienced barrier among local stakeholders, relates to the lack of already constructed infrastructure, particularly water and electricity grid connections to proposed development sites. Many stakeholders expressed concerns regarding the investment risk of constructing required connections and the additional planning sensitivities that come with it. For policy and regulation at local level, challenges surrounding planning permission were strongly highlighted throughout stakeholder interviews, particularly in relation to environmental objections and understanding the requirements of planning applications for hydrogen

technologies. Demand visibility was the third most frequently experienced barrier by stakeholders and mainly pertained to the lack of visibility of demand potential both locally and nationally. Some stakeholders even noted feeling well aware of the potential for export, but less versed on local demand. When considering all three barriers, it is clear they are interconnected. A lack of infrastructure increases CAPEX, and therefore raises additional hurdles for planning, increasing the investment risk. Stakeholders, particularly those with direct interest in developing on site production, expressed that they have too little clarity of the current and potential local demand to warrant high risk investment at this stage.

4.2 IMPACT OF BARRIERS TO DEVELOPING A HYDROGEN ECONOMY

The impact chart below shows the drivers that would aid local stakeholder in overcoming the immediate barriers and are placed in order of highest impactful to lowest, as well as easiest to overcome and hardest to. The results are based on the stakeholder analysis conducted throughout this study and draws on the knowledge and insight gained throughout interviews regarding the feasibility of overcoming regional barriers. This chart does not reflect any views of Ricardo or Hydrogen Sussex, it is a pure reflection of engagement outcomes.

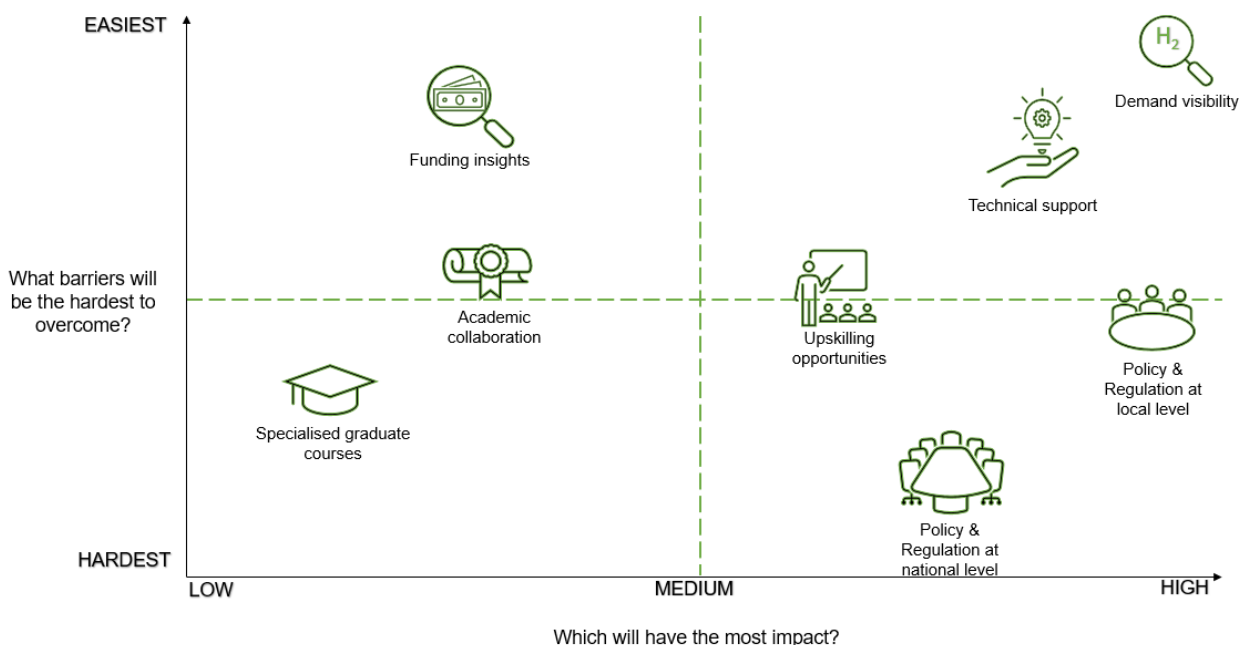


Figure 5 – Impact of the most impactful, and hardest barriers to overcome according to stakeholders

4.3 KEY FINDINGS BY CATEGORY

Hydrogen supply

Shoreham Port has the most advanced hydrogen supply project in the region. The key issue faced there is one being faced nationally. Off-takers are unclear and unwilling to commit to take or pay contracts that remove financial risk and stabilise the price of hydrogen to the price of directly procured electricity as opposed to being bought at market price from the grid. We class this as a **demand visibility** issue. The root cause of the issue is due to **national policy** not providing funding to bring down the capital cost of hydrogen transport and incentivise uptake. Opportunities exist in the forming of innovation funding competitions but the outcome of these are uncertain and there is no opportunity for other demand cases to follow on once the competitions have gone by. Demand needs further stimulation beyond what the government can offer.

Newhaven port also has good potential to develop a hydrogen hub that can both produce and use hydrogen. It serves a ferry route and offshore wind service vessels that have fixed routes and patterns of usage that are simpler to design a refuelling and storage system compared to that needed for other deep-sea vessels. There is a bus depot, a refuse collection fleet and up to 150 heavy goods vehicles visiting the site for the industries that operate there. The key issue for this site is the cost of improving power **infrastructure** to provide power supply to an electrolyser.

Brighton City Airport is investigating the potential to become a hydrogen hub. A key issue they are encountering is the cost of power supply **infrastructure**. They discussed seeking **local government support** to assess the feasibility of installing on-site solar for low-cost self-supply.

A prospective hydrogen producer revealed the depth of research they have to undertake to understand where off-taker opportunities are which a **demand visibility** issue. Co-location with renewable electricity is a key part of their strategy to lower the cost of hydrogen, therefore **local government** consenting more renewable energy infrastructure in the region supports the potential for hydrogen production.

A global investment and development business that is progressing its portfolio of hydrogen projects, revealed that infrastructure and demand visibility are key to attract investors. When asked what would attract the investors to the region, it was stated that the sourcing of renewable energy is a deterrent, and that additionality implications are a cause for concern, however, a strong business case with the added security of off-taker commitments would significantly improve a projects competitiveness and spark interest.

Hydrogen demand

Key hydrogen demand stakeholders are often aligned with the location of the proposed hydrogen supply locations. In these key locations the main need was to convert demand from speculative to committed by providing **technical support**, stronger **national** and **local policy** drivers to develop a near term need for transition, and **funding availability** to invest into the required **infrastructure and equipment**.

One stakeholder in the public transport business will be operating hydrogen vehicles within the region next year. They had difficulties in **sourcing green hydrogen** but have since overcome that issue. They would benefit from more **funding availability** in the future to continue decarbonising their fleet.

One stakeholder had hydrogen vehicles within the region but had to move them out to a neighbouring county due to the closure of hydrogen fuel stations, an **infrastructure** issue. Another niche vehicle type was finding it difficult to be sure about the role of hydrogen for their sector and is waiting to see a market form first.

One industry stakeholder fed back that they experienced difficulty **sourcing green hydrogen** and the infrastructure to become self-sufficient was very costly and far beyond their own resources. They felt they would benefit from **financial support** or **technical support** to develop a feasibility study to provide more substance on what would be required and what other long-term options they might have.

Worthing council crematorium recognised the opportunity they had for hydrogen but needed **technical and funding support** to take the next steps.

One demand type was actively procuring **technical support** to understand the feasibility of utilisation. They felt they need more guidance from **national level** policy.

Local and regional authorities

Local and regional authorities in the region are highly supportive of decarbonisation and address it in their policies. Interviews found there was a more general understanding around the potential that hydrogen has to replace fossil fuels in their own operations and that of businesses within their region but have varied thoughts on the role it has to play – something that may be supported with **demand visibility**. Most recognise that this new technology is an opportunity to grow the local economy in an emerging market.

Most recognised that power **infrastructure** and water availability are critical barriers for electrolysis that may make hydrogen production more difficult in the region.

Some recognised there are risks involved with the new technologies that meant for them that it may be better to follow a hydrogen transition rather than lead on one. Others said they are more interested in taking the leading role but need clear **funding support** and/or the **technical support** to make effective decisions. A few questioned how to attract **infrastructure** that their assets could access.

Stakeholders that identified policy and regulation at local level as an important driver consistently raised planning as the primary reason. These organisations tended to have a direct interest in developing on site hydrogen production and felt the clarification of planning requirements would be hugely beneficial.

Some councils were open about their weak knowledge on the hydrogen topic and could benefit from **upskilling opportunities** to better understand the role hydrogen could play, the infrastructure needed to facilitate it and how they can support it. At present, the lack of knowledge and the emerging stage of hydrogen technologies makes it difficult to make decisions that integrate it into policy. Examples included determining the role it should

play in a local transport plan and how to implement hydrogen into future procurement plans. Local councils have not yet undertaken independent studies to investigate how hydrogen might benefit their area.

Academia

Chichester College recently won government funding to develop capacity in emerging skills with an emphasis on decarbonisation. The alternative energy and hydrogen technologies project will develop a course to build essential skills for the hydrogen economy². Discussions found that initial studies by Net Zero Associates helped to identify the training needs but due to how nascent the sector is, it has been difficult to find technical professionals to deliver the courses. The staff would benefit from **upskilling opportunities** to increase the impact of the course. A key topic is hydrogen safety within the lab environment. This difficult subject reflects the complexity of **national regulation** around working with hydrogen.

Higher Education (HE) institutions have a track record of working on projects in the hydrogen economy. University of Brighton, in particular, has a history of collaborating with local business to conduct innovative research in the sector. In part this has been enabled by **funding availability** from the government that is concluding. Some funding access requires a company lead, so **supporting collaboration** can unlock that to benefit the university and its partners. The opportunities from this are not exclusive to hydrogen technology research but speciality skills such as mapping or data science can add value to a hydrogen economy. Therefore, other funding streams should be assessed as to if or how they might be able to interplay to **support further collaboration**.

Graduate level skills were frequently highlighted as a barrier in the region, predominantly felt by innovation and manufacturing companies. This is generally due to the need for specific expertise such as design and innovation that is not widely included in graduate level courses. Junior level workers that come straight from education to the hydrogen workplace are said to have a good understanding of broad topics but lack deeper knowledge of specialised technologies or practices.

University of Brighton currently has a module on one course that addresses the hydrogen economy but intends to expand on **specialised renewable energy courses** that will provide more **graduate level skills**.

Engineering industry

The engineering industry has varying needs based on the current business objectives they were aiming to achieve. One topic was consistent across them and that was the need for **senior expertise** level skills in the sector. The growth of the businesses meant that competition has risen for the slower growing number of professionals in the region. The attractiveness of well-paying roles may attract expertise into the region but not at a rate fast enough to meet the demand.

Some engineering companies remarked on the need for more supportive **government policy**. Current efforts by the government are too slow and unambitious compared to what is being seen in other countries. There is also the need for more **funding support** to grow at a pace to scale to meet the current activity in the hydrogen sector which is getting bolder and more ambitious with every new announcement.

One barrier seen by at least one company was the difficulty to **procure green hydrogen** at a reasonable cost and grade of purity needed for fuel cells. The government Renewable Transport Fuel Certificates (RTFCs) do not extend as far as company research and therefore they are paying unsubsidised prices.

