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WELL-BEING OF
FUTURE GENERATIONS



Llywodraeth Cymru
Welsh Government

FUTURE TRENDS REPORT 2021

Evidence pack

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What is this document?

The **Future Trends Report Wales : Evidence Pack** sets out an evidence base of likely future trends in the economic, social, environmental and cultural well-being of Wales.

It forms part of the Welsh Government's **Future Trends Report Wales 2021**. This will update the [Future Trends Report](#) published in 2017.

It is a resource for decision-makers in thinking about the long term. It is designed to help understand Wales' future better and help make more informed decisions for current and future generations in the context of the Well-being of Future Generations Act. The Act provides a comprehensive framework for people, places, and the planet both now and in the future. It contains seven well-being goals which we are seeking to achieve.

These well-being goals are, however, being progressed in an increasingly uncertain, complex and ambiguous environment. Thinking about the future and using different futures tools and techniques can provide organisations with a structured approach to decision making that responds to long-term change.

It provides a resource which presents evidence on potential future trends we should be prepared for in Wales, outlining the narratives and driving forces behind these changes, as well as providing a starting point for considering the potential opportunities and challenges these changes may create in achieving progress towards our well-being goals.

The evidence pack does not cover the potential implications of trends or make suggestions for a policy response. It is not a statement of government policy. It is a resource for decision makers across Wales.



Figure 1. The seven well-being goals for Wales

Introduction to the pack



Trends and drivers

Trends are underlying patterns of change that have a relatively clear direction of change. Drivers are the most mature trends with a wide range of influence across trend areas. They are also known as megatrends. The drivers of change (megatrends) featured in the 2021 report focus on the forces driving change for:

- People and Population
- Inequalities
- Planetary Health and Limits
- Technology

Within these broad areas there are specific trends which have developed over time and which are important to be aware of when considering the future in Wales. The report also focuses on the key trends which are shaping the future of the public sector, including those to be aware of in public finances, public sector demand, and digital public sector adaption.

Data

Evidence has been reviewed and gathered from official data sources, existing horizon scans, and foresight analysis to provide an overview of the key direction of change. Where possible, robust statistics have been selected from official sources which offer long-term data sets. These have been primarily gathered from reliable government sources such as StatsWales, the Office for National Statistics (ONS), and international sources such as United Nations reports and datasets. Datasets which are updated regularly have been used so that the report can be updated and the progress of trends tracked.

Coverage

The data sets cover a range of geographical areas, starting globally and then looking more closely at the UK or Wales level.

It is beyond the scope of this document, however, to consider each trend at a more localised level within Wales. Where this level of detail is needed, users should be guided by the trends outlined and consider which evidence they have, or could gather, that is relevant to their local area.

The data featured in this pack and the future trends report aim to give an overview of the key trends affecting Wales. Where data has been used, links to the source are provided on the relevant evidence slide.

At the end of the pack users can also find an overview of key data sources and additional reports.

The data and resources provided should be used alongside additional relevant analysis on areas of interest to gain a deeper understanding of how a particular trend or combination of trends are relevant to a specific area, population group, or policy.

Trend selection

The report brings together the **key economic, social, environmental, and cultural well-being trends likely to affect Wales into one single resource.** The trends featured were identified following a review of both international and Wales/UK-level analysis and evidence sources. This review was then presented to a range of relevant stakeholders and a process of deciding which trends to include was undertaken.

How to use this evidence pack

How is the evidence pack structured?

Each section begins with an overview of what the evidence presented says about how the identified trends have developed over time and their potential to create change in the future.

Following this high-level overview, a series of data slides are presented for each theme alongside analysis which outlines the key trends driving change in the area. Although presented separately, these should not be considered individually. **Where possible, cross-cutting evidence has been presented which brings together the key social, cultural, economic, and environmental issues arising across the drivers of change.**

When considering a particular trend, users should do so in the context of all the evidence presented and examine the interdependencies between them. For this reason, the evidence is presented in a single document with links included throughout where trends interact.

Links to additional data sources and analysis are provided under each theme. This is to provide users with the resources and information required to further explore trends of particular interest.

How can the evidence be used practically?

Foresight and futures exercises are tools which help structure the thinking around, and analysing of, potential future outcomes. They may also be used to help identify prospective opportunities and challenges, and to support effective planning around these using relevant evidence and robust analysis across a wide range of areas.

When this evidence and analysis is fed into the policy cycle effectively, it can enhance policy development, and in turn support a more effective response to the dynamics of change or a range of potential changes. These types of exercises are best undertaken when they account for uncertainties and changing outcomes. This involves working through scenarios. While the report does not focus on scenario planning, it does provide a tool to aide scenario planning and supports foresight and horizon scanning exercises.

Foresight and futures exercises are most successful when they involve a broad range of stakeholders able to feed in different perspectives and encourage a systems-based futures thinking approach, which takes account of associated complexities. This method encourages a joined-up approach across research and policy areas, focusing on the way a system's various parts interconnect and how larger systems drive change in particular areas. A systems-based approach will provide the greatest impact as it allows for an analysis of the interactions and dependencies between trends.

Various tools exist to support the use of evidence and other resources when undertaking foresight exercises, horizon scanning, and scenarios work. **A systems-based approach will provide the greatest impact as it allows for an analysis of the interactions and dependencies between trends. A useful place to start is the Government Office for Science's [guide to futures thinking and foresight](#), and [Futures toolkit for policy-makers and analysts](#).**

Our [blog](#) on the Future Trends Wales also provides useful links.

How to use this evidence pack

The go-science toolkit helps embed long-term strategic thinking within decision-making and policy processes, and works through how to manage uncertainty and identify future actions.

It sets out practical activities that can be used to develop futures capabilities, including tools for gathering intelligence and evidence about the future, exploring the dynamics of change, describing what potential futures may look like, and developing policy and strategy using a futures lens. The pestle (political, economic, social, technological, legal and environmental) framework outlined in the futures toolkit guide is often used at the start of foresight exercises as a starting point to think through the most important issues. It also provides a framework for driver mapping exercises, which can identify which drivers and trends are most important to take into account for the future of a particular policy area, or strategies to help users think through potential challenges and opportunities.

The [Three Horizons Toolkit](#) developed by the [Office for the Future Generations Commissioner for Wales](#) and Public Health Wales provides a **guide aimed at helping decision makers to think and plan better for the long term**. The Future Generations Commissioner's website also provides further information on the role of horizon scanning.

The [Foresight Manual](#) from the United Nations Development Programme introduces strategic foresight in the context of the 2030 Agenda for Sustainable Development. The World Economic Forum's [Strategic Intelligence](#) platform allows you to explore and better understand the connections between different issues and the Sustainable Development Goals.

The Observatory of Public Sector Innovation's [Toolkit Navigator](#) is a useful tool for public sector innovation and transformation.

Ongoing impact of the COVID-19 pandemic

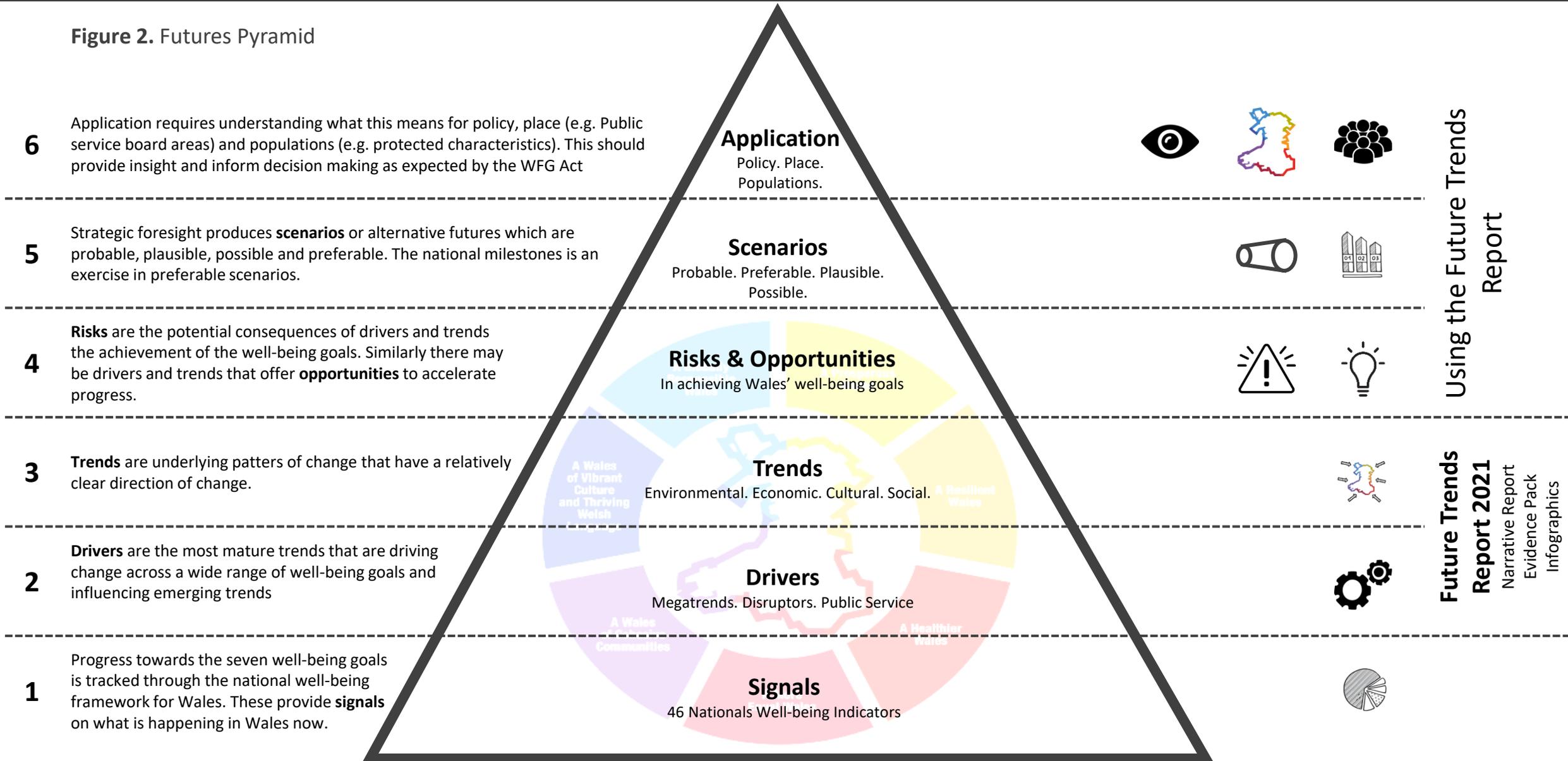
Wales' achievement of the well-being goals can be subject to disruption where a previously unknown event has a sudden and dramatic impact. The COVID-19 pandemic is an example of a disruptor affecting economic, social, environmental and cultural trends in Wales. The impact of the COVID-19 pandemic has led to renewed discussions and interest in futures foresight.

The pandemic has had profound effects on economies and societies around the world, with some noticeable short-term disruptions to trends. It has had a significant impact on the global economy and has a disproportionate impact on developing countries, exacerbating poverty and highlighting global disparities in access to vaccines and recovery trajectories. Mirroring the global situation, the pandemic has amplified existing inequalities in Wales, particularly for the most vulnerable, but also more widely across society. Women, older people, young people, people from [Black, Asian, and Minority Ethnic groups, disabled people](#), people with underlying health conditions, people living in substandard housing, and people working in informal, lower-income, and frontline service roles have all been disproportionately impacted.

It is likely that the ongoing pandemic will lead to the acceleration of some existing trends and potentially create new trends. However, how the evolving impact of pandemic will shape medium and long-term trends globally and for Wales is far more uncertain at this stage. This report acknowledges the impact of the pandemic but, given the uncertainty, it will not make any assumption on the certainty of the long-term impacts. We are planning an update to the evidence pack in early 2023 when further information and data becomes available.

Understanding Wales' Future

Figure 2. Futures Pyramid



Drivers and Trends

In reviewing the international literature, we have sought to focus the future trends report on:

1. Four global drivers of change (megatrends) and;
2. Two drivers of public service delivery.

The report considers how these drivers and trends might be developing at a national level in Wales.

The following pages provide an overview of the identified drivers and trends, accompanied by a series of data and evidence slides, as well an initial discussion on what opportunities and challenges these changes might create for Wales in its pursuit of the seven national well-being goals.

Global megatrends

People and Population

Inequalities

Planetary Health and Limits

Technology

Public Sector drivers and trends

Public finances

Public sector demand and digital



People and Population



Overview

Trends affecting people and population in Wales are being driven by changing demographic patterns, including reducing fertility rates and increasing life expectancies.

Changing population structures, and developments in the ways people want to live, work, and travel are reflected in trends towards an ageing population and associated health trends, changing housing need, and changing work and life patterns.

Population growth is set to continue globally, with projections indicating a rise of 2 billion people over the next 30 years, taking the global population to 9.7 billion by 2050. Growth may plateau around this stage owing largely to reduced fertility levels.