One company remarked that they were unaware of the full picture of hydrogen activity in the region and would therefore benefit from **demand visibility**. They felt that this visibility may help them potentially partner and support one another or develop innovative new products.

5. ECONOMIC GROWTH

5.1 THE PATHWAY TO LOCAL ECONOMIC GROWTH

Greater Brighton and the wider Sussex area has the engineering excellence to stand out in the UK hydrogen economy and be known as a research and innovation hotbed. It is already advantaged by being home to multiple world-class hydrogen technology businesses and academia with a track-record of winning national

² There is value in pointing out that the success of an electric vehicle training centre project is of importance to a hydrogen economy as fuel cell vehicles will be based on electric powertrains.

and international funding for hydrogen related research. Supporting this industry could provide the region with clean growth, attracting private investment into the region and creating high value, skilled jobs.

The UK government recognises that the UK is very well placed to be an international leader in hydrogen research. Wider Sussex has an opportunity to play a leading role in the UK's plans to achieve this. Two of the three firms (Ceres and Bramble) that the UK hydrogen strategy hails as being "at the forefront of the global shift to hydrogen" are within Sussex. Supporting these existing companies and nurturing hydrogen technology start-ups will provide organic economic growth whilst simultaneously contributing towards decarbonising the region. Ricardo estimates that getting this right could add over £261m of gross value added and 2,000 jobs to the regional economy by 2050³.

Sussex's academic institutions have a track record of winning and contributing to UK innovation. Winning public sector funding may provide around three times the amount of private sector investment (depending on the fund and the organisation). The government has committed to increasing public funding for national research and innovation to £22bn per year by 2024. As hydrogen is in an early stage of development, its role, and the associated technologies to enable it will continue to need to be explored. Research funding is likely to continue to play a central role in the government's hydrogen strategy. The target sectors for investment are clearly identified in the government's hydrogen investor 2021 roadmap (UK Department for International Trade, 2022) . Universities and businesses alike should be prepared to seize this opportunity and further their technologies. Cultivating research from academia into pioneering businesses will provide a more diversified and resilient hydrogen economy.

The global hydrogen investment is expected to reach \$500 billion by 2030. Sussex's home-grown hydrogen sector could be well positioned to take advantage of this global growth by exporting its technologies and services. Analysis suggests that around a quarter of UK jobs in the hydrogen sector, and around 30 per cent of economic opportunity, could be driven by exports by 2030, with these growing in relative importance by 2050. The UK government have earmarked £2bn to finance clean growth projects overseas and support export opportunities that will further the UK hydrogen opportunity.

New economic opportunities will arise through developing energy infrastructure and encouraging a local hydrogen supply chain from production through to point of consumption. The UK Infrastructure Bank has £12bn of capital available to support local governments and the private sector in developing projects with hydrogen infrastructure assigned as a priority. Beyond economic growth, Wider Sussex can make strides towards decarbonisation targets by providing low-carbon hydrogen to its hard-to-decarbonise industries. This agenda is aligned with the regional strategies of public bodies and their environmentally conscious citizens. Growing hydrogen hubs in areas of dense infrastructure enables the decarbonisation of multiple energy users as well as allowing them to share infrastructure, avoid distribution costs and benefit from improved local air quality.

The pathway to unlocking this clean economic growth is to support the sector to flourish by removing or mitigating the barriers that are currently restricting it, and by creating an enabling environment that has the potential to drive it beyond current limits.

5.2 SKILLS NEEDS

Achieving the Net Zero ambition will require a transformation of workers' skills across many areas of the economy, particularly those working in buildings, transport, maintenance, and energy. With hydrogen an embryonic industry, the skills required to achieve hydrogen related goals is a widely discussed topic. Released in 2021, the UK Hydrogen Strategy recognises the development of skills as a key component in creating a secure hydrogen economy, highlighting it as a 'challenge to overcome'. Its importance is cemented with analysis included in the UK Hydrogen Sector Development Action Plan that suggests that the UK hydrogen sector could be worth £900 million and support 12,000 jobs by 2030. These jobs will span across production, transport, storage and use technologies for both domestic and export markets and require a diverse range of worker skills. Many of these skills already exist in the UK, although mainly concentrated within the chemicals and oil and gas sectors, and these skills should be utilised through upskilling and retraining in the first instance. Figure 6 - shows the timeline of skills development plans set out in the UK Hydrogen Strategy.

³ Based on applying regional GDP to UK hydrogen strategy projections

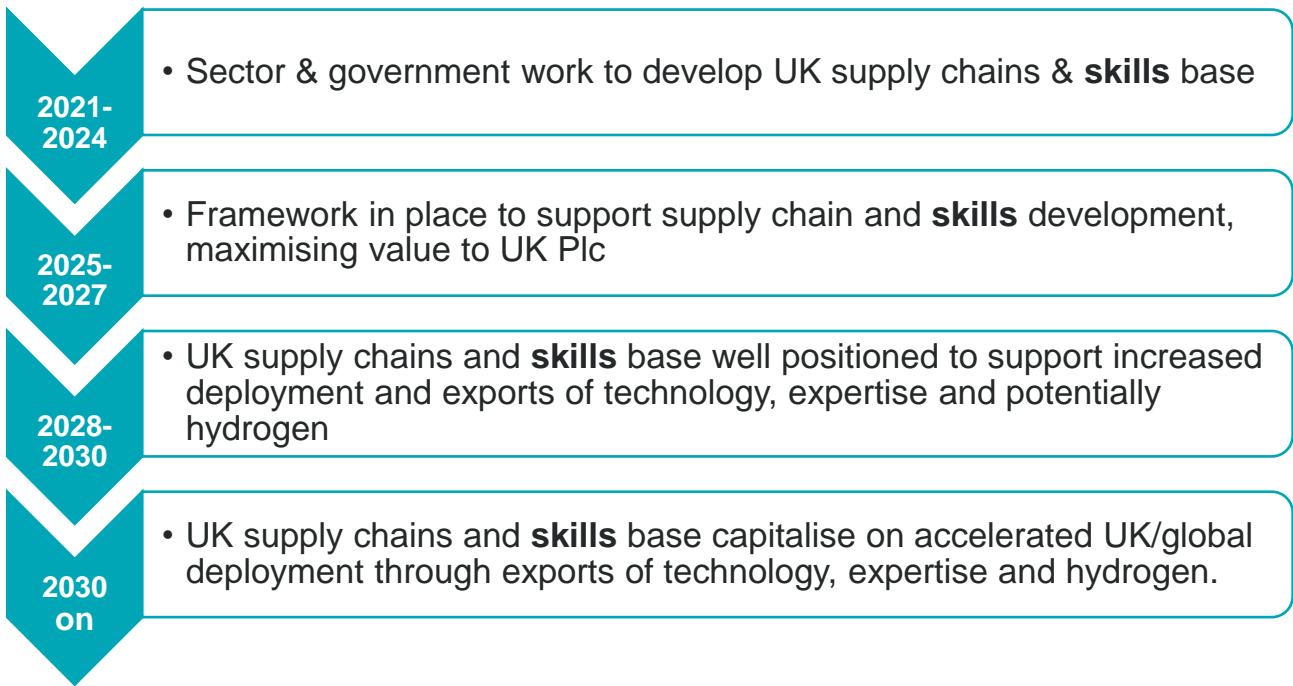


Figure 6 - Skills timeline from the UK hydrogen strategy

Experience with hydrogen across the supply chain remains a niche area, particularly when produced through renewable resources. Grey (high-carbon) hydrogen has been produced and transported in the UK as an industrial gas for decades, meaning there are already experienced professionals with the skills required for the transition. However, these professionals remain in high demand and are mainly located in other regions of the UK. There are examples of such topics beginning to be addressed in the North West of England, such as the Net Zero North West announcement of the UK’s first regional skills plan, known as the North West Net Zero Skills Charter. The new pan-regional group made up of businesses and universities will create plans and measures to support those wishing to transition to green jobs in the North West of England. The group will develop an action plan which will identify barriers and suggest solutions to accelerate the green economy and reach the goal of creating a 660,000 strong workforce in the region, some of which will be in the hydrogen industry. Figure 7 showcases the interrelationship between the skills required for the hydrogen economy and other key energy skills.

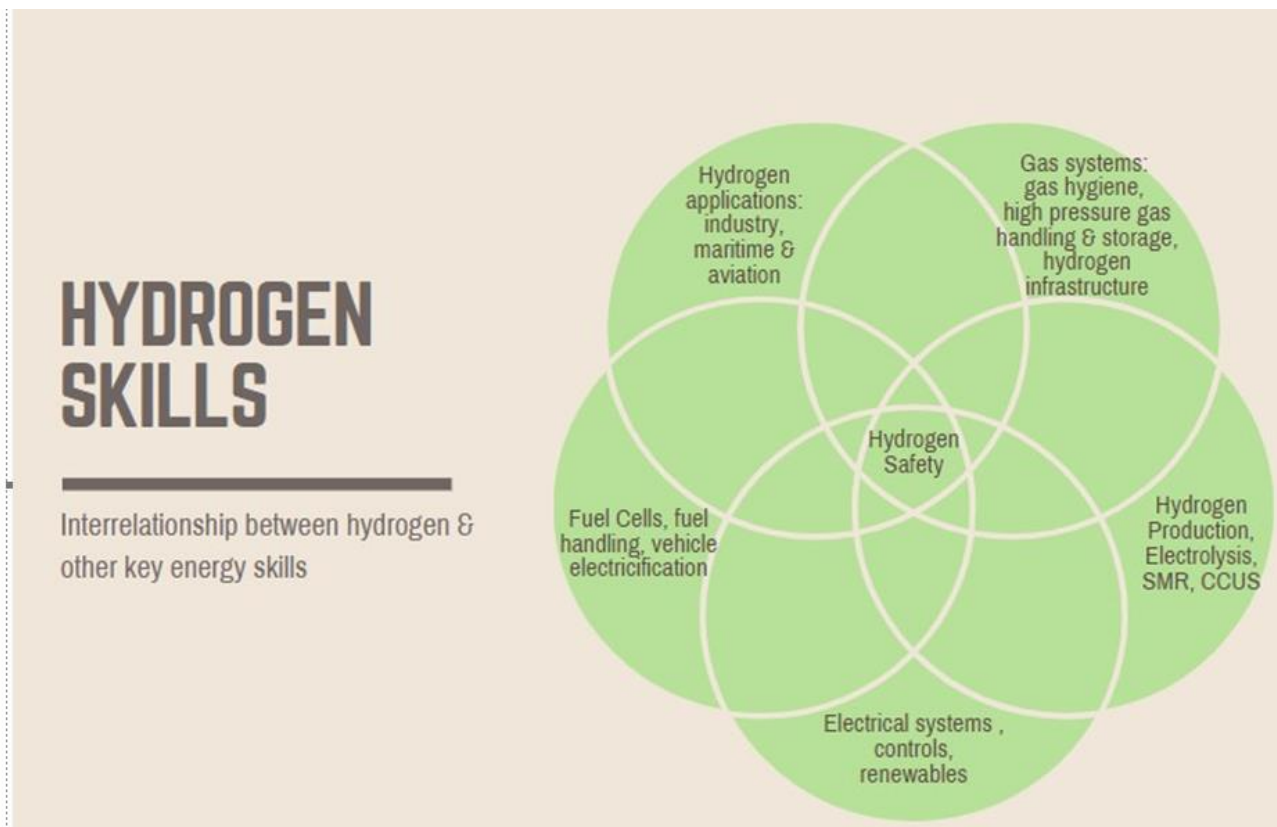


Figure 7 - Interrelationship between hydrogen and energy skills. Imaged credited to Net Zero Associates

Though the region does not have the industrial history of other comparable regions in the UK, it is home to several innovative hydrogen companies, along with two well renowned universities that boast green skills curriculum. The academic collaborations for hydrogen research between local universities and the private sector to date show the region’s forward thinking and flair for innovation. This strength in engineering excellence will need to continue to develop with the evolving hydrogen economy to ensure that local employment is achievable, and opportunities are not missed. Through stakeholder engagements, it was found that for the current level of hydrogen related employment, the skills currently in the region are sufficient for engineering and mid-level roles. The main discrepancy between employer needs and worker availability sits at the entry and senior management level, whereby graduate level workers do not have the hydrogen specific expertise required for technical roles, and management level workers with proven experience in hydrogen technologies are scarce. Companies working in the hydrogen space report that they need to ensure their workforce are highly skilled and experienced before they are comfortable releasing them to work on the new and expensive pieces of equipment. The equipment developed and installed for hydrogen refuelling stations, hydrogen delivery, hydrogen buses and refuse collection vehicles is currently hugely expensive, often still bespoke, and any damage or down time will very likely be hugely costly (potentially not only financially, but also reputationally). Hence skilled professionals are generally preferred over those with junior level expertise and practical experience. For this reason, senior level workers have become a commodity and the market is hugely competitive.

However, graduate level skills were frequently highlighted as a barrier in the region. From conversations with stakeholders, this is generally due to the need for specific expertise such as design and innovation that is not widely included in graduate level courses. Further education employees who come straight from education to the hydrogen industry have a understanding of broader hydrogen related topics but lack the necessary depth of technical knowledge. It was also noted that practical skills within graduate level workers were lacking, and, in some cases, graduate level roles have been deemed unsuitable due to commercial risk of unexperienced hands working on new and expensive technology, as well as finding that Small to Medium Enterprise (SME) companies struggle to dedicate the necessary time to train graduates.

Being a region with SME-size hydrogen companies, it is important that these issues are addressed and resolved to allow the local hydrogen economy to scale-up. In the first instance, aligning hydrogen related courses between higher and further education institutions will tackle any mismatch between course modules

and practical elements. Chichester College has recently developed a hydrogen specific course and attained hydrogen equipment to bring a practical element to the learning. Brighton University have introduced hydrogen modules to pre-existing courses and are looking to develop a dedicated hydrogen course in the coming years. Alignment of these courses would provide a 'skills ladder' that would allow those looking to pursue hydrogen as a career a clear path of qualification. This would require an open communication process between the two institutions to ensure the courses meet the needs of local hydrogen employers and supply a continuous flow of new workers to the local economy that accounts for the retirement rate of workers in the sector and transfer of workers in line with Just Transition. The provision of individual training modules for rapid upskilling of the existing workforce with hydrogen skills may prove preferable to multi-year courses for employers.

The development and roll out of upskilling opportunities should be encouraged, revised, and well-advertised in the coming years to ensure they are well utilised and suit the workers that require it most in the early years.

In addition to the skills required for the hydrogen value chain, councils can be critical to the success of hydrogen installations. Hence of key importance are the skills and strengths that a council possess to support the initial stages of the hydrogen economy in the region. Council planning departments typically do not have good familiarity with hydrogen projects due to the scarcity of such projects and may raise concerns regarding safety elements. Councils could be more proactive, as indeed some are being (such as Aberdeen) by ensuring that all the relevant people from within the planning team are educated about the opportunities identified, safety risks and mitigations, and how such a project might fit into the wider context of the local economy and plans, along with recognising the benefits. There will also be the requirement to ensure the emergency responders, particularly the fire service, are adequately trained for the technology change that will be introduced into the region.

5.3 REQUIREMENTS FOR RESEARCH & INNOVATION INSTITUTIONS

Discussions with research and innovation stakeholders found that they do not require added physical space for their activities or planned activities. However, as the region seeks to encourage more research and innovation organisations, extra commercial space will be required to facilitate them. A research park, along with the improvement of links between academia and local hydrogen businesses would help to provide an affordable, high-quality space and stimulate a culture of knowledge sharing and collaboration. It is expected that there would be insufficient needs for a dedicated hydrogen park, but including provision for safe storage and use of hydrogen when planning any new parks would make them attractive for businesses looking to relocate. Studies have shown that science park companies are able to attract a greater proportion of qualified scientists and engineers and grow faster than similar companies at different locations.

5.4 COUNCIL LEVEL FUNDING OPTIONS

Local authorities and regional Local Enterprise Partnerships have shown interest in COVID recovery and long-term growth through supporting decarbonisation investments. The support rarely explicitly suggests hydrogen as a potential solution. Given how nascent the sector is and the high costs associated with new technology, it is a challenge to attract investors to develop the related infrastructure. Local authorities may be able to facilitate seed investment that would ultimately attract larger private investment. An example could be to commit to investing in transitioning their refuse collection fleet to hydrogen, attracting private developers to invest in supply chain infrastructure to serve the demand. Ensuring this infrastructure is capable of serving other customers will give private sector vehicle owners the option of following such a transition.

Local authorities currently face financial challenges. However, should they wish to invest to support the growth in the hydrogen economy, public sector funding to support developments includes:

- Public Works Loan Board
 - UK government loans to local authorities for capital projects – good rate at the gilt yield plus 0.6%
- UK Infrastructure Bank (Less than £5m)
 - Offers financing to local authorities for economic infrastructure projects across clean energy, waste, water, digital and transport
- Local Climate Bonds

- They are regulated investment products launched by Councils to access cost-effective funding for specific decarbonisation projects, offering local people an opportunity to invest in their area in a way similar to crowdfunding and to make a return from doing so
- Innovate UK
 - Hosts a variety of project calls, many of which centre on decarbonisation and hydrogen, often requiring a commercial and public partner

Monitoring the funding landscape and directing local authorities and private partners to appropriate sources of funding could be a key role for Hydrogen Sussex in future.

As part of this study, a full literature review of the national and regional policies was completed to inform the wider analysis, this review can be found in appendix 1.

6. ROADMAP

For a region to strategically plan toward accelerating economic growth, there must be a clear pathway and direction of focus. By setting goals, a region can implement actions that aid the completion of milestones and better track progress. In turn, a regional roadmap can be compared against nationally set goals and highlight additional areas of opportunity. The strengths and opportunities of the region have informed the goals that the region could strive towards. As part of this study, ten goals are recommended for the region. The goals are realistic, ambitious, and have the potential to unlock economic growth from the hydrogen economy.

Be recognised as a region of engineering excellence

As previously mentioned, the region is already a region of strong engineering excellence. However, while the individual businesses and institutions may be recognised within the industry, their connection to the region may not be. To achieve this goal, the region should direct focus to ensuring university courses remain relevant in the progressive hydrogen market as well as interconnected disciplines such as renewable energies. The promotion of this strength through interregional collaborations (both private and public sector) would contribute to the region being recognised nationally as a region of engineering excellence. Promotion of the region by curation of seminars or events featuring local hydrogen companies and institutions could further this aim.

Be a hydrogen research and innovation hub

The region has the ambition to become a hydrogen research and innovation hub to further cement its place in the national hydrogen economy. Being a nationally recognised research and innovation hub for hydrogen would attract new players to the region and present wider opportunities for interregional collaborations that would stimulate the economy. The ultimate goal should be to have the resources to provide support to external companies where possible and hold unique expertise, such as engineering, that would encourage hydrogen companies to re-locate or set up in the region. As a whole, this would see the region have a wide portfolio of research and innovation activities, projects and organisations.

Increased hydrogen research capabilities

As previously mentioned, the region already has a strong presence of engineering excellence and building on this would create additional opportunities. The uniqueness of innovative hydrogen businesses in the region should be strategically optimised by encouraging and facilitating collaboration between the private sector and academia as much as possible. One example of this could be a joint venture development of a hydrogen testing facility, to enable early supply and safe use of hydrogen, perhaps including the maritime case. These collaborations are mutually beneficial to all parties and would bring additional expertise to the region that would:

- Allow academic institutions to extend their research offering
- Generate additional funds for equipment procurement or upgrade
- Advance in-house hydrogen expertise of the region
- Create cross-sector relationships and encourage additional knowledge sharing
- Attract new players to the region, or encourage interregional collaborations, bringing additional income to the region contributing to economic growth
- Create new high skill job opportunities

In addition, the region could seek to fill a niche gap in the innovative space by creating designated test facilities for innovation, particularly for the marine sector. Test facilities, particularly those for marine technologies (not limited to hydrogen), are scarce across the UK, with many companies forced to travel to test their technologies, increasing costs and timeframes for local technology developers. The presence of such facilities would eliminate this barrier locally, attract new players to the region and generate additional income to the region, and present the region as a strong player in the national hydrogen economy context. The near-term aim should be to support the prominent marine sector in the region by creating designated marine testing facilities to develop a landscape where companies can develop, manufacture, test, and roll out their technology locally. By creating designated test facilities for innovation, the region would host a regional commodity.

Support the first regional hydrogen hub

The region is already working toward this goal due to the ongoing development of Shoreham Port, though planning is still underway for its ambitious hydrogen production plans. Achieving this goal would be a significant milestone for the region and encourage additional off-taker agreements as a result of supply security and potentially, the further growth and cost reduction of local hydrogen production. Councils and Hydrogen Sussex should do everything within their powers to support this project (respecting the boundaries of support to private enterprise), as failure of this early achievable project would be a blow to the hydrogen ambitions of the region. Support could include planning (including the required renewable generation), support identifying offtakers and councils potentially acting as anchor customers, for example for refuse collection vehicles.

Advance more hydrogen hubs

This milestone should see the development of additional hydrogen hubs across the region. The ideal location for such hubs should be determined in the near-term and take lessons learned from the establishment of the first hydrogen hub to accelerate development and maximise success. At this stage, clarity of potential off-takers and confidence in businesses with potential for hydrogen applications should be achieved to ensure off-taker security.

Become a hub for green skills

Green skills are skills that are required to support a sustainable society. These skills are diverse and non-exhaustive, ranging from research to implementation. For a region to become a green hub, it must have the required skills to attain such a reputation. By drawing on the experience of innovative businesses and the education sector, the region has the ambition to become a nationally recognised green skills hub and should aim to develop the required skill sets in the near term. For hydrogen, many of these skills will be present but require an element of upskilling or retraining for those already in an interconnected industry such as engineering. Presently a region of engineering excellence, a key focus should be toward the facilitation, utilisation, and roll out of hydrogen specific courses, upskilling opportunities and academic collaborations between academia and the private sector. In the near-term, the region should aim to be self-sustaining for internal employment of hydrogen jobs and further develop to become a region that others are attracted to for its unique employment opportunities within the hydrogen economy. Whether that be to attract high skills workers to the region for its unique opportunities or attract students from all over the UK to study at a local university, this strength will stimulate not only the local hydrogen economy but also the wider economy.

Developed hydrogen skills ladder

A symbiotic relationship within the education sector is a crucial element to ensure the skills landscape of a region is well suited to the needs of the industry. For the region, developing a strong communication base between higher education and further education institutions will ensure the alignment of course relevance. The ultimate goal will be to develop a hydrogen skills ladder that creates a clear pathway for those wishing to pursue a career in hydrogen and create a sufficient flow of skilled workers into the local industry.