Rates of growth vary considerably across the globe, with the highest rates projected in sub-Saharan Africa which, is expected to continue at a high growth rate past 2050. Several countries across Asia are likely to see a decline during the same period, while the population in Europe is largely predicted to plateau after a slow growth period up to 2050.

Wales' population is projected to increase by almost 4 per cent up to 2043. Some of the largest increases in population are expected in south Wales whereas in other local authorities a decrease in population is expected during the same period.

Migration is likely to be a key driver of population change in Wales. Since 2019, there has been a shift in migration patterns which has led to an increase in net migration. EU net migration into Wales had been falling but has now stabilised at a much lower level than in the years leading up to the EU referendum. Non-EU net migration has been gradually increasing since 2013, and **the year ending March 2020 saw some of the highest levels of non-EU migration to the UK since records began.**

Over the next 20 years Wales is set to continue on a trend towards an ageing population. The proportion of those aged over 65 is expected to increase to 85,000 by 2043 – a 5 per cent increase in the share of the population compared to 2020. Proportions of those in the working age and under 16 population groups are expected to decrease in the same period.

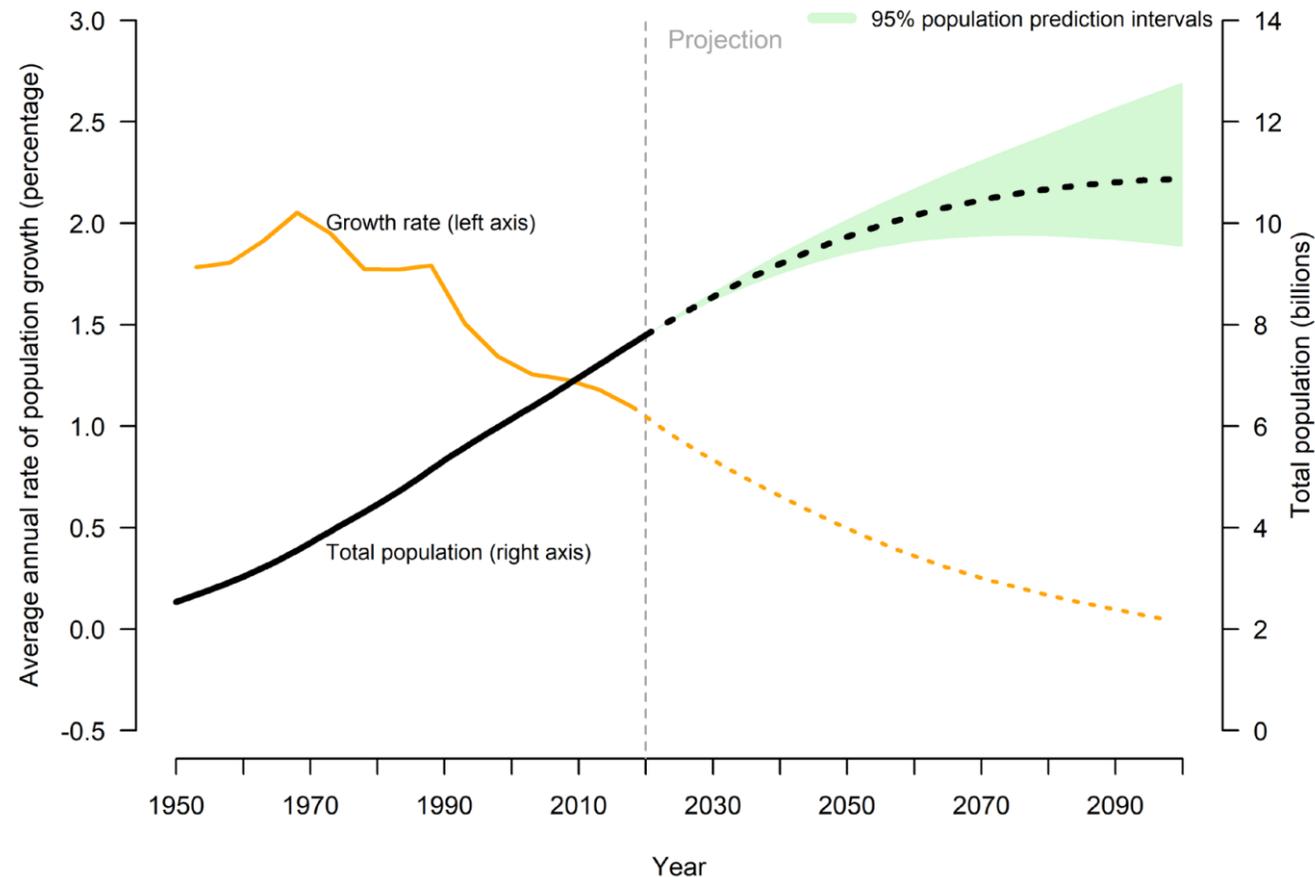
Life expectancy increases in Wales look set to continue, although there is a lot of uncertainty around the extent of increase. Estimates for the next 50 years range from very little increase in overall life expectancy to a potential rise of around 10 per cent. However, these estimates were made prior to the COVID-19 pandemic. Life expectancy has fallen for the most recent period, reflecting the impact of the pandemic and it's not known what long-term impact it may have on the figures

An ageing population interacts with other trends relating to health and the economy, with more resources needed to fund changing needs in the population and increasing prevalence of certain diseases, chronic health conditions, and complex care needs.

The number of households in Wales is projected to steadily increase over the next 20 years. There is likely to be a gradual decline in newly arising housing need across this period, reflecting a slowdown in projected household growth over the same period. Household sizes are becoming smaller with the number of single-person households in Wales projected to increase by over 10,000 in the period from 2020 to 2043.

Global population is increasing but overall growth is slowing over time

Figure 3. Population size and annual growth rate for the world: estimates, 1950-2020, and medium-variant projection with 95 per cent prediction intervals, 2020-2100 (United Nations, 2019a).



The global population is expected to increase by 2 billion people within the next 30 years, from 7.8 billion to 9.7 billion in 2050.

However, global population growth is projected to occur at a slower pace than any time since 1950.

The main factor responsible for driving this change is reduced fertility levels.

References & Resources



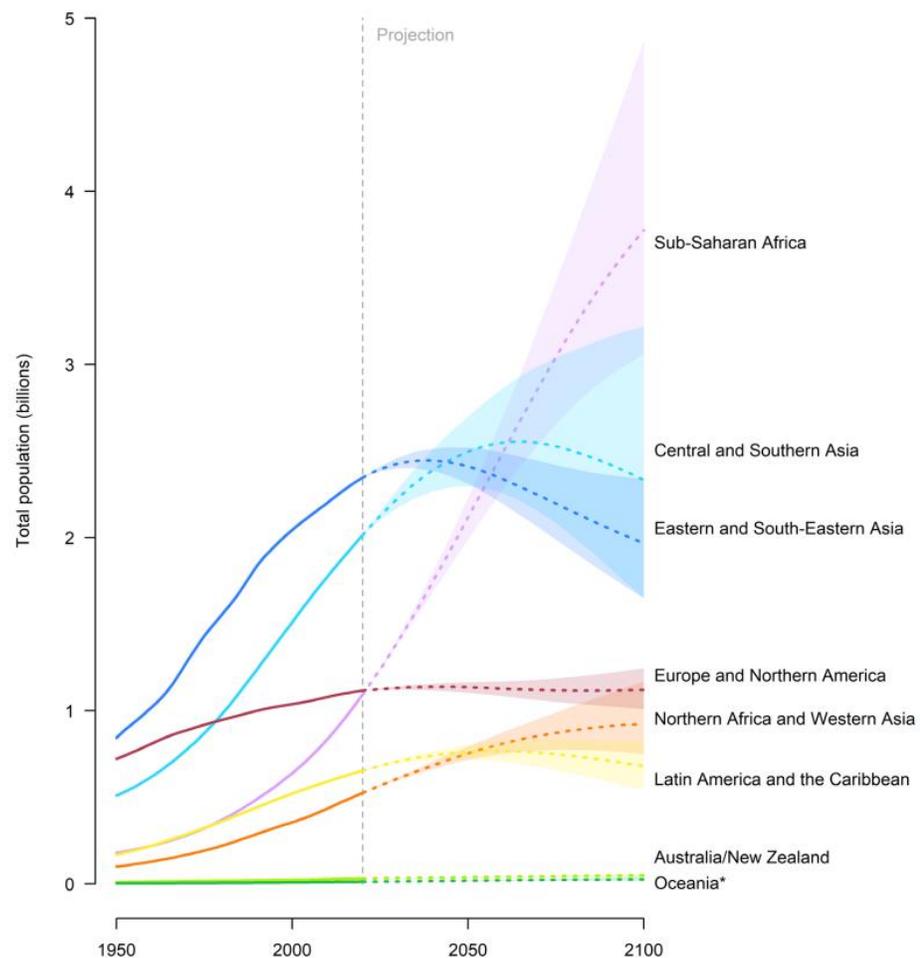
World Population
Prospects 2019 (United
Nations, 2019a)



Population Data
(United Nations,
2019b)

Rates of population change are expected to vary across the globe

Figure 4. Population by SDG region: estimates, 1950-2020, and medium-variant projection with 95 per cent prediction intervals, 2020-2100 (United Nations, 2019a).



Rates of population change are expected to vary across the globe.

Nine countries are projected to make up more than half the projected growth of the global population between now and 2050: India, Nigeria, Pakistan, the Democratic Republic of the Congo, Ethiopia, the United Republic of Tanzania, Indonesia, and the United States.

While sub-Saharan Africa is projected to become the most populous geographic region, other populations meanwhile are expected to reach peak population size and begin to decline before the end of this century. These include populations in eastern and south eastern-Asia, central and southern Asia, Latin America and the Caribbean, and Europe and northern America.

References & Resources



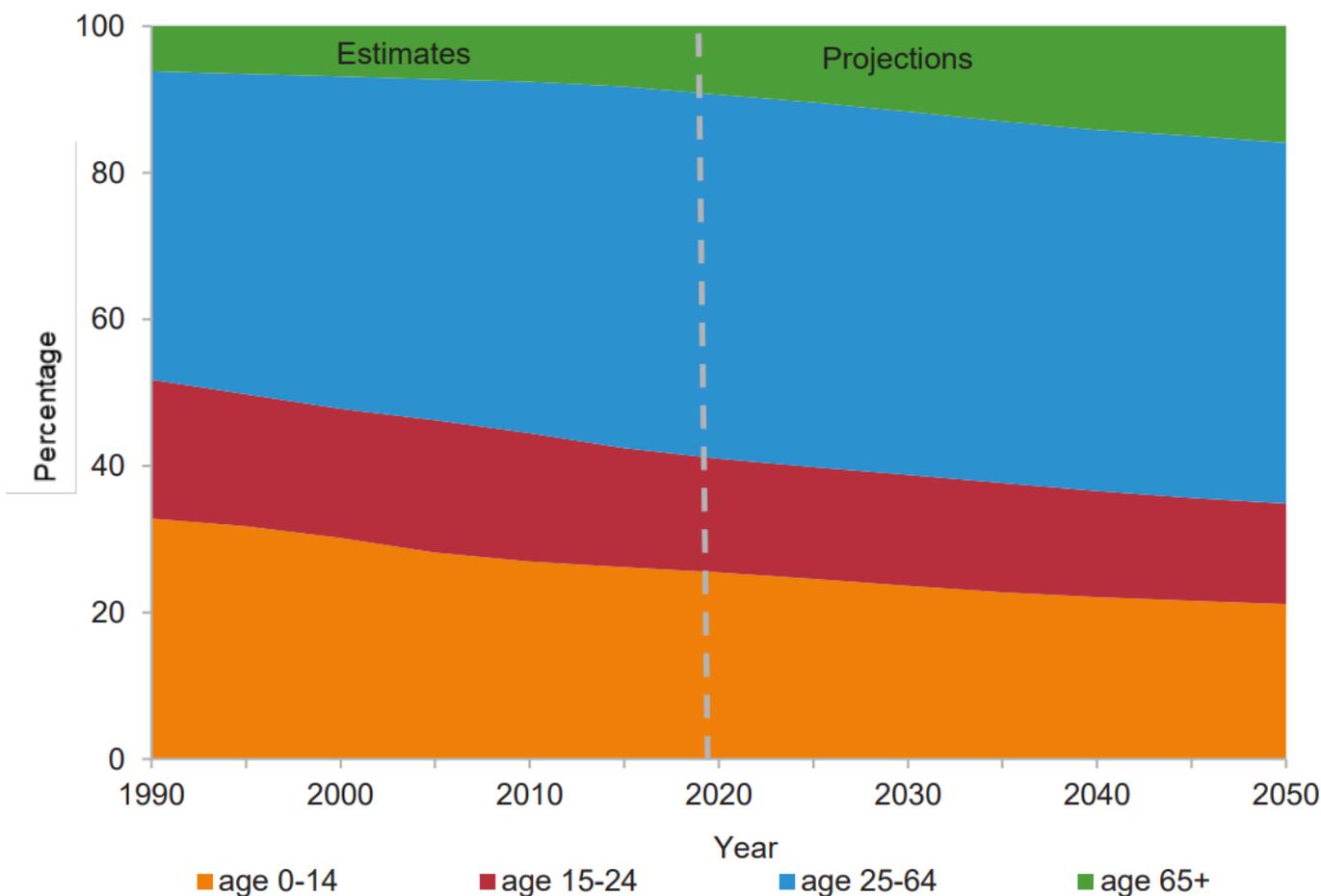
World Population
Prospects 2019 (United
Nations, 2019a)



Population Data
(United Nations,
2019b)

Populations are ageing across the globe

Figure 5. Global population by broad age groups, 1990-2050 (percentage) (United Nations, 2020).