The region has a particular strength in engineering excellence, however, further developing and showcasing this strength will emphasise the region as a valuable player within the national hydrogen economy and unlock additional opportunities at a local and national scale.

Have defined planning policies

Defining hydrogen specific policies will be a key aspect to unlocking the region's potential for hydrogen roll out. For this reason, the region should clearly define hydrogen-specific planning policies, including linking them to the enabling renewable generation, and ensure they are clear to stakeholders. This could include identifying areas for wind and solar to support hydrogen development in the Local Plan. These policies should be

separated from other fuels where possible, and where overlaps are present should be clearly explained to avoid confusion and consequent delays.

Capacity building for planning officers

This goal will play an essential role in accelerating the hydrogen economy in the near-term by educating planning officers in not only how to frictionlessly review and process hydrogen project applications, but also inform the staff of the wider economic benefits that hydrogen could bring to the region. These workshops should inform planning officers of best practices, ensure adequate knowledge of the technologies, and ways in which the development application can improved and made more efficient to expedite project development across the region.

Eliminate barriers in enabling infrastructure, to enable an attractive environment for investment in hydrogen production and use

The production and use of hydrogen is dependent on infrastructure owned and operated by a number of different utilities, such as the electricity grid, water and potentially gas. Hydrogen Sussex and the regional local authorities should identify likely local sites for hydrogen and work with the relevant utilities and planning authorities to identify and minimise constraints and connection costs. This will enable investors to rapidly develop hydrogen projects on these sites.

6.1 ROUTE MAP OF GOALS

Based on the preceding sections, the route map below displays each goal in its targeted timeframe and have been categorised into relevant strategic areas.

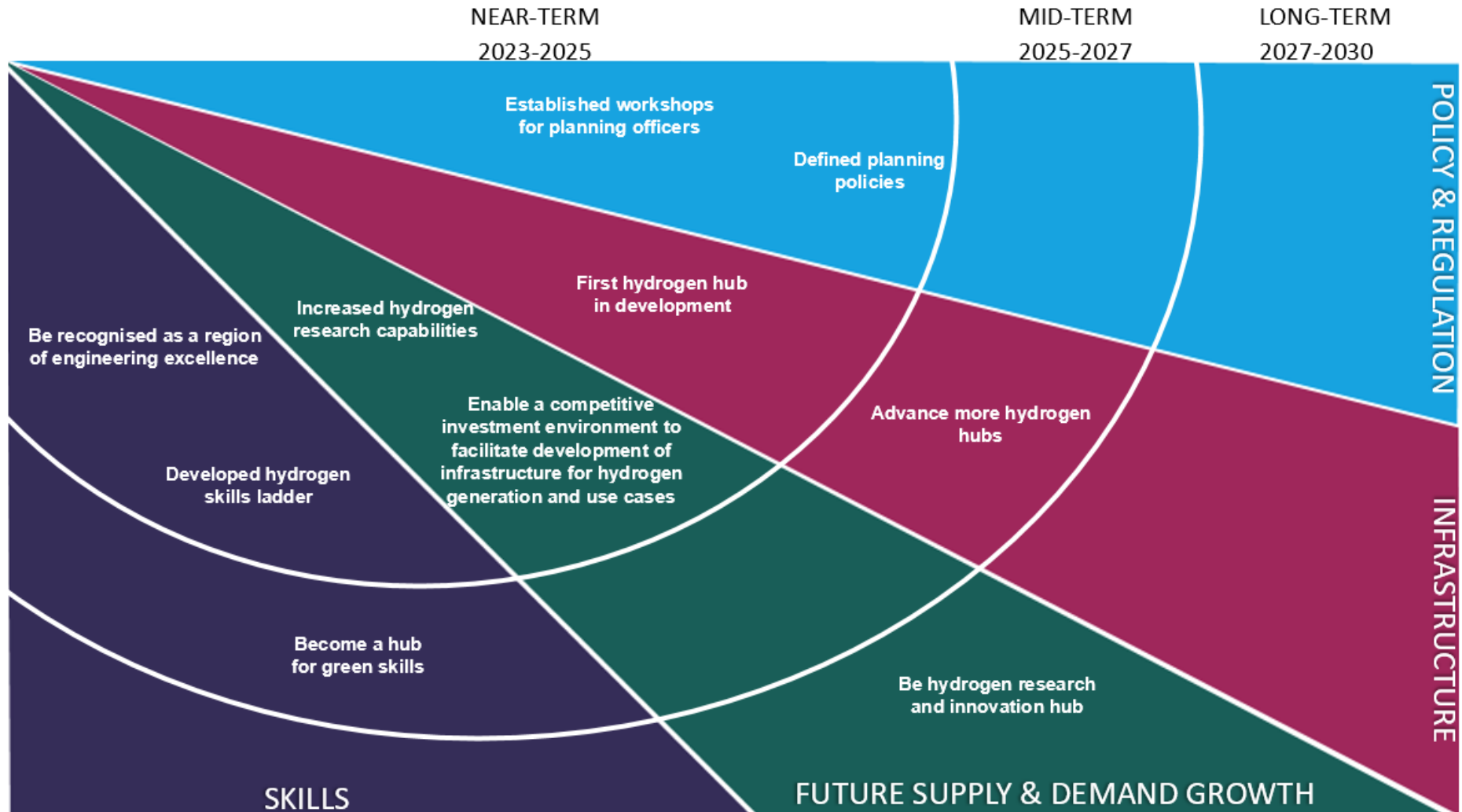


Figure 8 – Route map of goals associated with strategic themes





6.2 ACTION PLAN

In order to accelerate economic growth and aid the success of the local hydrogen economy, 42 actions have been recommended. These actions, though some more substantial than others, will each positively impact the local hydrogen industry and create a pathway for economic growth. These actions were informed by the impact chart along with additional analysis of the region itself and potential opportunities.

6.3 NEAR-TERM 2023-2025 ACTIONS

The table below displays the actions to be undertaken in the near-term. The suggested owners are as follows.

● Hydrogen Sussex
 ● Public Sector
 ● Private Sector
 ● Academia
 ● Utilities
 ● All

| POLICY & REGULATION | SKILLS | INFRASTRUCTURE | FUTURE SUPPLY & DEMAND GROWTH |
|---|--|--|---|
| Review planning policies to give clear hydrogen-specific guidelines for planning applications  | Facilitate industrial and commercial sector & academic sector collaboration  | Feasibility study to identify the most crucial infrastructure required for initial scale up  | Assessment of the individual business case for local manufacturing of hydrogen technology  |
| Understand and prepare for potential public opposition to and concerns about hydrogen developments  | Promote and develop the research and innovation capabilities of the region to increase collaboration capacity and create more jobs  | Undertake study to identify where enabling infrastructure is required, for Hydrogen generation, distribution, storage, and enabling. For example, brownfield / industrial zone land, land close to electrical infrastructure, port access, grid capacity  | Map potential local off-takers  |
| Upskill public authority employees to recognise the wider hydrogen opportunity to cut carbon emissions as part of energy transition  | Create a support knowledge sharing environment  | Initial investment in supply to build capacities and deploy planned hydrogen projects  | Explore opportunities for inter-regional off-taker agreements, including near hydrogen clusters, ports, export options, supply chain  |
| Provide public information and consultation sessions on hydrogen safety to alleviate protest around planning applications for hydrogen projects  | Secure technical support to regional SMEs to gain funding to extend their hydrogen services/utilisation, creating more jobs and upskilling opportunities  | Dialogue between HS and LAs to alleviate conflict between planning and infrastructure requirements  | Identify opportunities for local authorities to stimulate the local hydrogen economy by becoming an anchor demand  |
| Encourage and support the creation of incentives to alleviate the socio-economic impact of the energy transition  | Support the development of engineering-specific upskilling opportunities, programmes and internships to encourage uptake and attract more skilled workers to the area  | Host educational sessions to inform stakeholders of infrastructure requirements for hydrogen uptake in business plans  | Investigate potential for import of hydrogen or derivatives to Sussex region, particularly via seaports and from neighbouring areas such as Kent, Portsmouth etc, to increase availability of H2 in medium term.  |
| Local authorities to lobby national governments to encourage the required policy introduction and amendments for hydrogen economy growth transition, especially on vulnerable and disenfranchised citizens  | Host educational sessions to inform local businesses of assets that can be converted to hydrogen using existing infrastructure and supply chain opportunities  | Knowledge sharing of best practices  | Communications - Publish case studies + news items on successful projects to raise awareness locally and nationally of action in Sussex  |
| Map potential test sites, with particular focus on marine testing facilities  | Identify and map the skills gaps of the region*  | Ongoing engagement with water utilities to address demand for water for hydrogen production, including costs and alternative solutions such as desalination, non-potable water, etc*  | Develop strong links between H2 development and industrial decarbonisation, especially high-emitting manufacturing sites, to identify and progress decarbonisation opportunities, including low-carbon H2  |

| | | | |
|--|---|---|---|
| <p>Information sharing regarding amendments to hydrogen regulation*</p> <p style="text-align: center;">●</p> | <p>Regular forecasting of future skills demand and review educational opportunities accordingly*</p> <p style="text-align: center;">● ●</p> <p>Encourage open and continuous communication between FE and HE institutions to ensure alignment of hydrogen related courses, addressing regional skills gaps*</p> <p style="text-align: center;">● ●</p> <p>Assist universities in attracting research funding, especially in partnership with industry. For example: Setting up H2 innovation challenges and research groups across local research institutions; mission-oriented partnerships for developing specific local capabilities; H2 innovation asset catalogues and showcases; establishing interdisciplinary and international research projects and partnerships*</p> <p style="text-align: center;">● ●</p> | <p>Ongoing engagement with gas suppliers and infrastructure owners on potential for blending, storage, and future investment needs*</p> <p style="text-align: center;">● ●</p> <p>Ongoing engagement with electricity suppliers to address electricity supply constraints (including renewable electricity), costs, and investment forecasts. Evidence areas where additional electrical capacity is needed to facilitate hydrogen projects*</p> <p style="text-align: center;">● ● ●</p> | <p>Secure low-cost support with funding applications to enhance competitiveness*</p> <p style="text-align: center;">● ●</p> <p>Support with funding insights, including niche funding opportunities for innovation, research and place-based*</p> <p style="text-align: center;">●</p> <p>Facilitate open communication between producers, suppliers, and potential demand*</p> <p style="text-align: center;">●</p> <p>Incorporation of hydrogen into commercial and industrial business ESG strategies*</p> <p style="text-align: center;">● ●</p> <p>Forecast near-term production volumes to assess the suitability to individual demand requirements*</p> <p style="text-align: center;">●</p> <p>Knowledge sharing of best practices, business models, innovative equipment, etc*</p> <p style="text-align: center;">●</p> <p>Commission a study into the costs associated with the key actions in this plan</p> <p style="text-align: center;">● ●</p> |
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Table 4 - Recommended short-term actions

6.4 LONG-TERM ACTIONS

The table below displays the actions to be undertaken in the long-term. The suggested owners are as follows:

● Hydrogen Sussex ● Public Sector ● Private Sector ● Academia ● Utilities ● All

| POLICY & REGULATION | SKILLS | INFRASTRUCTURE | FUTURE SUPPLY & DEMAND GROWTH |
|---|---|--|---|
| <p>Information sharing regarding amendments to hydrogen regulation*</p> <p style="text-align: center;">●</p> <p>Implement designated research sites for shared use for those in the region and further afield to attract new players to the region</p> <p style="text-align: center;">●</p> | <p>Identify and map the skills gaps of the region*</p> <p style="text-align: center;">● ●</p> <p>Regular forecasting of future skills demand and review educational opportunities accordingly*</p> <p style="text-align: center;">● ●</p> | <p>Ongoing engagement with electricity suppliers to address electricity supply constraints (including renewable electricity), costs, and investment forecasts. Evidence areas where additional electrical capacity is needed to facilitate hydrogen projects*</p> <p style="text-align: center;">● ● ●</p> | <p>Secure low-cost support with funding applications to enhance competitiveness*</p> <p style="text-align: center;">● ●</p> <p>Support with funding insights, including niche funding opportunities for innovation, research and place-based*</p> <p style="text-align: center;">●</p> <p>Knowledge sharing of best practices, business models, innovative equipment, etc*</p> <p style="text-align: center;">●</p> |

| | | | |
|--|---|---|---|
| | <p>Assist universities in attracting research funding, especially in partnership with industry. For example: Setting up H2 innovation challenges and research groups across local research institutions; mission-oriented partnerships for developing specific local capabilities; H2 innovation asset catalogues and showcases; establishing interdisciplinary and international research projects and partnerships*</p> <p style="text-align: center;">● ●</p> <p>Encourage open and continuous communication between FE and HE institutions to ensure alignment of hydrogen related courses, addressing regional skills gaps*</p> <p style="text-align: center;">● ●</p> | <p>Ongoing engagement with gas suppliers and infrastructure owners on potential for blending, storage, and future investment needs*</p> <p style="text-align: center;">● ●</p> <p>Ongoing engagement with water utilities to address demand for water for hydrogen production, including costs and alternative solutions such as desalination, non-potable water, etc*</p> <p style="text-align: center;">● ● ●</p> | <p>Facilitate open communication between producers, suppliers, and potential demand*</p> <p style="text-align: center;">●</p> <p>Incorporation of hydrogen into commercial and industrial business ESG strategies*</p> <p style="text-align: center;">● ●</p> <p>Forecast near-term production volumes to assess the suitability to individual demand requirements*</p> <p style="text-align: center;">●</p> <p>Continue to progress hydrogen innovation and related engineering and research capabilities to demonstrate the region as a national player Create resources and support schemes to turn research and novel ideas into commercial projects</p> <p style="text-align: center;">●</p> |
|--|---|---|---|

*Actions that span across near-term and longer-term

Table 5 – Recommended long-term actions

7. SUPPORTING STRUCTURES & NETWORKS

7.1 HYDROGEN SUSSEX'S POTENTIAL ROLE

Hydrogen Sussex's role as defined by GBEB is to support the development of a low carbon hydrogen economy across Sussex. Conversations with stakeholders have formed suggestions on Hydrogen Sussex' activity that would forward that objective. The activity follows four distinct themes: Informing, convening, technical support, and monitoring.

Informing

Hydrogen supply stakeholders have revealed that finding committed off takers is one of their most significant challenges. Furthermore, the Hydrogen Council's "Hydrogen Insights 2022" report states that policy makers need to enable demand visibility to forward implementation projects (Hydrogen Council, 2022).

Hydrogen Sussex is uniquely placed with the right contacts and knowledge to inform regional demand visibility. Supply stakeholders informed Ricardo that keeping track of UK activity through their own mapping has been a part of their prospecting process. By Hydrogen Sussex taking ownership of that process, they will be providing value to suppliers, reducing their burden and giving them confidence in the information they have in the region.

Demand visibility is not the only way to add value through signposting. Other valuable points of interest to signpost could include:

- Relevant research activity;
- Large scale renewable energy plants;
- Energy distribution infrastructure;

- Sustainable water sources; and
- Hydrogen-related service providers.

University of Sussex have expressed that they can support this activity through their internal expertise for complex mapping.

Education

Hydrogen is an emerging sector in energy decarbonisation. Hydrogen Sussex can help to educate others and build capacity amongst policymakers and potential demand users. Well-informed people can be empowered to make decisions with confidence. The education could aim to:

- Share the basics around hydrogen and how it differs to fossil fuels
- Share where it is best placed as a solution and promote other green energy alternatives
- Break misconceptions around hydrogen safety but be clear about the risks
- Share experience on lessons learnt from member experiences

Activity sharing

Stakeholders have seemingly low visibility of hydrogen activities in the region. Sharing hydrogen activity by inviting guest speakers to talk about their experiences and capability could help develop business partnerships or a collaborative take on solutions to problems.

Not everyone will be able to attend Hydrogen Sussex meetings and so a quarterly (or more regular) newsletter would allow people to stay up to date and track activity.

Fund tracking

Some stakeholders reported that they find the UK government funding landscape difficult to keep track of. Flagging funds before and when they are open will give stakeholders sight of the opportunity and time to prepare. For more broad reaching funds, the flagging should also be clear about how the fund could be used to benefit a local hydrogen economy.

Convening & Lobbying

Hydrogen Sussex can help to create a stakeholder network conducive to business collaboration or advancing local projects from development to implementation. Hydrogen Sussex could be a touch point into the region for new entrants to the local hydrogen market who might be seeking to establish new contacts who they can do business with. Examples of ways Hydrogen Sussex could add value through ad-hoc convening:

- Introducing prospective supply and demand stakeholders to one another to establish supply agreements
- Guiding demand stakeholders to infrastructure and equipment providers that can enable their transition. Hydrogen Sussex could prioritise introducing stakeholders to local providers that contribute to the economic growth of the region before recommending providers further afield.
 - Introducing engineering technology companies who may be seeking to collaborate

Hydrogen Sussex can influence government for the benefit of stakeholders in need of support. Hydrogen Sussex could act as an agent for the local hydrogen economy bringing attention to the success and opportunities and lobbying to remove barriers at the national level to enable further growth.

Technical Support

Hydrogen suppliers are seeking to aggregate customers that will allow them to meet their minimum commercial viability threshold. Potential customers are unsure of their path to decarbonisation, and this is making it difficult for suppliers to find customers that are committed. Developing business cases for potential end users would inform them of their options, provide confidence in their solution and potentially commit them to become a future hydrogen demand.

There will be a cost associated with developing a flexible model that can calculate a robust business case. The model could be reused with updated data at the time of applications so there is just one larger upfront cost and smaller costs thereafter.

University of Sussex expressed interest in being able to support the development of business cases.

HS could provide technical support to demand users prospecting hydrogen as a decarbonisation option. This would be particularly relevant to supporting users without an energy background. An example could be supporting a potential hydrogen user through a funding application or conducting a market assessment of hydrogen technologies.

Monitoring

The UK government will be setting a framework to monitor and evaluate the development of the hydrogen economy in line with its targets. Hydrogen Sussex could copy the same framework where feasible. This would allow Hydrogen Sussex to report their success in a familiar manner to the government which may aid in lobbying efforts. Metrics to be tracked could include:

| Theme | Example metrics |
|-----------------------|--|
| Overall benefits | <ul style="list-style-type: none"> • Deployment of hydrogen in capacity • GVA added to local economy • CO₂ reductions from hydrogen • Public awareness statistics |
| Supply chains | <ul style="list-style-type: none"> • Number and turnover of companies active • Number and turnover of companies engaged by initiatives |
| Jobs & skills | <ul style="list-style-type: none"> • Number of different types of jobs in sector • Number of people trained in sector • Funding provided for skills development |
| Exports & investment | <ul style="list-style-type: none"> • Exports value • % of companies exporting • Inward investment figures |
| Research & Innovation | <ul style="list-style-type: none"> • Funding won for research & innovation • Patents secured |

Table 6 – Example key performance indicators that could track regional progress

7.2 FUNDING MODELS

Hydrogen Sussex aims to be a self-sustaining organisation focussed on supporting the growth of hydrogen in the region by various means. This is not expected to include owning or operating any facilities, but as shown below, there are some public and commercial approaches to achieving that remit.

We have conducted analysis of the business models of other successful organisations to assess which Hydrogen Sussex could replicate. Four models were identified. Interestingly most organisations were driven by the private sector. Organisations that started from public sector funding remain on it which presents a risk to their longevity. A private sector approach bears risks of not accruing enough revenue to remain self-sustaining and may require aligning objectives with customers rather than the greater good of the region.

We reviewed several organisations and their business models including the Carbon Trust, the Energy Savings Trust, Hydrogen UK, Solent Cluster, UK Hydrogen Fuel Cell Association, Hydrogen East and Thames Estuary.

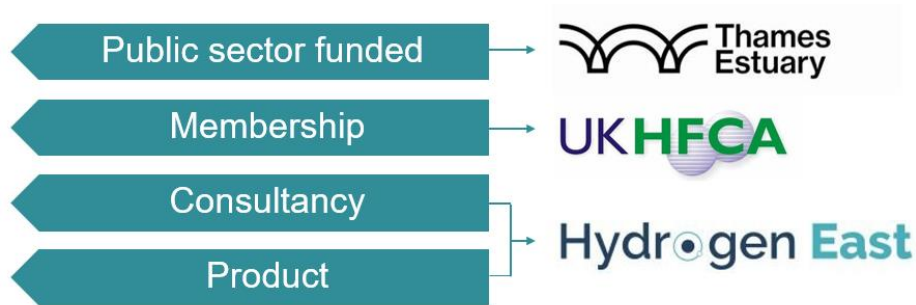


Figure 9: Example organisations in the hydrogen sector and their funding models

Public funding

Thames Estuary are an organisation who received central government funding as a result of the positive action they are having in their region. Their funding is for a certain number of years and therefore is not self-sustaining. However, it is a low initial risk funding model that organisations like Thames Estuary have shown is achievable. They are expected to support a wide variety of hydrogen economy interactions within the region. The main purpose of the funding is to provide an informing and convening role in the region to develop conducive partnerships

Membership

The UK Hydrogen Fuel Cell Association is an example of an organisation that are funded by their members’ subscriptions. Under this model the organisation is expected to find a way to consistently maintain a programme of value to all its users who will have diverse needs. The price point needs to be correct to attract members whilst maintaining income.

Consultancy

Hydrogen East are an example of a hydrogen entity who utilise the consultancy private funding model. They contract public sector and private sector concept and feasibility work to operate as a profit-making business. Their expertise is in their regional insight that is important for new entrants into the area.

Carbon Trust and the Energy Savings Trust are also consultancy models, but the former is a not-for-profit specialising in public sector carbon savings. Being a not-for-profit allows them to charge lower prices than for-profit competitors. The latter is a “profit for purpose” organisation which grows to serve its mission in addressing the climate emergency.

Product

Hydrogen East have an online GIS mapping product that contains over 100 layers of data showing information such as: where energy infrastructure exists; where energy consumption centres are; where the largest carbon emitters exist and where environmental factors could present project risks. Hydrogen East have understood the importance of the geographical factor behind hydrogen and the opportunity for their region to become a hydrogen exporter. They have crafted a solution that makes it easy for new entrants to quickly discover suitable locations for projects.

Analysis

The suitability of the funding models have been assessed against the recommended role of Hydrogen Sussex in the table below.

| Services | Consultancy | Membership | Product | Public funding |
|-------------------|-------------|------------|---------|----------------|
| Signposting | | X | X | |
| Education | X | X | | X |
| Activity sharing | | X | | X |
| Fund tracking | | X | | X |
| Convening | | X | | X |
| Business cases | X | | X | |
| Technical support | X | | | |

Table 7 – Services provided to the industry by supporting players against income models

All potential services do not fit under any one business model due to their level of effort or breadth of beneficiary. The public sector funding model has significant benefits in removing start-up risks and provides time for the organisation to grow into its role and demonstrate its value. This could be useful for a base income before a transition into the membership model once a user-base is established.