The global population is projected to become older up to 2050.

Over the next three decades, the global number of older people is projected to more than double, with all regions seeing an increase in the size of their older population between 2019 and 2050.

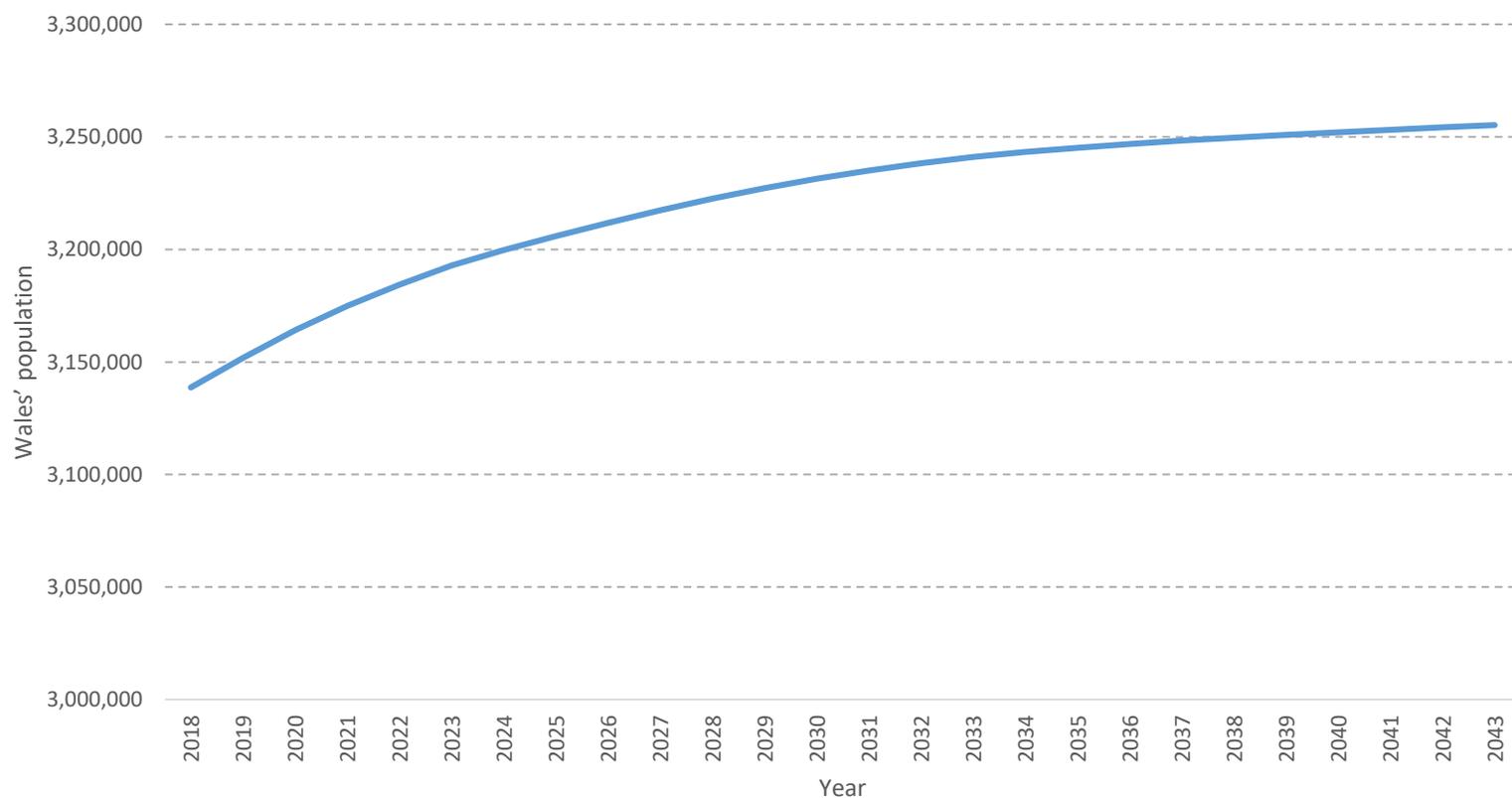
As populations age, shares of working age (25 to 64 years) and older (65+ years) people rise, while shares of children (0 to 14 years and 15 to 24 years) will fall across the globe.

A main driving force behind the ageing population is reduced fertility levels combined with an increasing life expectancy. Globally, a person aged 65 could expect to live an extra 19 years by 2045-2050 compared to 2015-2020. Women tend to live longer than men and this pattern is projected to continue. By 2050 it is projected that women will make up 54 per cent of the global population.



Wales' population will continue to grow up to 2043, although the rate of growth will slow over time

Figure 6. Projected population change in Wales up to 2043 (Welsh Government, 2020a).



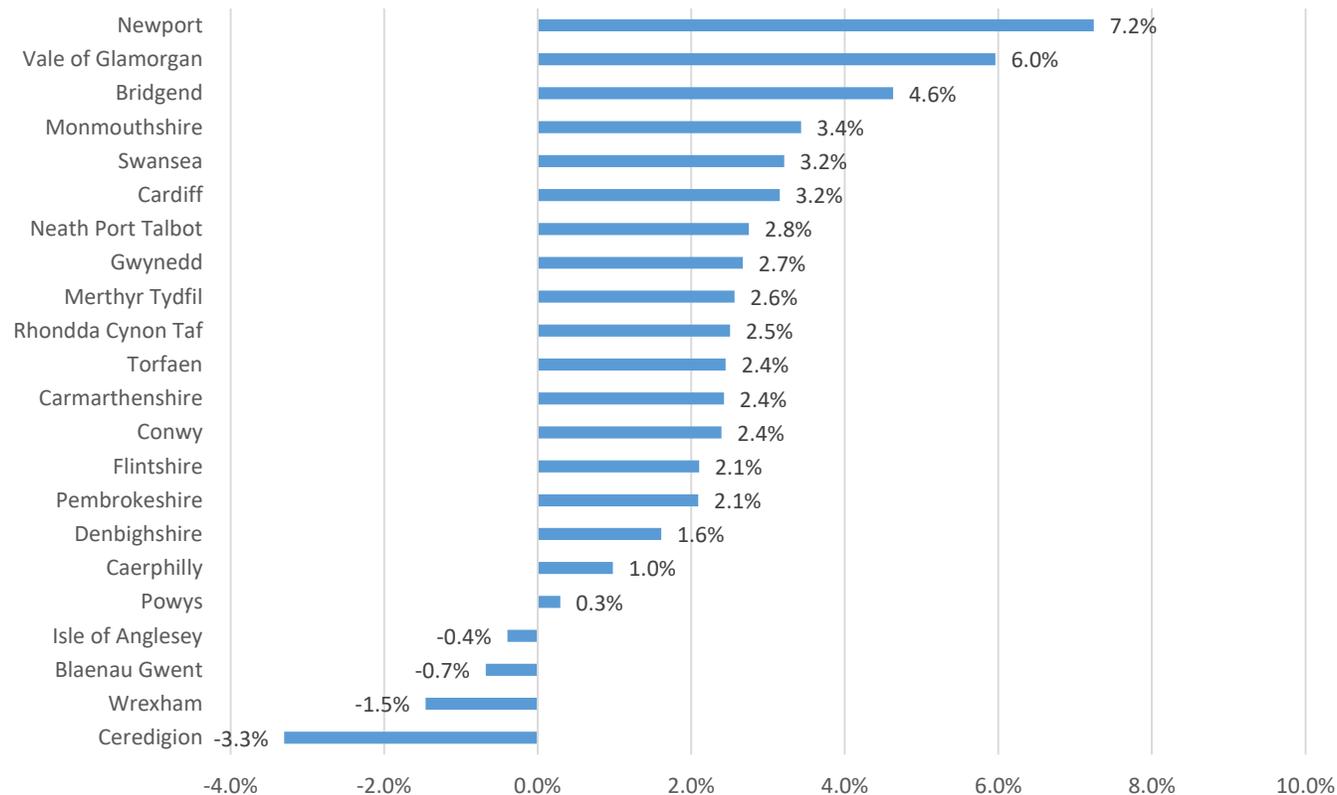
The population of Wales is projected to increase by 2.7 per cent to 3.22 million by 2028, and by 3.7 per cent to 3.26 million by 2043.

Across the UK as a whole, the population is projected to rise from 66.4 million in 2018 to 69.4 million over the decade to mid-2028 whilst reaching 72.4 million by mid-2043.

The rate of growth is not expected to be equal across the UK, with England projected to see a faster growth rate than the other UK nations (5.0 per cent between mid-2018 and mid-2028, compared with 2.7 per cent for Wales, 1.8 per cent for Scotland and 3.7 per cent for Northern Ireland).

Most local authorities in Wales will see an increase in population, with differences in how this is occurring between local authorities expected

Figure 7. Percentage change in the principal population projections by local authority, 2018 to 2028 (Welsh Government, 2021a).



During the period up to 2028, the population is projected to increase in 18 of the 22 local authorities in Wales. Of these, the largest percentage increases in the population are focused in the south Wales region. Newport is expected to increase by 7.2 per cent, while the Vale of Glamorgan is projected to increase by 6 per cent, and Bridgend by 4.6 per cent.

Each of the four remaining local authorities, Ceredigion, the Isle of Anglesey, Blaenau Gwent and Wrexham, are all projected to decrease in the period up to 2028, with the largest decrease expected in Ceredigion (3.3 per cent).

Local authority population projections consist of four components of change (births, deaths, international migration and internal migration). Natural population change will decrease when there are more deaths than births. Migration also influences population change. Migration is projected to add to the population of all local authorities in Wales except Wrexham in the period 2018 to 2028. Most local authorities are also projected to see negative natural change (more deaths than births). However, for most local authorities, net positive migration will more than offset the negative natural change resulting in overall population increases.

References & Resources

NOTE: These projections arranged by local authority focus on the first ten years of the population projections period (2018-2028), as projections tend to become increasingly uncertain in the longer term. However, over the full 25-year projection period, the projected trend remains similar, with the same 18 local authorities projected to increase in population, and the same 4 local authorities projected to decrease.



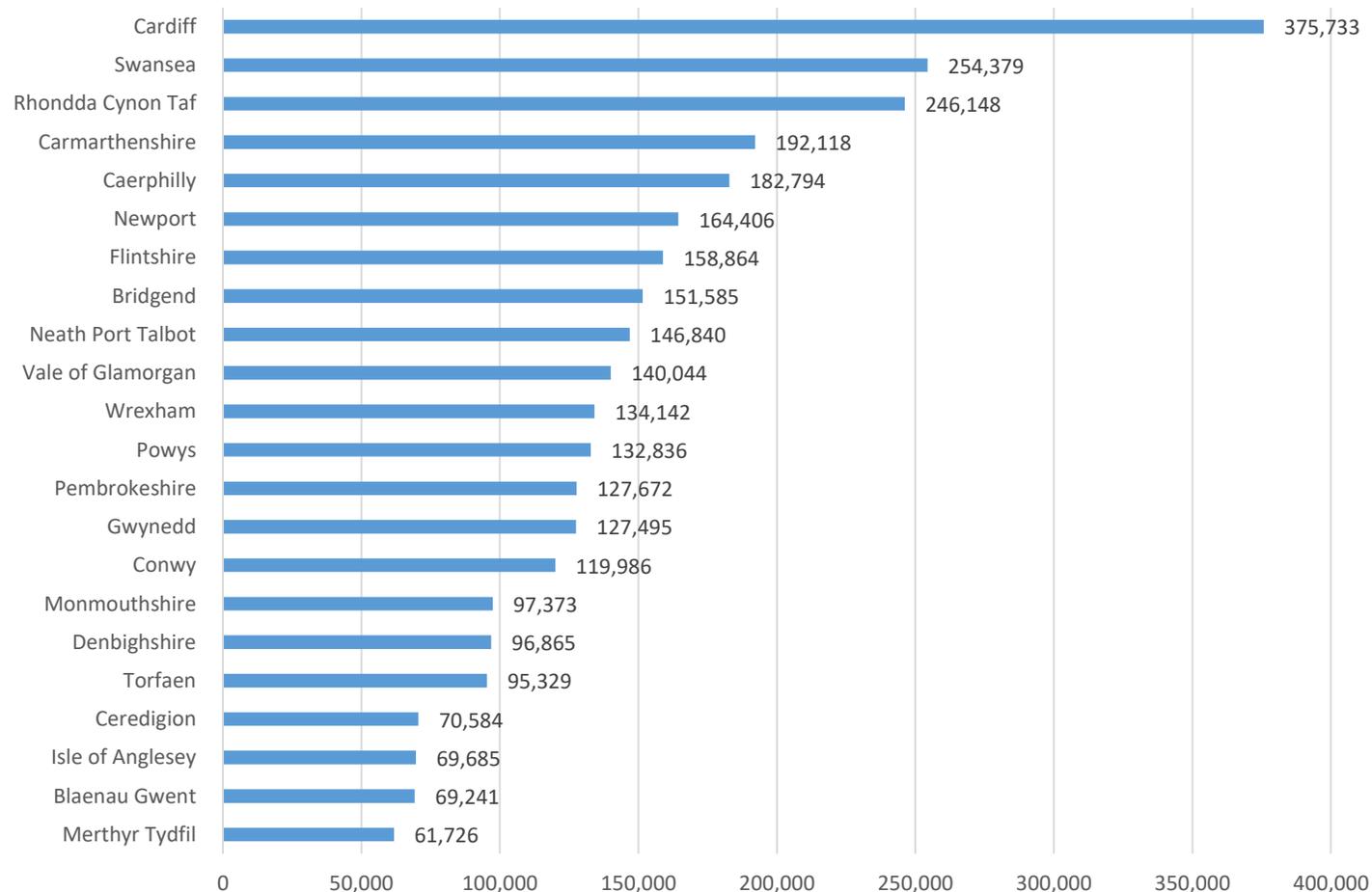
Population Projections
Report (Welsh
Government, 2020b)