A membership model would be able to fund a lasting role for Hydrogen Sussex. Unlike public funding, Hydrogen Sussex would be expected to publicly demonstrate its value to its members on an ongoing basis whether this is through communicating to them through activity sharing, fund tracking or updated signposting.

Considering their overlap in services, a split between the two income methods may be appropriate. Part fulfilling with incomes needs with membership fees may assist in evidencing to central government the value Hydrogen Sussex is providing to its members.

There may be value in developing products around signposting or calculating replicable business cases that users pay a one-off charge or a subscription fee for access. However, the need must be sufficient enough to warrant the capital investment into the product and ensure it is recovered.

Ad-hoc support for business cases and technical support are unlikely to facilitate the needs of all members, therefore, they should be provided under bilateral consultancy terms.

8. CONCLUSIONS

The region has already broken ground in the hydrogen industry. The plans for a multi-MW electrolysis plant at Shoreham Port could act as a catalyst for growth in hydrogen across the region. Home to several hydrogen technology companies, the region has a strong capacity for innovation, that if supported, could be developed to expand its engineering excellence and allow the region to stand out within the UK hydrogen landscape. As an environmentally conscious area, it was found that local public authorities share the ambition to become a key hydrogen player and are actively participating in activities that will aid this ambition. In the near-term, this focus will be crucial to ensure the region does not miss its opportunity.

The cross-sector collaboration required to successfully complete various actions listed with the action plan will be key to the region's success. There are already strong existing relationships between sectors, evidenced by the extensive membership portfolio of Hydrogen Sussex, in turn showcasing the regions ambition to accelerate the local hydrogen economy.

In the early years, prioritising actions that contribute to alleviating the three main barriers experienced by stakeholders will ensure that resources are utilised in the most impactful way. These barriers are infrastructure, policy and regulation at local level, and demand visibility. Focus should be placed on building the region's current strengths, continuing to develop its engineering excellence, being proactive and ambitious in the innovation space, and ensuring that the current academic excellence evolves with the hydrogen economy.

By tracking progress against the route map of goals, the region will ensure it stays on track to reach each milestone. Ricardo recommends this route map be regularly revised to reflect progress and future ambitions that arise from success.

In summary, with the correct focus and collaboration, the region has real potential to stand out within the UK hydrogen landscape and gain economic benefits from hydrogen.

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10. APPENDICES

Appendix 1 National funding analysis

1.1 Net Zero Hydrogen Fund

The Net Zero Innovation Portfolio (NZIP) includes the £240m Net Zero Hydrogen Fund (NZHF) which was designed to provide grant funding and a hydrogen business model (HBM) to encourage private sector investment out to 2025. The HBM includes a revenue support mechanism with a twin track approach to provide individual attention to the needs of green hydrogen against blue hydrogen. There are four funding strands

- Strand 1: DEVEX support for FEED studies to grow the pipeline of hydrogen projects with up to 50% co-funding support. Access to this support closed on 23rd of June 2022.
- Strand 2: to provide up to 30% CAPEX co-funding support for projects that do not require revenue support. These are more likely to be smaller electrolytic projects that interact with the Renewable Transport Fuel Obligation. Access to this support closed on 13th of June 2022.
- Strand 3: for HBM projects electrolytic allocation windows. These projects can access up to 20% CAPEX support and the revenue support mechanism. Access to this support is available at the time of writing:
 - The first window recently closed on the 12th of October 2022. It aims to support at least 250MW of production capacity. The first contracts are expected to be in place early 2023
 - The second window will open in 2023 and aims to support further production capacity to stimulate a total of 1GW of electrolytic hydrogen in construction or operation by the end of 2025.
- Strand 4: for HBM projects that are CCUS enabled and are part of the phase 2 cluster sequencing process. These projects can access CAPEX support and the revenue support mechanism. Access windows for this support have yet to be announced but are not expected to be relevant to the region.

Projects taking advantage of the HBM need to meet the Low Carbon Hydrogen Standard to be eligible. Adhering to the standard requires producing hydrogen below a threshold of 20 gCO_{2e}/MJ_{l_{h_v}.}

Other completed supply funds (which could indicate potential future funds) included:

- The £33m low-carbon hydrogen supply competition which funded 5 projects providing low carbon bulk hydrogen supply solutions.
- The £60m low-carbon hydrogen supply 2 competition which funding to 28 projects. £6m went towards 23 projects to conduct feasibility studies on innovative hydrogen supply solutions. 5 projects went on to receive £38m of funding to support physical demonstration of the solutions.

1.2 Renewable Transport Fuel Obligation

The Department for Transport (DfT) have their own subsidy scheme called the Renewable Transport Fuel Obligation (RTFO). The RTFO requires any suppliers of 450,000 litres or above to provide a volume of sustainable renewable fuel, calculated as a proportion of the total fuel they supply. The RTFO was initially designed to incentivise the uptake of biofuels but has since evolved to incorporate new fuels such as renewable hydrogen. The RTFO covers fuel supplied for use in:

- Road vehicles
- Non-road vehicles, including inland waterway vessels that do not operate at sea
- Tractors
- Recreational craft that do not operate at sea

Suppliers can meet their obligation under the RTFO in two ways; by paying an annual fixed sum for each litre of fuel they wish to 'buy out', or through selling qualifying fuel that RTFCs. RTFCs are certificates that can be exchanged, traded and sold. Any company that supplies development fuel is eligible to claim RTFCs and sell them on the open market to companies who need them to meet their obligation.

Under the policy, hydrogen is classified as a 'development fuel'. As a development fuel, hydrogen is rewarded with RTFCs equivalent to double its relevant multiplier (4.58), meaning for each kilogram of hydrogen, at the current RTFC value, the supplier would be awarded 9.16 RTFCs. Suppliers may trade RTFCs on the open market, the value of these RTFCs fluctuates. Between 2020 and 2021 development fuel RTFCs were traded

between 70-73 pence per certificate, comparative to a buyout value of 80 pence. These certificates act as an incentive for businesses to produce clean fuels and act as a subsidy for production costs.

This represents an ongoing opportunity for hydrogen for transport suppliers that can be utilised at any time. However, the RTFC price may fluctuate and decrease in the longer term as more renewable fuels are brought to market.

1.3 Industry

The government is focussing on decarbonisation of industrial clusters in the UK that together have the largest amount of greenhouse gas emissions. The government believes that these should be the test beds for industrial decarbonisation with hydrogen. All other locations are considered “dispersed” industrial sites, which includes industry based in Sussex. The government’s plan shows that widespread fuel switching across dispersed sites is not expected to begin until 2029. Near term access to hydrogen for dispersed sites is expected to come from dedicated pipelines connected to large scale hydrogen production hubs or from local electrolytic production, either on-site or transported by road from relatively local production. The government has been providing funding to support with this transition:

- £315m Industrial Energy Transformation Fund was supporting the uptake of energy efficiency and low-carbon technologies, including hydrogen technologies. Support was provided for feasibility, engineering studies and the capital support for first movers upgrading their equipment. Phase 1 was in 2020 and allocated £70m in funding. Opportunities to apply for the remaining funding in phase 2 which closed in April 2022.
- As part of the 2017 Clean Growth Strategy, a £20m Industrial Fuel Switching Competition was launched. It was a 3-phase competition, initially beginning with research and then competitions for demonstrator projects. The funding aimed to stimulate early investment in fuel switching processes and technologies.
- As part of the NZIP, a new £55m Industrial Fuel Switching 2 Competition was launched, aiming to support the development of fuel switching and fuel switch enabling technologies for UK industry.
- The £26m NZIP Industrial Hydrogen Accelerator Programme aimed to identify, support and then develop credible integrated hydrogen production and fuel switching systems to bring about a step change in understanding and the rate of future deployment to support the achievement of Net Zero by 2050.
- The £10m Green Distilleries Fund provides funding to distilleries across a range of solutions including hydrogen.
- The £40m Red Diesel Replacement Competition provided funding to the development and demonstration of innovative technologies in the Non-Road Mobile Machinery sector used for quarrying, mining and construction.

Throughout the early 2020s, the government will also be supporting the engineering and technical design elements of decarbonisation projects across the UK’s industrial clusters through UKRI’s Industrial Decarbonisation Challenge.

1.4 Heating

Domestic heating

The government recognises that heat electrification is the most efficient decarbonisation solution and aims to encourage the installation 600k heat pumps per year by 2028. However, they have left open the option of whether or not to pursue hydrogen for heating and plan to make a major decision on their approach to it by 2026. In the meantime, they are generating further evidence on the costs, benefits, safety, feasibility, air quality impacts and consumer experience of using low carbon hydrogen for heating relative to more established heating decarbonisation technologies. The following are key milestones leading to the decision:

- Conduct a hydrogen for heating neighbourhood trial by 2023. The development of this activity is already underway in Levenmouth in Fife and aims to provide hydrogen to 300 homes for heating and cooking.
- Conduct a hydrogen for heating village scale trial by 2025.

- By 2025, develop plans for a possible hydrogen heated town that would be implemented by the end of the decade.
- By 2026, make a major strategic decision on the role hydrogen has to play on decarbonising heat in buildings in the UK.

Blending

In parallel to the above the government is assessing the use case of blending up to 20% volume of hydrogen into the existing gas network by late 2022 and aim to make a final policy decision by late 2023. Blending 20% hydrogen only decarbonises the gas network by 7% due to the low energy density of hydrogen compared to natural gas. However, the key strategic benefit could be the facilitation of an early use case for hydrogen providing a “oftaker of last resort” to suppliers that would reduce the project risk and help get projects to a final investment decision. Blending projects HyDeploy and FutureGrid are providing safety demonstrations on blending and are expected to conclude in 2023. A comprehensive value for money assessment is required to assess the costs and benefits.

1.5 Road transport

Since 2017 the government has been supporting hydrogen use in transport with a £23m Hydrogen for Transport programme. This project led to the design and development of refuelling sites in the UK, one of which was based on Crawley, however the site was not developed further.

Bus

On the 15th of March 2021, the Department for Transport released the national bus strategy for England which discussed the Zero Emission Bus Regional Areas (ZEBRA) scheme. Since then, it has provided funding of £198 million this year and £70 million last year to enable the acquisition of 1,278 new zero-emission buses. The fund is committed to delivering 4,000 new zero emission buses so future rounds are expected.

Road freight

In 2021-22, UK government has invested about £20 million for trials for electric road system and hydrogen fuel cell based heavy goods vehicle.

1.6 Shipping

The NZIP included a £20m Clean Maritime Demonstration Competition to develop maritime technology. The fund ended up allocating £23m to 55 feasibility studies and technology trials. This was followed by a short-notice second round that awarded a further £15m to 31 projects. The third and final round allocates £60m of funding for technology and system demonstrations.

1.7 Non-road mobile machinery

The red diesel replacement programme funded under NZIP aims to increase the technology readiness level of alternatives to red diesel for the off road, mining and construction industries. Many of the projects underway include hydrogen supply and use.

1.8 Aviation

The government has established various funding mechanisms with the aim to decarbonize the aviation sector and deliver zero emission flights. They released their Jet Zero Strategy in 2022 to deliver net zero aviation by 2050. In it they pledge £685m over three years for UK aerospace research and development through the Aerospace Technology Institute programme.