StatsWales Population
Projection (LA) (Welsh
Government, 2021a)

By 2028 Cardiff is projected to remain the largest local authority by population in Wales

Figure 8. Projected population size in 2028 by Welsh local authority (Welsh Government, 2021a).



Cardiff is projected to remain the most populous local authority in Wales by 2028, with the population rising to over 375,700 people. Swansea will also continue to be Wales' second largest local authority, with a projected population of 254,379, approximately 12 per cent of the national population of Wales.

The local authorities projected to have the smallest populations are Merthyr Tydfil (around 61,700), Blaenau Gwent (around 69,200), the Isle of Anglesey (around 69,700), and Ceredigion (around 70,600).

References & Resources



Population Projections Report (Welsh Government, 2020b)



StatsWales Population Projection (LA) (Welsh Government, 2021a)

Prior to COVID-19, life expectancy was expected to increase across all nations in the UK

Figure 9. Cohort life expectancy at birth for selected years, UK and constituent countries (ONS, 2019a).

		2018	2043	2068
Males	UK	87.6	90.4	92.7
	England	87.9	90.6	92.9
	Wales	87.0	89.8	92.3
	Northern Ireland	87.1	89.9	92.4
	Scotland	86.0	88.9	91.5
Females	UK	90.2	92.6	94.6
	England	90.5	92.8	94.8
	Wales	89.8	92.3	94.3
	Northern Ireland	89.8	92.3	94.3
	Scotland	88.8	91.4	93.6

Figure 9 shows projected cohort life expectancy at birth for selected years in the UK and England, Wales, Northern Ireland and Scotland.

While still useful for understanding long-term trends of life expectancy across the UK, these projections are based on data that predate COVID-19 and therefore do not reflect the impact of the pandemic.

In Wales, using 2018 cohort projections which factor in projected changes in future mortality rates, life expectancy at birth was expected to reach 89.8 years for males and 92.3 years for females by 2043, with further increases by 2068 taking life expectancy to 92.3 years and 94.3 years respectively.

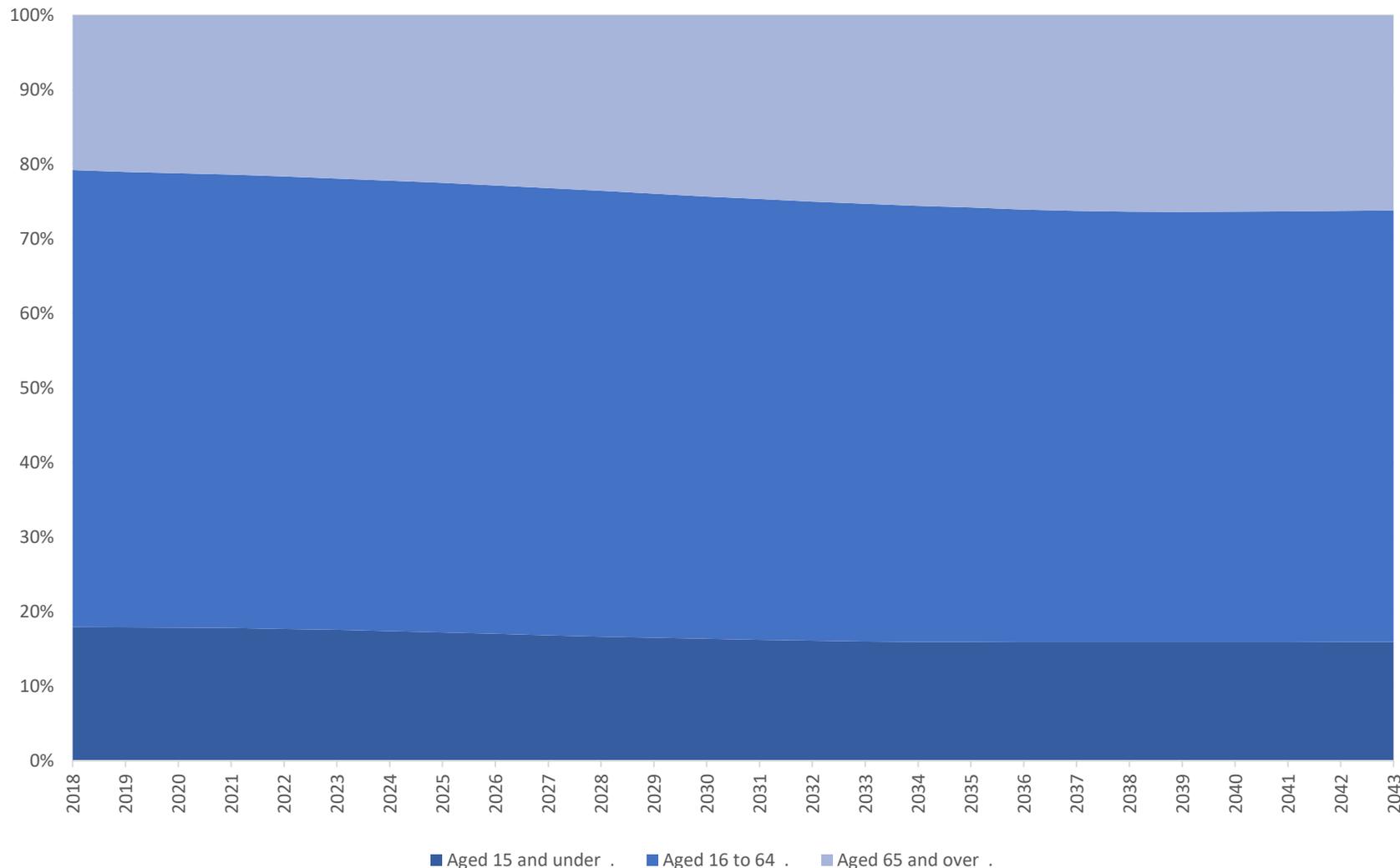
It is also worth noting that this projection represents an average figure across the population. It does not, however, reflect unequal life expectancy outcomes across population groups, with healthy life expectancies important in understanding the quality of life experiences by people as they age.

This life expectancy trend will drive the wider trend towards an ageing population.



Wales will see a continuation of the trend towards an ageing population driven by changing demographic patterns

Figure 10. Wales population projections by year and age group (Welsh Government, 2020a).



Following the global trend, Wales is projected to have an ageing population up to 2043.

The proportion of the population aged 65+ is expected to increase from around 67,000 in 2020 to just over 85,000 by 2043. Meanwhile, the working age population is projected to decrease in the same period.

An evidence review of population ageing in the UK by the UK Government Office for Science (2016) outlined some of the potential impacts this might have, and key issues to be aware of. A key factor will be in how public services plan to meet the increasing demands an ageing population will place on them.

While dependent on future health improvements, it is likely an ageing population will increase the amount of ill-health with more chronic conditions and multi-morbidities. Demand for health and social care will therefore increase, at a time where there are fewer people of working age to fund these services.

Unpaid care, which is disproportionately taken up women, may become more important if adaptations to current services cannot be provided and subsequent social and economic problems might arise from this. The success of the economy will become increasingly tied to the ability of older workers being able to continue to work for longer.

Other trends, such as the adoption of new technologies in work, may facilitate longer working lives. Housing needs will also change as the population ages, with an increased need for housing that can adapt to people's changing needs as they age. Across the UK as whole, there are predicted to be 1.42 million households headed by someone aged 85 or over. This is an increase of 161 per cent from 2016.

References & Resources



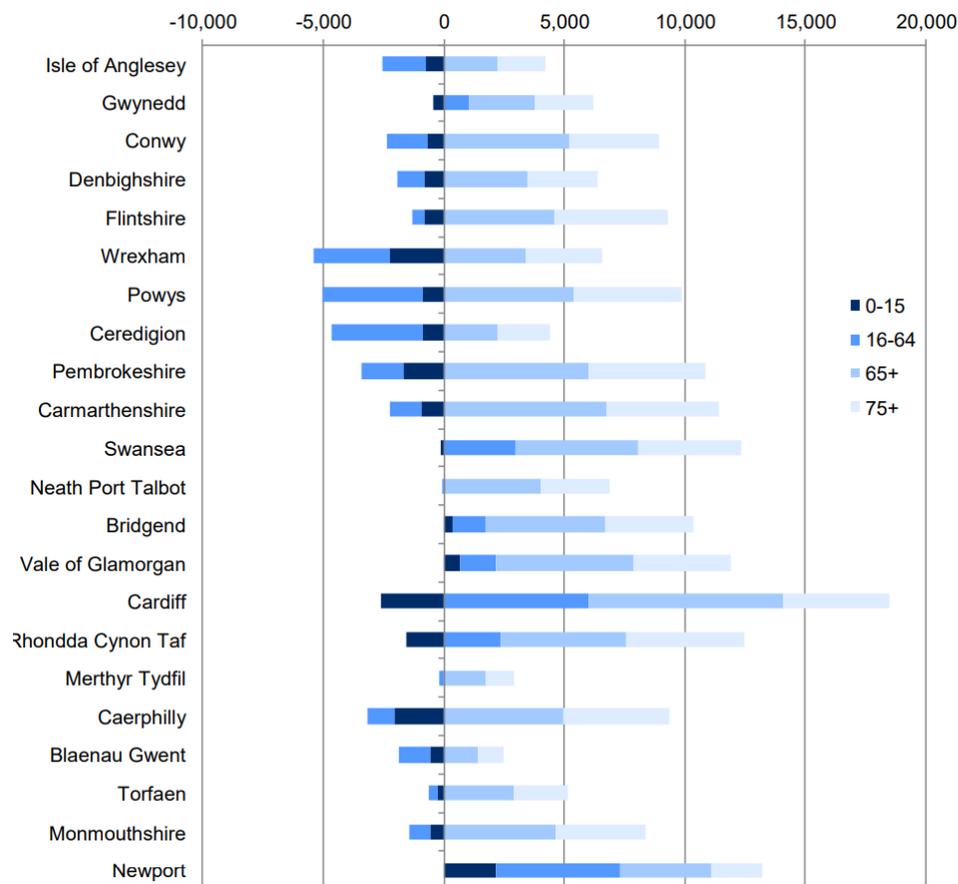
[Future of an Aging Population \(Government Office for Science, 2016\)](#)



[StatsWales Population Projections by Age \(Welsh Government, 2020a\)](#)

The ageing population in Wales will not be experienced equally across Wales, with some local authorities ageing faster than others

Figure 11. Change in the principal population projections by local authority and age, 2018 to 2028 (Welsh Government, 2020b).



The national change in population growth by age is not projected to occur equally across Wales.

During the period up to 2028, it is projected that all local authorities, other than Newport, the Vale of Glamorgan, Bridgend, Neath Port Talbot, and Merthyr Tydfil, will see a decrease in the number of children and young people aged 0 to 15 years old. The greatest decreases in 0 to 15 year olds are projected to be seen in Wrexham (down 8.6 per cent), Ceredigion, and Pembrokeshire (both down 7.9 per cent).

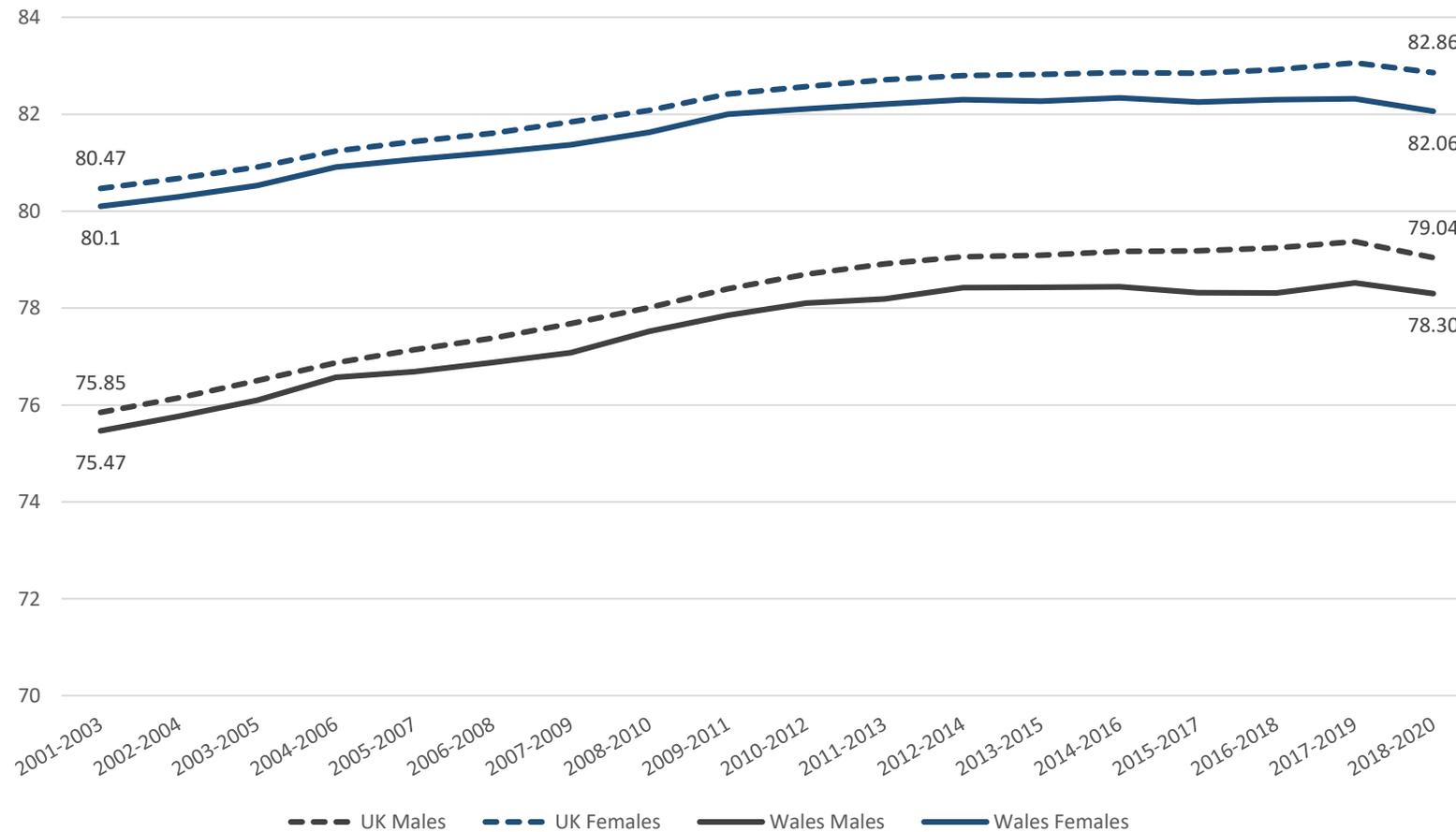
For the working age population, it is projected there will be decreases in all local authorities other than in largely urban local authorities in south Wales (Newport, Cardiff, Swansea, the vale of Glamorgan, Rhondda Cynon Taf, Bridgend) and in Gwynedd. The greatest percentage decreases in 16 to 64 year olds are projected to be seen in mainly rural areas.

For people aged 65 and over, it is projected there will be an increase in all local authorities in Wales, with the greatest increases in the Vale of Glamorgan, Monmouthshire, and Pembrokeshire. The number of local authorities where over a quarter of the population will be aged 65 or over is projected to double from four in 2018, to eight in 2028.

References & Resources

Life expectancy is increasing in Wales, although in recent years improvement has slowed, with a decline in the most recent period reflecting the impact of COVID-19

Figure 12. Life expectancy at birth in Wales and UK (2001-03 to 2018-20) (ONS, 2021a).



The changing and ageing structure of our population is driven primarily by two factors. Improvements in life expectancy mean people are living longer and reaching older ages. Along with this, there has been a decrease in fertility, with people having fewer children and having children later in life.

Between 2001-03 and 2010-12, male life expectancy had increased by 2.6 years, before slowing dramatically until 2016-18. While 2017-19 saw a considerable rise of 0.2 years, this progress was lost in 2018-20 reflecting the impact of the COVID-19 pandemic.

Female life expectancy shows a similar pattern. After increasing by 2 years between 2001-03 and 2010-12, improvement slowed between 2010-12 and 2017-19 seeing an increase of only 0.2 years. A decline in life expectancy was again seen in the most recent period, dropping by 0.26 years following the pandemic.

The gap between male and female life expectancy has narrowed since 2001-03, falling from 4.63 years at this point to 3.76 years in 2018-20. This is due to both greater increases in male life expectancy and a greater decline in female life expectancy in the most recent period.

References & Resources



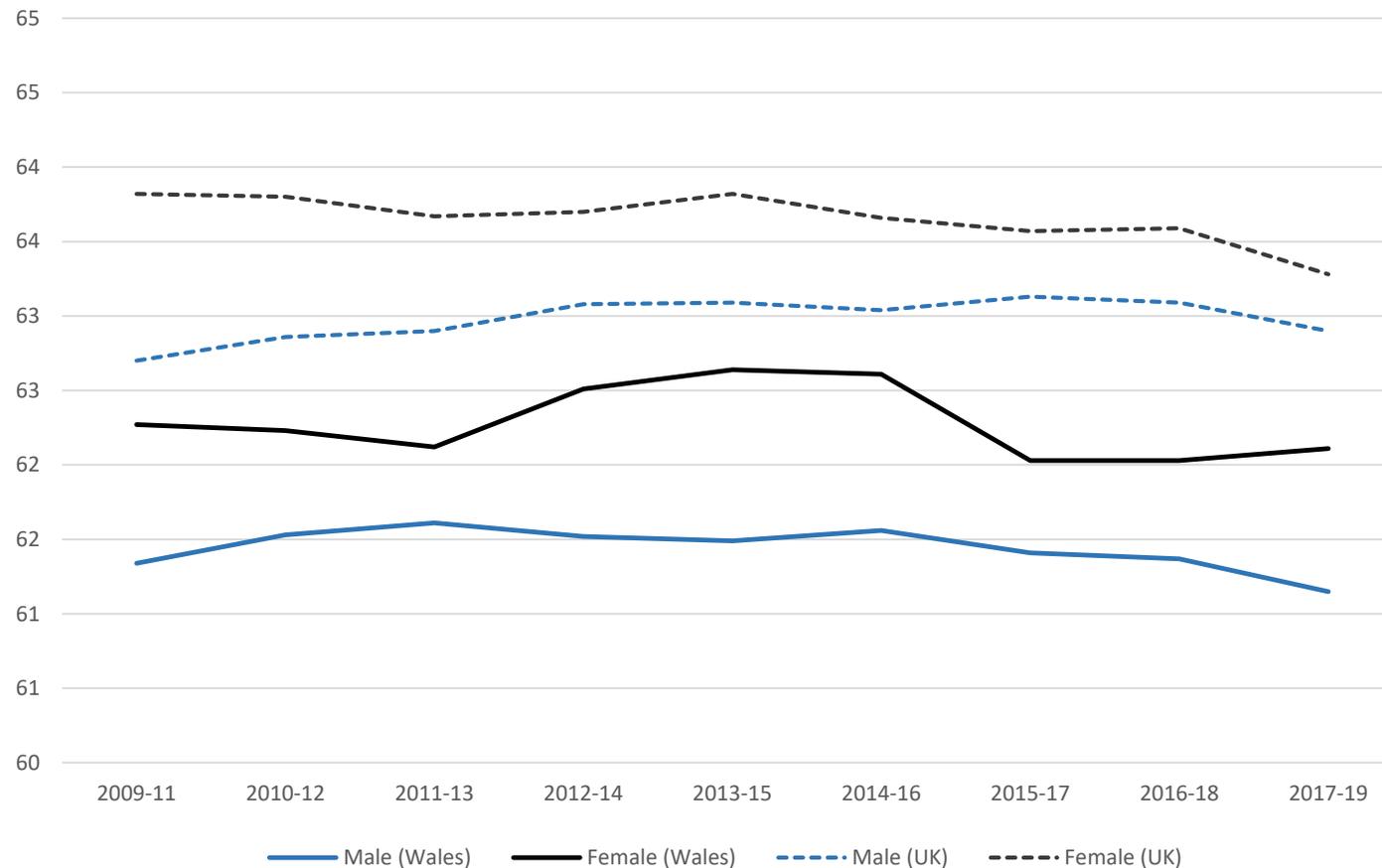
Projected Life Tables,
2018-Based (ONS, 2019a)



Life Expectancy Datasets
(ONS, 2021a)

Healthy life expectancy in Wales is lower than the UK average, and has shown little change over time

Figure 13. Healthy life expectancy is lower in Wales than the UK average, and has shown little change over time (ONS, 2021b).



Healthy life expectancy measures the average number of years people are expected to live in good health and provides a useful measure of life quality to support general life expectancy.

With people projected to continue living longer in Wales, there will be challenges in supporting people to live well into their older age. However, ensuring that people remain healthy for longer can help tackle some of the challenges that an economy faces when supporting an ageing population. For example; by enabling people to remain healthier for longer, working lives are extended and people are able to remain economically productive for a greater period of time, which in turn alleviates pressures on health and social care services.

Measuring healthy life expectancy helps to predict future demand on health and social services and to prepare for its potential impacts.

Since 2009-11, healthy life expectancy in Wales has remained relatively stable, being calculated at 61.2 years for males and 62.1 years for females in the 2017-19 period.

It is important to note that these figures predate the COVID-19 pandemic. The longer-term effects of the virus on healthy life expectancy are currently unknown and are likely to be reflected in future figures.

References & Resources



[Projected Life Tables, 2018-Based \(ONS, 2019a\)](#)



[Healthy Life Expectancy Datasets \(ONS, 2021b\)](#)

Inequality gaps in life expectancy and healthy life expectancy remain, with little change over the past decade

Figure 14. Slope Index of Inequality, Wales, 2011-13 to 2017-19 (ONS, 2021c).

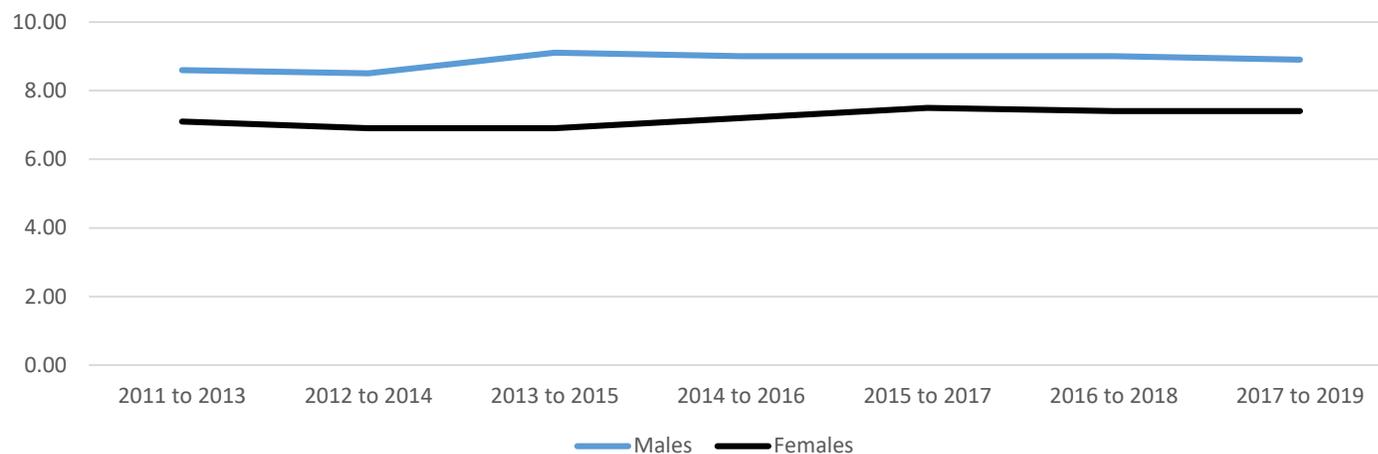
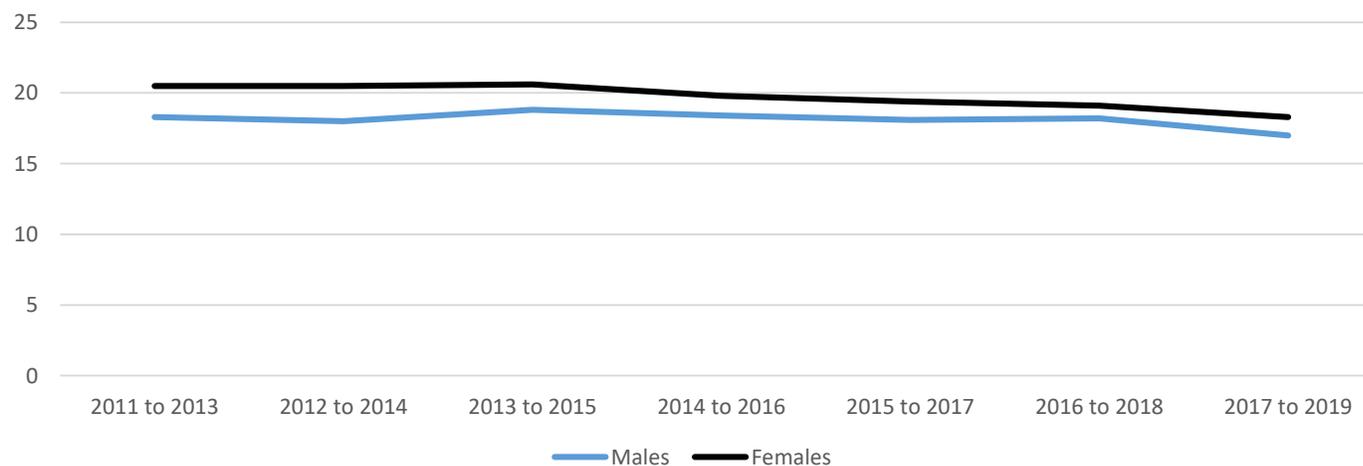