In 2021 the government launch a Green Fuels Green Skies competition providing £15m to support the development of the emerging Sustainable Aviation Fuels (SAF) sector. In the Jet Zero Strategy they offered a further £180m of new funding over three years until 2025. Lastly, £1m is going to support the delivery of the first net zero transatlantic flight.

1.9 Energy Storage

The NZIP funded, £68m Longer Duration Energy Storage Demonstration Competition (LODES) was designed to find ways to store low carbon power generation for longer periods of time to help in managing the natural variation in output of renewable energy. The funding excludes widely deployed technologies including lithium-ion batteries and water storage. The fund was in two streams. The first was for actual demonstration in operational environments. The second was for prototype demonstration to develop first-of-a-kind energy storage prototypes. Both streams have awarded their funding to successful applicants.

Appendix 2 National policy

The government has been developing policy and funds at a national level to support the hydrogen economy. The UK hydrogen strategy, published in August 2021. Describes the ambition for the country and the actions taken to support it. It interlinks and adds upon other national strategies to focus on hydrogen as an energy vector for a wide variety of sectors. The most significant support has been funding targeted at supporting industrial decarbonisation and growing the hydrogen supply market.

The largest funding package was announced in the Prime Minister’s 10 point plan for a green industrial revolution in November 2020. It provides ongoing revenue support for hydrogen producers to bring down the cost of hydrogen to make it competitive with oil fuels and thereby more accessible for users. The second most significant funding measures are to help industry to decarbonise through new technologies with hydrogen being a leading solution. Other funding is based around innovation competitions that give one-off opportunities to further decarbonisation amongst end users. These are often open to a mix of solutions.

The £1 billion Net Zero Innovation Portfolio (NZIP) which was announced in late 2020 in the Prime Minister’s 10-point plan for a green industrial revolution. The funding allocation aims to accelerate the commercialisation of low-carbon technologies, systems and business models in power, buildings, and industry. One of the priority areas was Driving the Growth of Low Carbon Hydrogen by targeting 5GW of production capacity by 2030 (updated to 10GW in the energy security strategy).

Alongside supply, the NZIP references exploring hydrogen solutions in energy storage, transport and heat. It is also interlinked with investments in Carbon Capture, Usage and Storage which would enable blue hydrogen production.

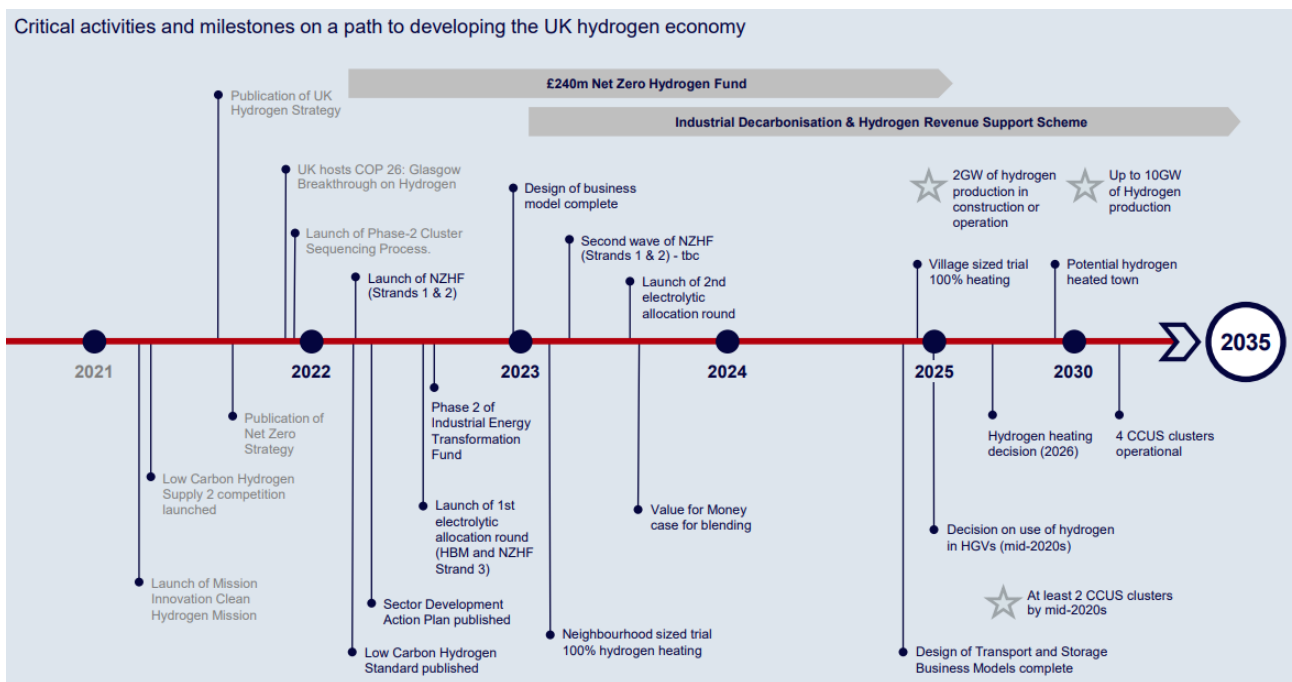


Figure 10: Critical activities and milestones in the UK’s roadmap for a hydrogen economy (UK Department for International Trade, 2022)

Appendix 3 Regional policy

2.1 Energy South2East

In 2017 BEIS funded all Local Enterprise Partnerships to develop local energy strategies (LES). Coast to Capital, Enterprise M3 and Southeast worked together to set a vision for energy provision across the regions. They produced their strategy in 2019 that gave 18 project models across five priority themes: low carbon heating; energy savings and efficiency; renewable generation; smart energy system; and transport revolution. We identify that hydrogen can interrelate with 7 of the 18 project models described by the LES:

- District heat networks
- Hydrogen injection into the natural gas grid
- New-build homes on hydrogen grid
- Offshore wind development
- Solar on landfill sites
- EV charging and hydrogen refuelling infrastructure
- Ports – modernisation of energy infrastructure

The study identified the following key opportunities and challenges associated with the assessed regions.

| Opportunities | Challenges |
|--|--|
| Significant renewable potential | Electrical grid constraint prevents growth and development |
| Rich in natural assets | Waste heat not utilised efficiently |
| Large amount of development taking place | 20% of homes are not connected to the gas grid |
| Key sectors are already engaging | There are real concerns around air quality and emissions |

A disadvantage to the South2East study is its breadth. The study reviews a wider region than GBEB, including as far as Hampshire the west and Essex to the east. The GBEB energy plan builds upon the themes and findings from the South2East study to provide an updated plan more relevant to the region.

2.2 Greater Brighton Economic Board (GBEB)

In October 2020, GBEB declared 10 pledges in tackling climate change. A hydrogen economy could potentially contribute to four of the pledges:

- Zero emission fleets – where battery electric vehicles are insufficient, fuel cell electric vehicles are slated as the alternative solution.
- Innovation – hydrogen is a very nascent technology, therefore developing a hydrogen economy will provide opportunities for knowledge sharing and technology innovation
- Low carbon heating – hydrogen is needed for high-temperature heat processes and can be used as a reserve fuel source for hybrid heating systems
- Water recycling – electrolysis requires very pure water that must be purified beforehand. Water can be purified from wastewater sources with the appropriate purification technology.

To deliver on the pledges GBEB are developing a Green Blue⁴ investment plan and a Climate Action Plan. A hydrogen strategy would form part of that plan by providing a direction for investment into stimulating a hydrogen economy.

⁴ Energy and water

Greater Brighton Energy Plan

In 2020 GBEB commissioned BuroHappold Engineering to provide a regional Energy plan. The plan was funded by the European Union organisation Interreg Solarise. The energy plan provides a list of key energy projects.

- include an Energy Investment Company to attract grant funding and external investment, and to reinvest profits from projects, with the aim of realising pipeline energy projects, expanding the successful partnerships with community energy companies which are such a notable feature of our City Region. This could potentially be led by the Greater Brighton infrastructure panel. The EIC could run the Power pool
- Brighton Energy Coop and OVESCO are looking into solar farms in region (including landfill sites)
- Ground source heat pump (community heating) with BHCC
- Net Zero Firle Village Microgrid in rural community BHESCo + Firle village heat network (Investment plan underway 2020⁵)
- Food waste gas to grid (or gas to hydrogen with CCS research) BHESCo
- Newhaven has a cluster of opportunities around landfill site, waste to energy plant, enterprise zone (H2 could be produced with new solar developments to service the rampion service vessels, bus depot, pilot ignite WTE plant and for hydrogen training hub).
- Newhaven Port, Shoreham Port
- Shoreham heat network, Adur district council
- Landfill solar sites including Beddingham and Lidsey

The 2021 Greater Brighton Annual report⁶ suggests the following actions:

- Position Greater Brighton as a region that champions and leads on sustainable growth
- Support the University of Brighton's leading role in the national Clean Growth UK Programme
- Create a Greater Brighton hydrogen hub to accelerate private sector production of green hydrogen
- Support C2C's efforts with partners in the public and private sector to create a world-class innovation centre within Crawley

2.3 Coast to Capital Local Enterprise Partnership

Coast to Capital is an LEP working to enable the region to build back stronger, smarter and greener following the COVID-19 pandemic. To achieve this, the group has three set goals:

- Support Crawley with a plan to grow and evolve by developing new housing, commercial space and enhancement of skills and innovation to match the ambition of Global Britain and of a model for sustainable living.
- Build upon the pre-existing knowledge and innovation community of Brighton to expedite investment in knowledge. This is to include supporting the development of an internationally significant hub for Quantum Technologies alongside digital and clean growth sectors.
- To draw on the regions talented workforce and local business specialisms to lead green recovery and work toward UK net zero targets with a twin-track approach by decarbonising the energy supply chain whilst securing and coordinating investment in natural capital as a way to offset emissions.

In addition, a set of investment 'asks' have been identified in the way of transformational projects to accelerate economic growth, which includes the creation of a Greater Brighton hydrogen hub. This 'ask' comes from the groups particular focus to utilise hydrogen as an alternative transport fuel source, with hopes a hydrogen hub will accelerate public and private investment in hydrogen.

⁵ <https://democracy.brighton-hove.gov.uk/documents/s155840/Greater%20Brighton%20Energy%20Plan%20Projects.pdf>

⁶ <https://greaterbrighton.com/wp-content/uploads/2022/07/Greater-Brighton-Economic-Board-2020-21-Annual-Report-PDF.pdf>

2.4 East Sussex County Council

East Sussex County Council declared a climate emergency in 2019 and subsequently committed to become carbon neutral from its own activities by 2050 at the latest. Within the Climate Emergency Plan document, hydrogen is recognised as a method to reduce emissions from buildings when switching from gas.