Figure 15. Slope Index of Inequality, Wales, 2011 to 2013 to 2017 to 2019 (ONS, 2021c).



Inequalities in life expectancy and healthy life expectancy continue exist for those living in more deprived areas.

The slope index of inequality (SII) is used to assess the absolute inequality in life expectancy and each health state life expectancy. The higher the SII, the more unequal the life expectancy is.

Figure 14 and **Figure 15** opposite show the trend for the SII for life expectancy and healthy life expectancy at birth for Wales between 2011 to 2013 and 2017 to 2019 by sex.

In 2017 to 2019, the inequality in male life expectancy was 8.9 years. This was a higher inequality than seen for females, which was 7.4 years.

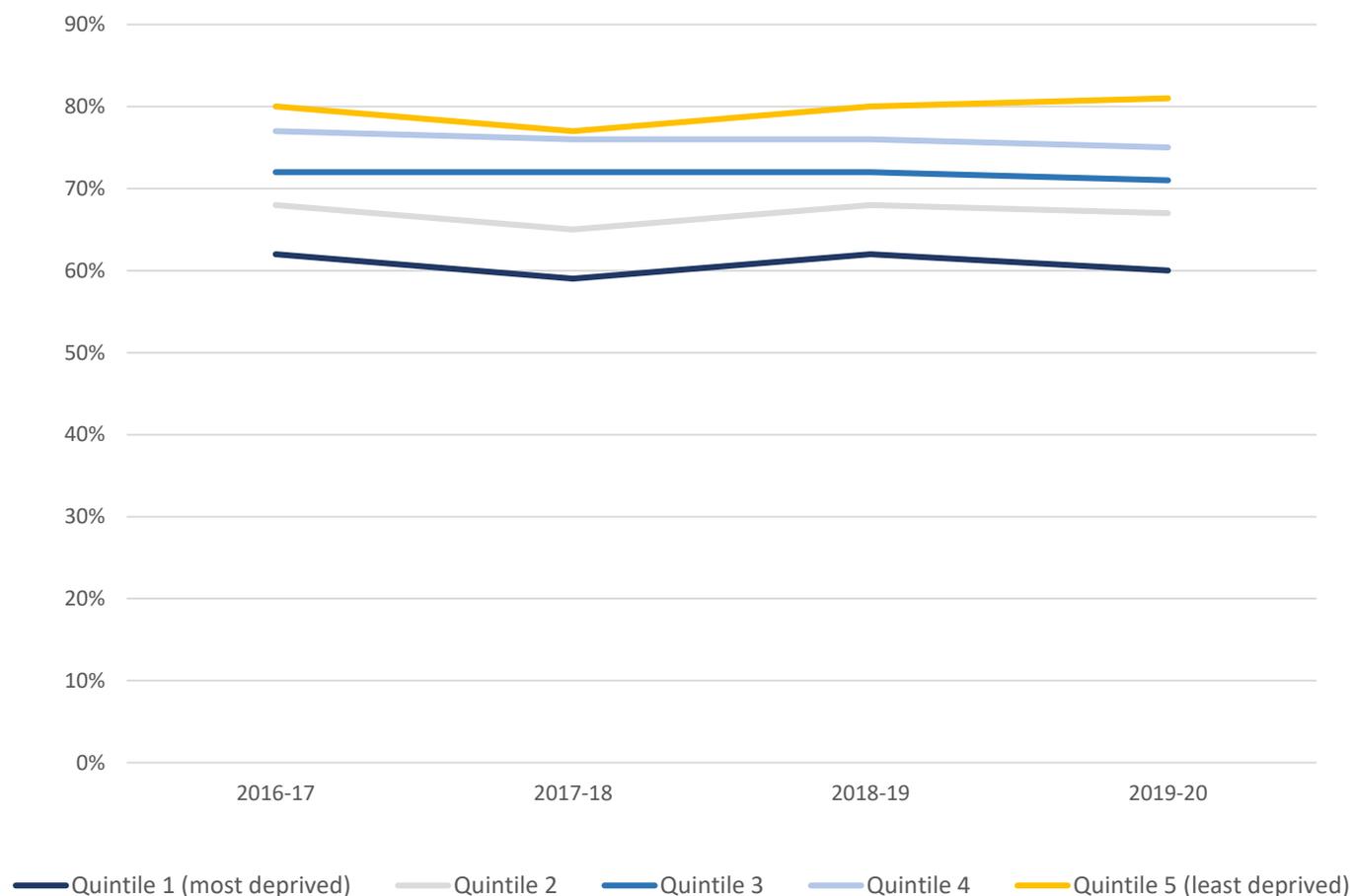
Healthy life expectancy at birth had a more substantial gap. Females experience a larger inequality, at 18.3 years compared with 17.0 for males.

While the inequality trend in life expectancy has remained consistent for both males and females since 2011-13, there has been a marginal improvement in the healthy life expectancy deprivation gap.



Self reported health has shown little improvement in recent years, with the gap between the most and least deprived widening slightly

Figure 16. Percentage of adults (aged 16+) reporting good or very good health by Welsh Index of Multiple Deprivation (WIMD) deprivation quintile (Welsh Government, 2020c).



There is a relationship between the level of self-reported health and the level of deprivation experienced by adults in Wales.

Figure 16 opposite shows the percentage of adults (aged 16+) reporting either 'good' or 'very good' health by Welsh index of multiple deprivation (WIMD) quintile.

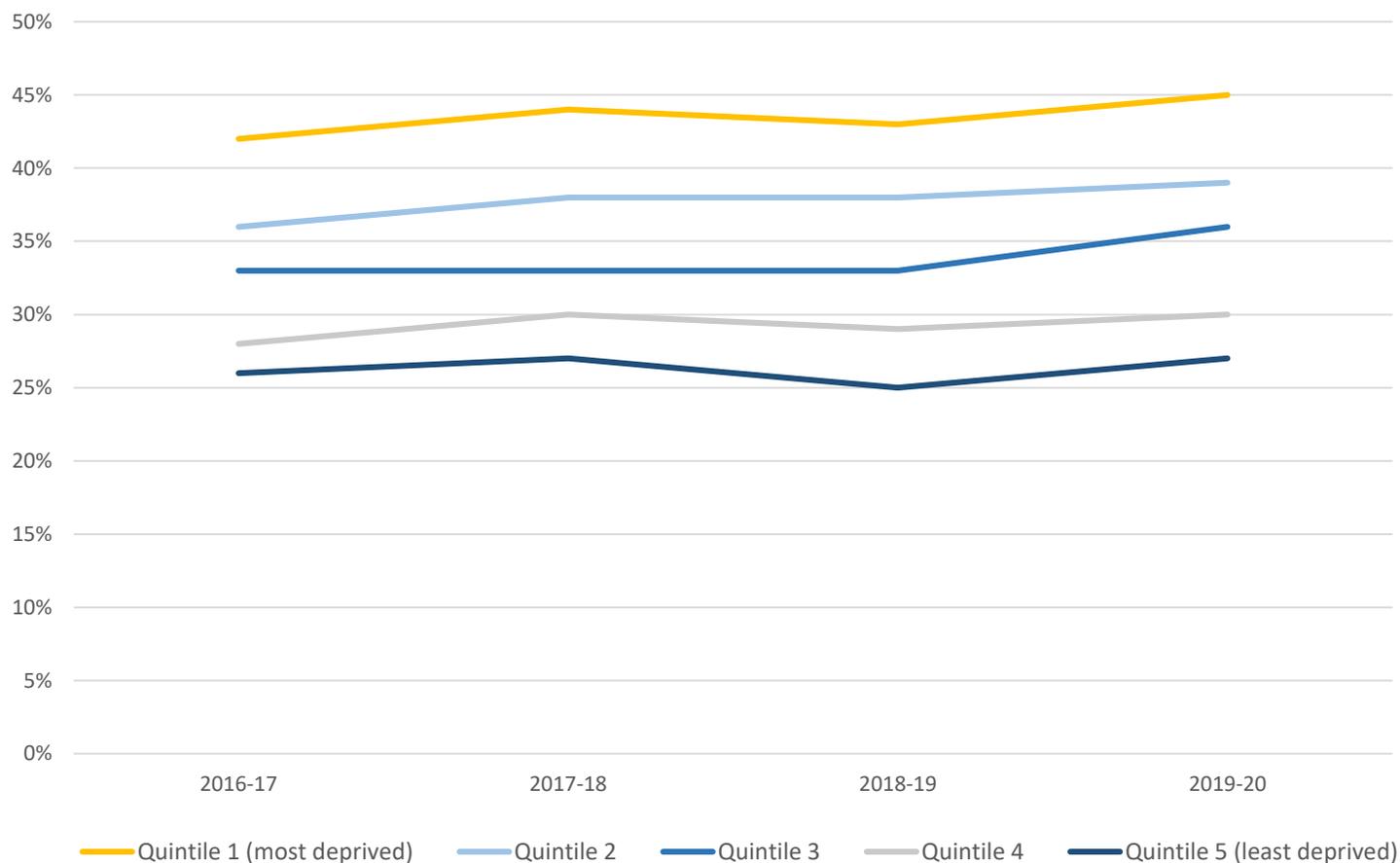
As shown in the graph, those who are most deprived in Wales are the least likely to report being in good or very good health, with the inverse true for the least deprived.

The gap between those in the most and least deprived quintiles reporting good health has widened very slightly in the past few years. The overall trend however remains fairly stable with little change in those living in good health across each of the groups.

In 2019-20, 81 per cent of those in the least deprived fifth of the population reported being in good health compared to 60 per cent of those in the most deprived fifth

There has been a slight increase in those reporting limitations due to longstanding illness in the period up to 2019-20, with higher levels among those living in the most deprived areas

Figure 17. Reported limitations due to long-standing illness by WIMD deprivation quintile, 2016-17 to 2019-20 (Welsh Government, 2020c).



There is a similar deprivation gap in those that report being limited by longstanding illness, with fewer adults in the least deprived fifth of the population reporting limitations due to longstanding illness than those in the most deprived fifth.

This has been a constant trend since 2016-17, with the latest figures from 2019-20 showing that 45 per cent of those in the most deprived group reported such limitations, compared to just 27 per cent of those in the least deprived group.

In each of the deprivation groups, there has been a slight increase in those reporting being limited by longstanding illness in the latest period reported up to 2019-20.

How healthy people are, and how limited they are by illness, will be important in adapting to and meeting the challenges that increased prevalence of chronic health conditions and complex care needs an ageing population may bring. If there are inequalities in health trends it is important to also understand how this may link to changing health needs of an ageing population and whether certain groups may be more vulnerable to its impacts.

With an ageing population, rates of certain diseases and chronic health conditions, including dementia, are projected to increase

Figure 18. Prevalence of dementia in the four countries of the UK by severity of dementia, 2019 (CPEC, 2019).