East Sussex County Council Recovery Plan 2022

The East Sussex Recovery Plan, created in 2021, presents six 'Missions' that include a number of actions that will drive the county council toward its set goals. The main aim of this document is to set actions aimed to allow the area to 'bounce back' from any setbacks resulting from the COVID-19 pandemic but touches on elements that could also aid acceleration of the hydrogen sector, such as:

- Re-focus Talent Accelerator to support young people into work post-Covid-19. Talent Accelerator is a new framework through which education settings and creative/cultural industry employers can co-design new learning and real-world skills programmes.
- Develop bus infrastructure proposals to also help increase public transport usage.
- Develop a programme to work with low carbon businesses and the energy sectors to support the development/delivery of clean energy technologies and the decarbonisation of the economy, linking with the current LoCase initiative.
- Improve local and international connectivity to support Newhaven Clean Green and Maritime Growth Corridor

2.5 West Sussex County Council

West Sussex County Council (WSSC) has several plans and strategies which may support growth in the hydrogen economy:

WSSC Economic Reset Plan

Two of the 10 'headline actions' in the COVID recovery-focussed plan have direct relation to hydrogen:

- Continued engagement with Gatwick airport (action 8) on climate change through solar, renewable heat and hydrogen economy activities.
- To progress strategic partnerships and potential projects (action 10), this action pairs with projects that would support the economy reset, including projects in line with the Coast to Capital Strategy. This highlights the creation of a Greater Brighton hydrogen hub as a transformational project, potentially linking West Sussex County council plans to the LEP's.

WSSC Climate Plan

The Climate Plan states that £25 million will be set aside for new schemes that support economic developments and £21.2 million set aside for new schemes that come forward as capital improvements. This funding could potentially support hydrogen developments.

WSSC Economy Plan

The Economy Reset Plan 2020-2023 was adopted by West Sussex council in 2020. Some of the 'headline actions' adopted since its creation could link to the development of the regional hydrogen economy:

- Capitalise on Government funding awarded to WSSC for heat decarbonisation studies, considering the best options for the heat decarbonisation of the 50 buildings with highest heat use in the corporate estate. Use the studies as an evidence base for attracting additional funding for project delivery.
- Progress economy activities in support of the Climate Change Strategy, initially focussing on 'green skills and jobs' as part of the employment and skills theme, growing the low carbon and environmental goods and services sector through LoCASE, and progressing the SME low carbon programme

WSSC 2030 Energy Strategy

The West Sussex 2030 Energy Strategy follows on direction set by the Climate Change Strategy (2020). Actions which present opportunities for hydrogen include:

- We will develop, and support our partners to develop, more sustainable energy generation and (heat) networks in West Sussex which will contribute to the decarbonisation of energy (heat and power) in the county.

- We will use mature technologies such as solar, battery, wind and heat pumps as well as new and emerging technologies over the course of the strategy.
- Opportunities for decarbonisation in sectors over which the county council has greatest influence (e.g. transport) will be prioritised. This may include supply, facilitation of project development or other contributions towards progress in this important area.

The strategy states the actions they intend to complete to ensure delivery, which includes hydrogen-related skills:

- The council will develop partnerships with local training providers to support the development of green energy skills provision
- The council will use its investment activity and existing assets to leverage learning opportunities for green energy skills.

Appendix 4 Hydrogen economy actors

3.1 National government

National government plays a pivotal role in the development of the UK hydrogen industry. Considered a nascent industry, hydrogen has and will continue to require the introduction and adaptation of regulations and incentives. With limited specific regulation, elements of low-carbon hydrogen fall within other regulations, leaving uncertainty for producers, manufacturers, and developers. This is particularly pertinent when considering the different methods of hydrogen production where relevant policies and regulation differ. National government can enable the hydrogen economy through the creation of dedicated policy and regulation across the entire value chain, including health and safety, qualification and certification standards, and infrastructure. In addition, the release of roadmaps and strategies at national government level can steer the wider industry by highlighting gaps through analysis as well as outline government plans over a particular period. These documents act as a guide and allow industry to align in closing gaps, encourage investment, and increase confidence.

Government funding has and will continue to be a major driver for success in this space. The introduction of dedicated funding, namely the Net Zero Hydrogen Fund (NZHF), Hydrogen Business Model (HBM) and the Industrial Energy Transformation Fund (IETF), has aided a significant number of hydrogen projects to commence.

National government will also play a major role in shaping the skills profile through strategies and training/qualification requirements that will affect each region of the UK. The roll out of nationally recognised accreditations and standards will accelerate dedicated courses for new workers and those requiring upskilling to work with hydrogen, helping close those skills gaps in the region today.

3.2 Local government

Local government can contribute to shaping a local hydrogen economy in several ways, dependent on the knowledge of the organisation itself, its size, financial ability, and its overall influence in its region. One of the main ways that local governments can contribute is by providing support. Support provided at local government level can be in several forms:

- The development of local hydrogen strategies to encourage alignment of the private and public sector in common goals across the supply chain
- The development of local energy communities exploring various energies including hydrogen
- Exploration of the possibility to become a baseload demand for producers
- Incorporation of hydrogen into council owned residential and/or commercial developments
- The development of local renewable energy plans and sites
- Aiding those applying for planning permission e.g., a new hydrogen plant
- Conversion of council owned fleets to hydrogen to act as anchor customer
- Collaboration with other local authorities at a local and national level to share best practices and lessons
- Recognition of hydrogen within purchasing procurement frameworks and alignment between councils
- Testing support for demonstrations through designated test sites

Through local stakeholder interviews, it was made apparent that planning and demand visibility are causing issues for those in the local supply chain. Planning complications and delays have occurred due to unfamiliarity of hydrogen with planning officers, as well as strict criteria – particularly related to sound limits and environmental protection. . The upskilling of planning officers to increase familiarity and recognition of the benefits of hydrogen could allow the impact of this barrier to be significantly decreased. Lack of demand visibility for this emerging technology, particularly for producers, was highlighted as another major hurdle, as off taker agreements are difficult to achieve within the region. To support this, local governments could look to procure both technology and hydrogen locally to stimulate the economy and allow the growth required to distil confidence for wider roll out.

3.3 Electricity and gas utilities

Electrolysis is an electricity intensive process therefore large grid connections are required. Even hydrogen producers co-located with renewable energy providers have indicated that they would not connect without a grid connection to ensure security of supply. They also would purchase renewable power from the grid when local renewable generation is low, or could choose to purchase cheap constrained renewables.

Sussex is a power grid constrained region and the costs associated with grid extension can be very significant. The electricity utility plays a role in designing, costing and implementing grid extensions. The lead times on these extensions and any upstream reinforcement can take many years.

Distribution utilities can also be end customers to companies partaking in power-to-hydrogen. Utilities flag locations of constraint where they may be able to defer investment if decentralised generation can meet their needs. In return they establish contracts that pay a cost for having the security and a secondary cost for every time that system is called upon. Battery energy storage systems often fulfil this function today but for longer durations, batteries are not suitable. In this circumstance power through stored hydrogen may be better placed to provide a service.

3.4 Water utility

Green hydrogen production requires approximately 40-60 litres of water per kilogram of hydrogen (though a proportion of this can be returned, often warmer and with concentrated impurities). The electrolytic process alone requires 9 litres but there are losses at the point of cooling, purification and deionisation. In addition to large volumes, electrolysis requires the use of clean water, and for this reason, water utilities are a key actor within a successful hydrogen economy. Much of the region is considered to be a high water-deficit zone and could therefore present a barrier for large scale hydrogen roll out. To minimise this, water utilities could play a part in collaborating with hydrogen producers to investigate alternative source options to potable water, reducing the risk of further water scarcity whilst allowing local hydrogen production to develop. Alternatives suggested by Southern Water include:

- Water recycling
- Use of non-potable water
- Rainwater harvesting
- Desalination

Each option mentioned above comes with its own expenditure and practical challenges, therefore knowledge sharing between water utilities and hydrogen producers could find a viable solution and minimise conflicts between these two actors. Co-investment for alternative solutions to potable water such as desalination plants could reduce costs for both parties and encourage inward investment that could further improve the water grid.

3.5 Industrial scale Hydrogen production developers

For any region to be a significant player within a national hydrogen industry, local industrial scale hydrogen production will be a key driver. The presence of production at scale secures confidence for inward investment and attracts both private and public projects and off takers to set up business within the region. Hydrogen is notorious for its distribution challenges that often prove costly. From speaking with local stakeholders, it was highlighted that up to two thirds of the cost to purchase hydrogen in the current market is a result of its delivery to site. Some producers will set boundaries of ~100km for its transport to minimise cost for offtakers.

Development of hydrogen production is already underway within the region, with more producers expressing interest. For the entire value to chain to develop, confidence in supply will need to be nurtured through larger production volumes. Investment into the construction of new hydrogen plants would not only attract local off takers and newcomers to the region, but create more jobs, develop the overall skills profile, and encourage wider infrastructure developments.

With companies such as Michelmersh Bricks conducting hydrogen trials to produce bricks, potential demand for energy intensive uses is growing.

In these early stages, producers can play a key role alongside other actors by promoting open communication between themselves and potential off takers. It may be the case that many companies are not fully aware of hydrogen or the potential benefits of its applications in a commercial perspective, therefore the communication

and an element of self-promotion between producers and these businesses could spark interest and build a case for larger scale production.

3.6 Hydrogen distributors

The distribution and logistical solutions for hydrogen are key factors in developing a strong regional hydrogen industry. Hydrogen distributors will play an important role through the distribution of hydrogen itself as well as the skill developments required to achieve this.

Given the density of heavy goods vehicle movements in the region, especially around Shoreham Port, hydrogen distributors could explore the possibility of local logistics hubs to create viable options for companies looking to incorporate hydrogen into their operations. In turn, this could aid the creation of a regional hydrogen network and increase the possibility of cost competitive hydrogen. To achieve this, investments would need to be made in distribution methods such as tube trailers and upskilling of vehicle technicians and drivers.

3.7 Renewable energy producers

Renewable energy production is the key to making low-carbon hydrogen through electrolysis. Without it, the upstream fossil fuel generation is normally higher than simply using fossil fuels. Hydrogen producers must enter into commercial power purchase agreements to officially procure the energy. Government revenue support mechanisms also require evidence that the power was generated at the same time as it was consumed.

Encouraging renewable energy generation into the region is a secondary opportunity in attracting inward investment and creating green jobs. It is an essential part of achieving net zero and can reduce the need for grid infrastructure transmitting power into the region. The major challenges for renewable generation are the issues of space and planning, some of which can be ameliorated by the actions of local authorities

For many hydrogen producers, having renewable energy co-located with their plant is essential in reducing their levelised cost of hydrogen and remaining competitive. A private wire bypasses the need to utilise the grid and therefore avoids the associated fees charged on each unit on electricity.

3.8 Supporting infrastructure providers

Supporting infrastructure providers enable the transport and application of hydrogen to its end user. This includes refuellers, storage units, pipelines and tube trailers. Some hydrogen producers are offering end to end solutions whereby they source the implementation of infrastructure through their partners and cost it into a longer-term offtake contract.

3.9 Offtakers

Though other actors seemingly have the largest impact when developing a regional hydrogen industry, offtakers have a very important role to play. For production to increase, distributors to begin operating and supporting infrastructure to be developed, the realisation and visibility of current and potential demand is critical to ensure confidence in investment. Through stakeholder discussions, it was highlighted that the visibility of demand is currently a major barrier within the region. Hydrogen companies currently operating are unsure if any capital-intensive developments would be commercially wise, as if there is no or limited demand, any developments made would be redundant. Potential off-takers can express interest and open discussions with local authorities and local hydrogen related companies, which would help clarify potential demand as well as educate suitable off-takers of the best way hydrogen could benefit their operations.

Those with operations well suited to hydrogen e.g. heavy duty vehicles, could consider converting their fleets. Incorporating hydrogen into investment plans and sustainability goals, whether short term or long term, would aid the acceleration of the local hydrogen industry.



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