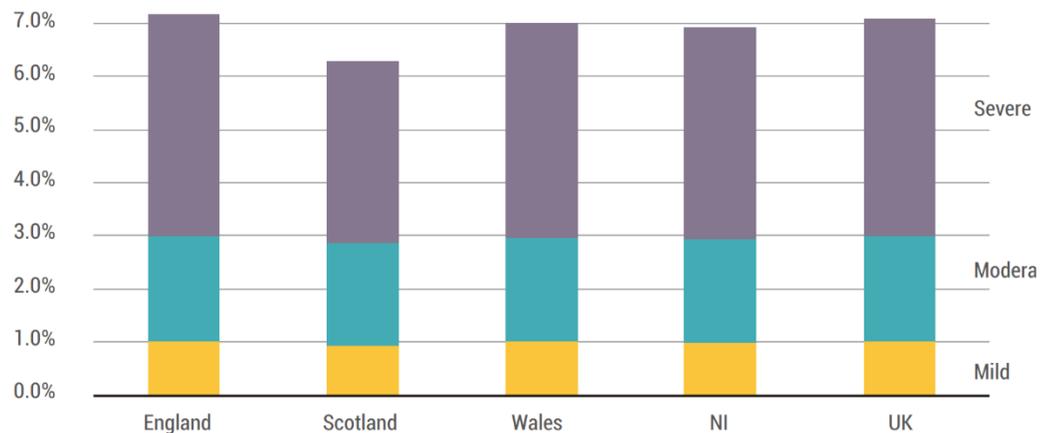
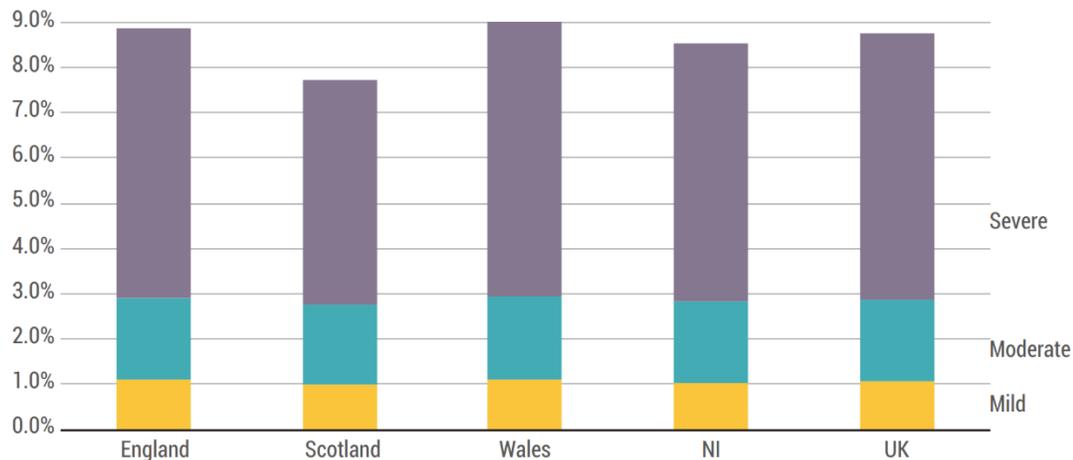


Figure 19. Prevalence of dementia in the four countries of the UK by severity of dementia, 2040 (CPEC, 2019).



As previously mentioned, one consequence of an ageing population is a rise in the prevalence of chronic conditions and multi-morbidities, including increased rates of dementia.

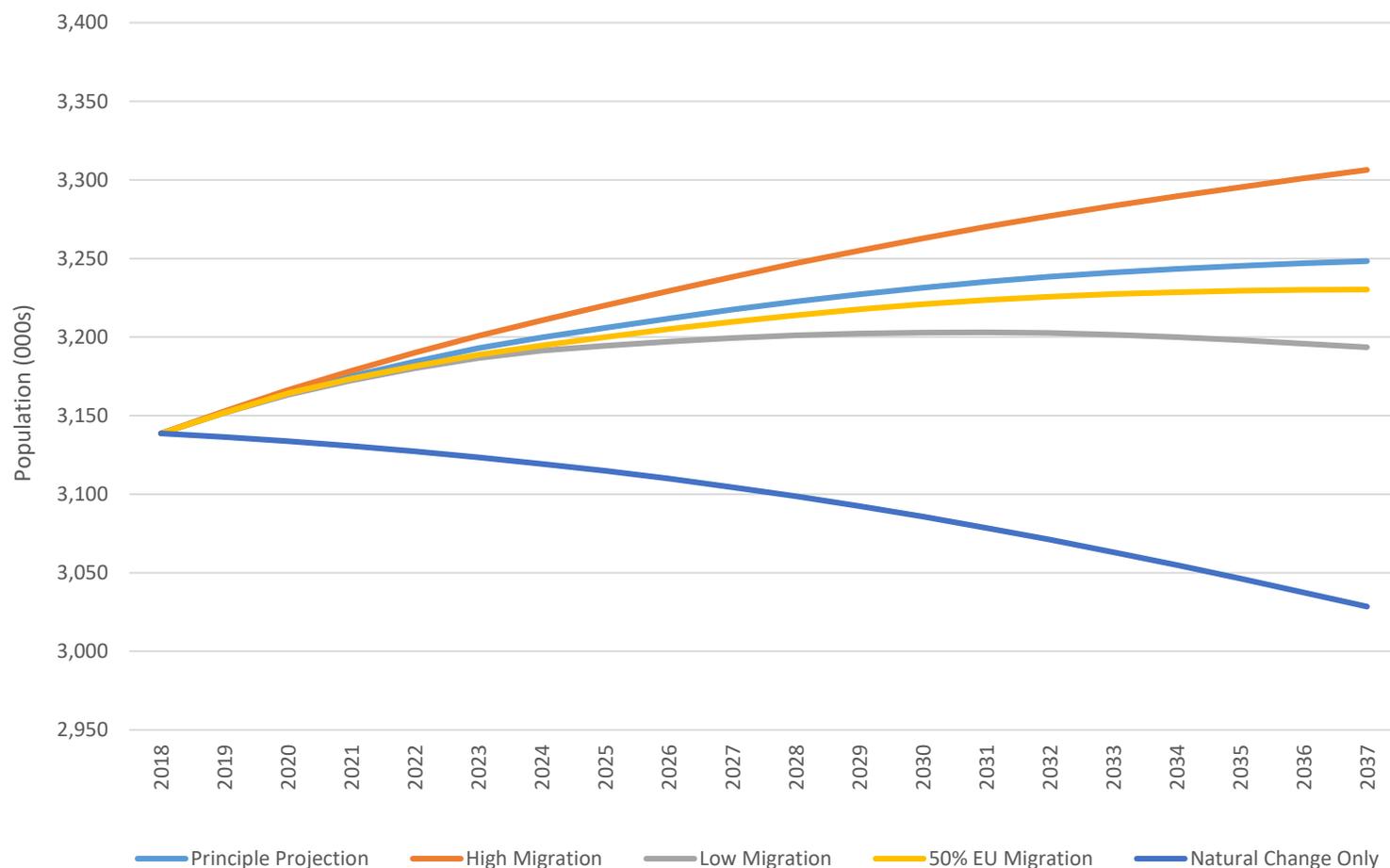
As of 2019 in Wales, 7 per cent of older people are estimated to have some level of dementia. This is projected to increase to 9 per cent in 2040.

Alongside other complications associated with an ageing population, increased dementia rates will increase pressures on health and social care services. Some of this additional demand is therefore likely to be addressed through unpaid and informal care.



The principal migration projection for Wales points to an increasing population up to 2037

Figure 20. Population projection with different variants, Wales, 2018-2037 (ONS, 2019b).



Migration is projected to be a key driver of population change in Wales.

While projections vary depending on the assumptions used to forecast change, without any migration (natural change only) the population of Wales would be projected to decrease.

Even under the 'low migration' scenario, the direction of change shifts toward a 1.75 per cent increase in the overall population between 2018 and 2037. If migration levels remain consistent with those from 2018, this increase grows to 3.5 per cent across the same time period, while a 'high migration' scenario would see increases of up to 5.35 per cent.

References & Resources



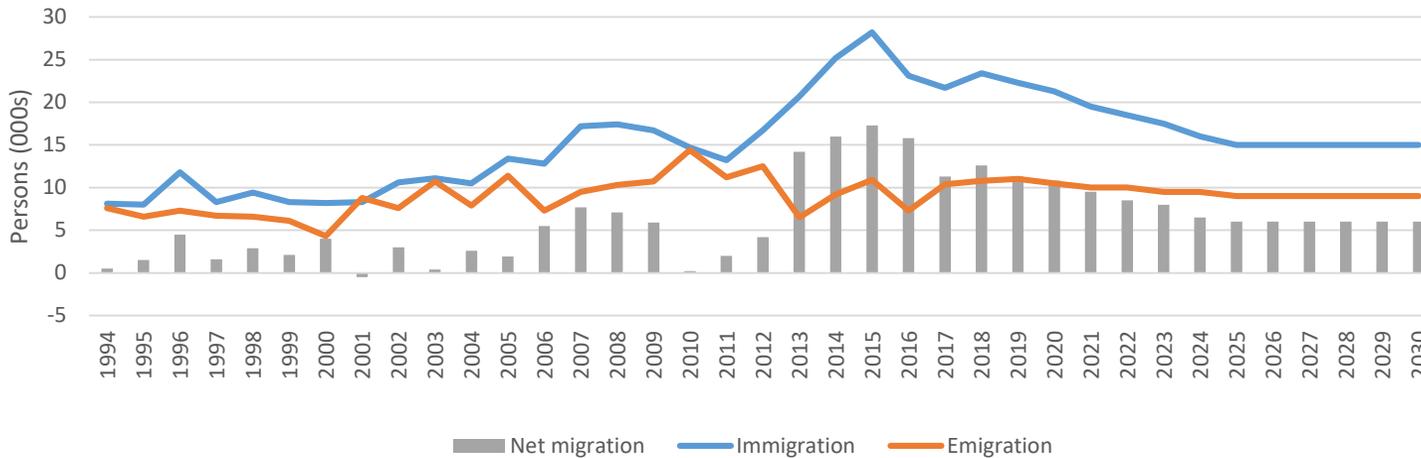
Demographic Trends in Wales (Bevan Foundation, 2018)



National Population Projection Datasets (ONS, 2019b)

Annual net international migration to Wales is projected to be at around 6,000 per year from mid-2025 onwards

Figure 21. Total international migration, Wales, years ending mid-1994 to mid-2030 (ONS, 2019c).

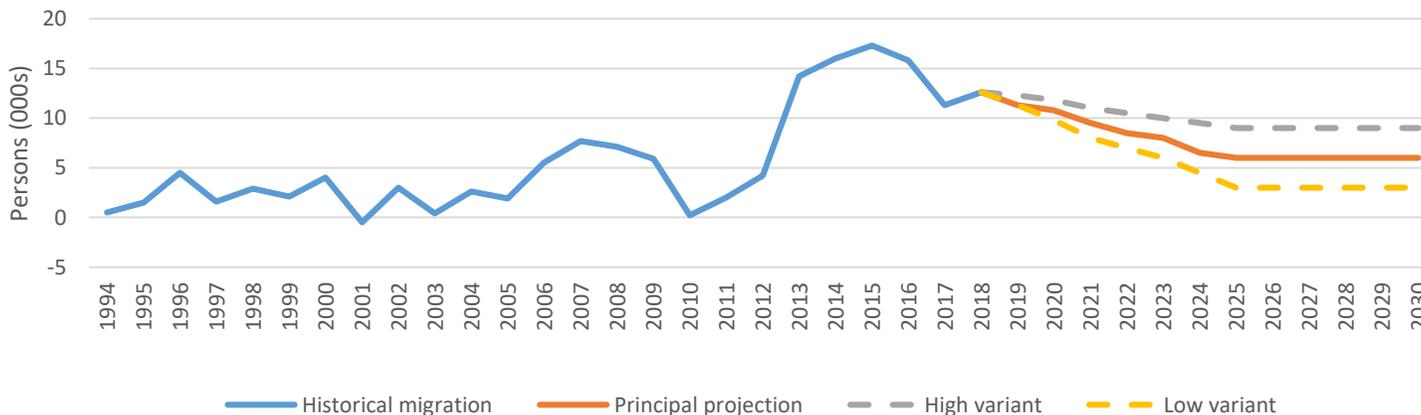


Using the most recent population projections, international migration to Wales is assumed to be relatively constant up to 2030, with an expected net increase of around people 6,000 per year from mid-2025 onwards.

This is following an increase over the 2010s and a subsequent slight decrease from around 2015 up to 2021.

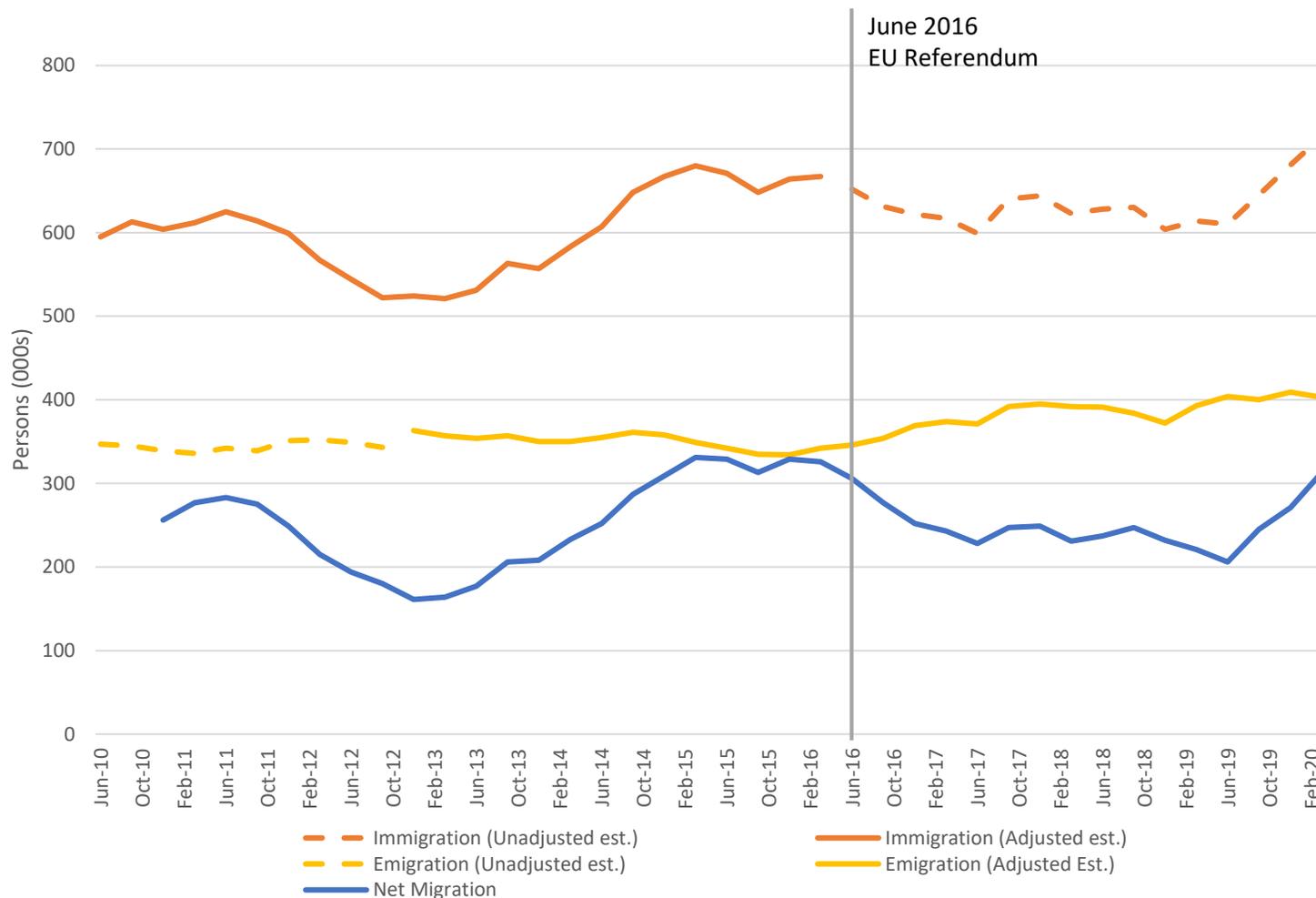
Including high and low variant migration assumptions provides an estimate of alternative scenarios on migration. As shown in **Figure 22**, a high migration scenario could see annual net migration to Wales increase to 9,000 from the year ending mid-2025 onwards, while a low migration scenario would reduce that increase to around 3,000 per annum.

Figure 22. Net international migration estimates, principal and variant migration assumptions, Wales, years ending mid-1994 to mid-2030 (ONS, 2019c).



Non-EU net migration has been increasing in the UK since 2013, while EU net migration has stabilised since 2018

Figure 23. Long-term international migration, UK, year ending June 2010 to year ending March 2020 (ONS, 2020).



Using the most recent population projections, international migration to Wales is assumed to be relatively constant up to 2030, with an expected net increase of around people 6,000 per year from mid-2025 onwards.

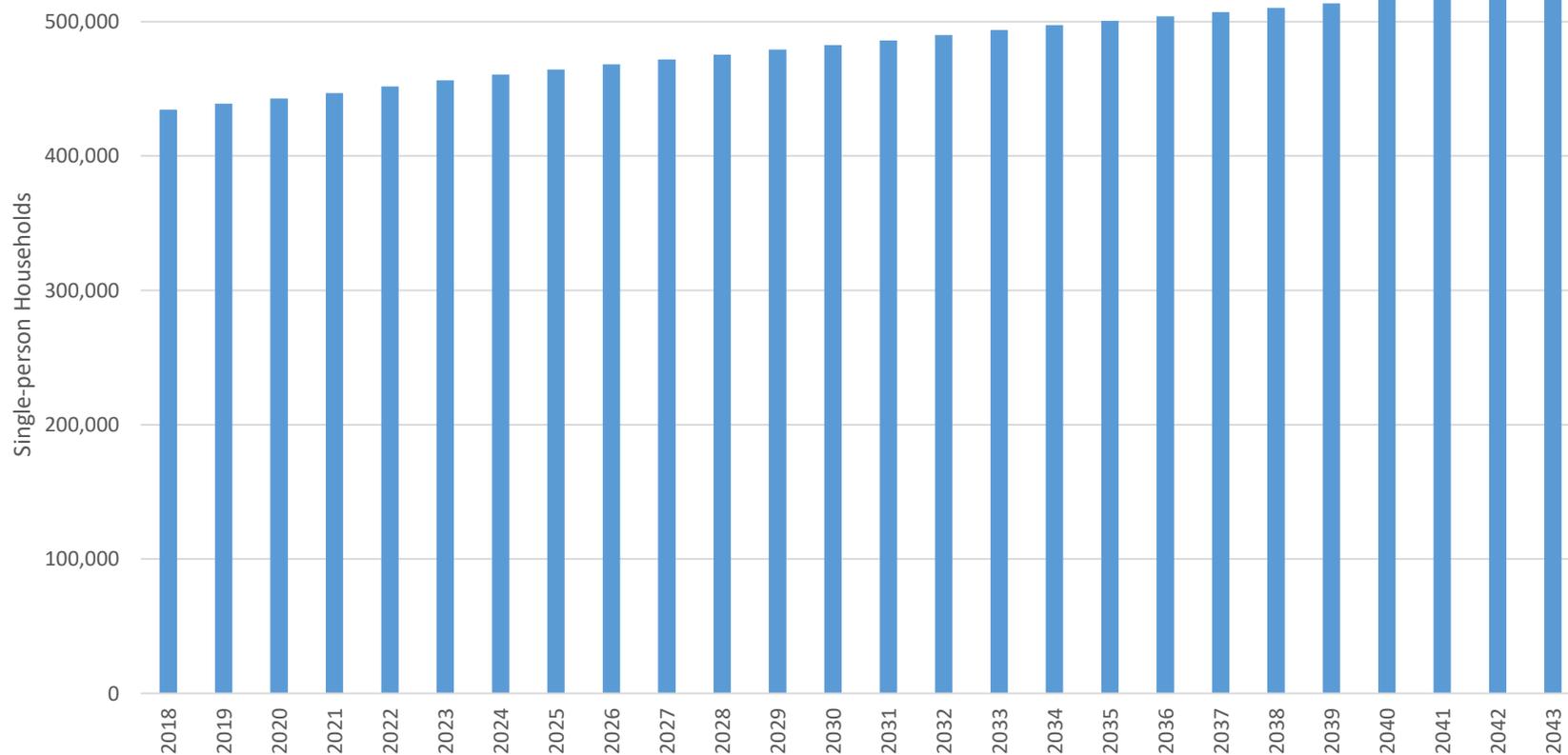
This is following an increase over the 2010s and a subsequent slight decrease from around 2015 up to 2021.

Including high and low variant migration assumptions provides an estimate of alternative scenarios on migration. As shown in **Figure 23**, a high migration scenario could see annual net migration to Wales increase to 9,000 from the year ending mid-2025 onwards, while a low migration scenario would reduce that increase to around 3,000 per annum.



The number of people living in single-person households is likely to increase in the future

Figure 24. Single-person household projections by year (Welsh Government, 2021b).



The number of single-person households in Wales is projected to steadily increase in the period up to 2043.

From just over 440,000 in 2020, the central projection estimates there could be over 520,000 people living in single-person households by 2043.

References & Resources



[Household Projections, 2018-Based \(Welsh Government, 2020d\)](#)

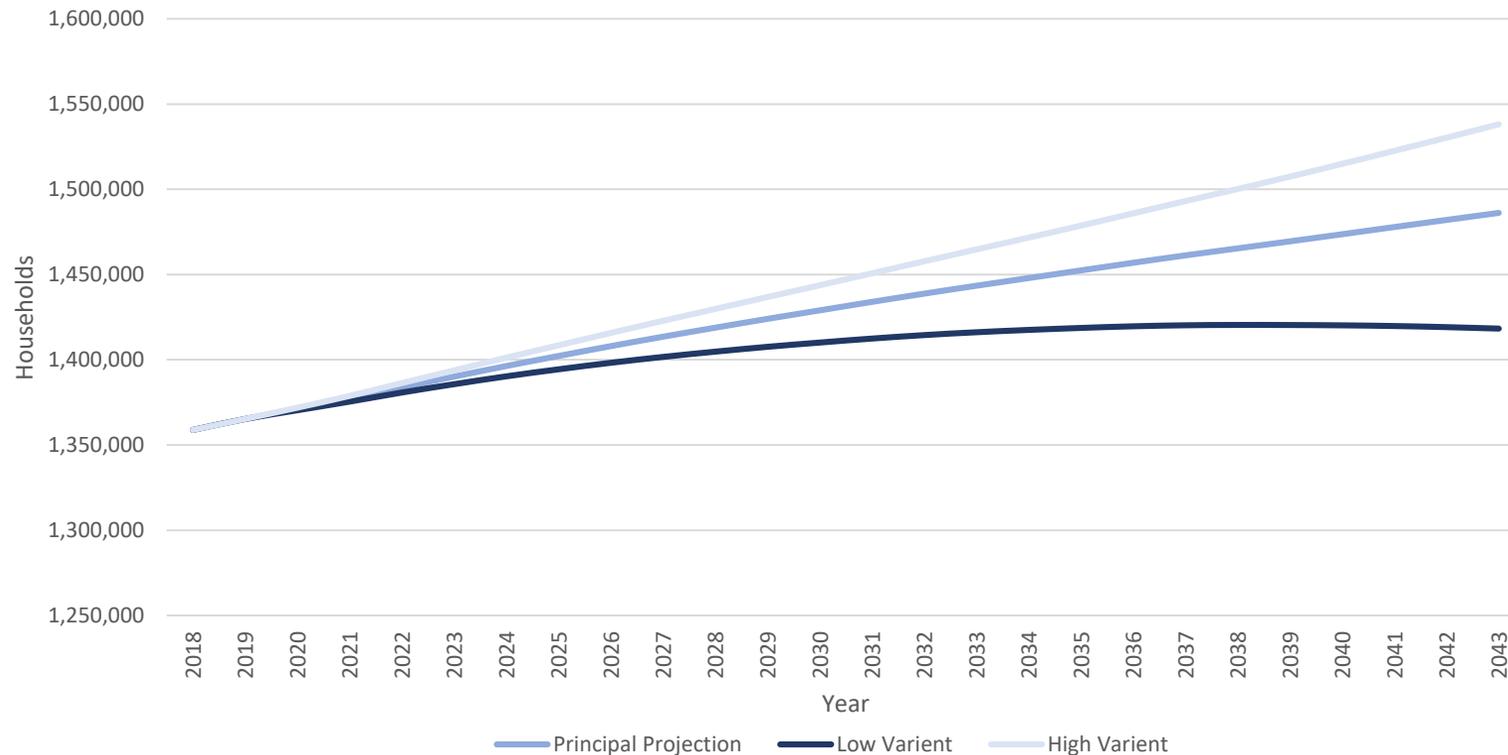


[Household Projections by Type and Year \(Welsh Government, 2021b\)](#)

The number of households in Wales is projected to increase in the future

Figure 25. Wales household projections by variant and year (2018-based)

(Welsh Government, 2021c).



Depending on the projection variant, the number of households in Wales is projected to increase anywhere between 4 per cent and 13 per cent over the next 20 years.

Figure 25 shows projections under different variant scenarios, with the ‘principal projection’ showing a 9 per cent increase in households by 2038 if rates remain consistent from 2018.

References & Resources

NOTE: The higher variant is based on high fertility, life expectancy and migration assumptions. The central variant is based on principal household projections and the lower variant is based on low fertility, life expectancy and migration assumptions



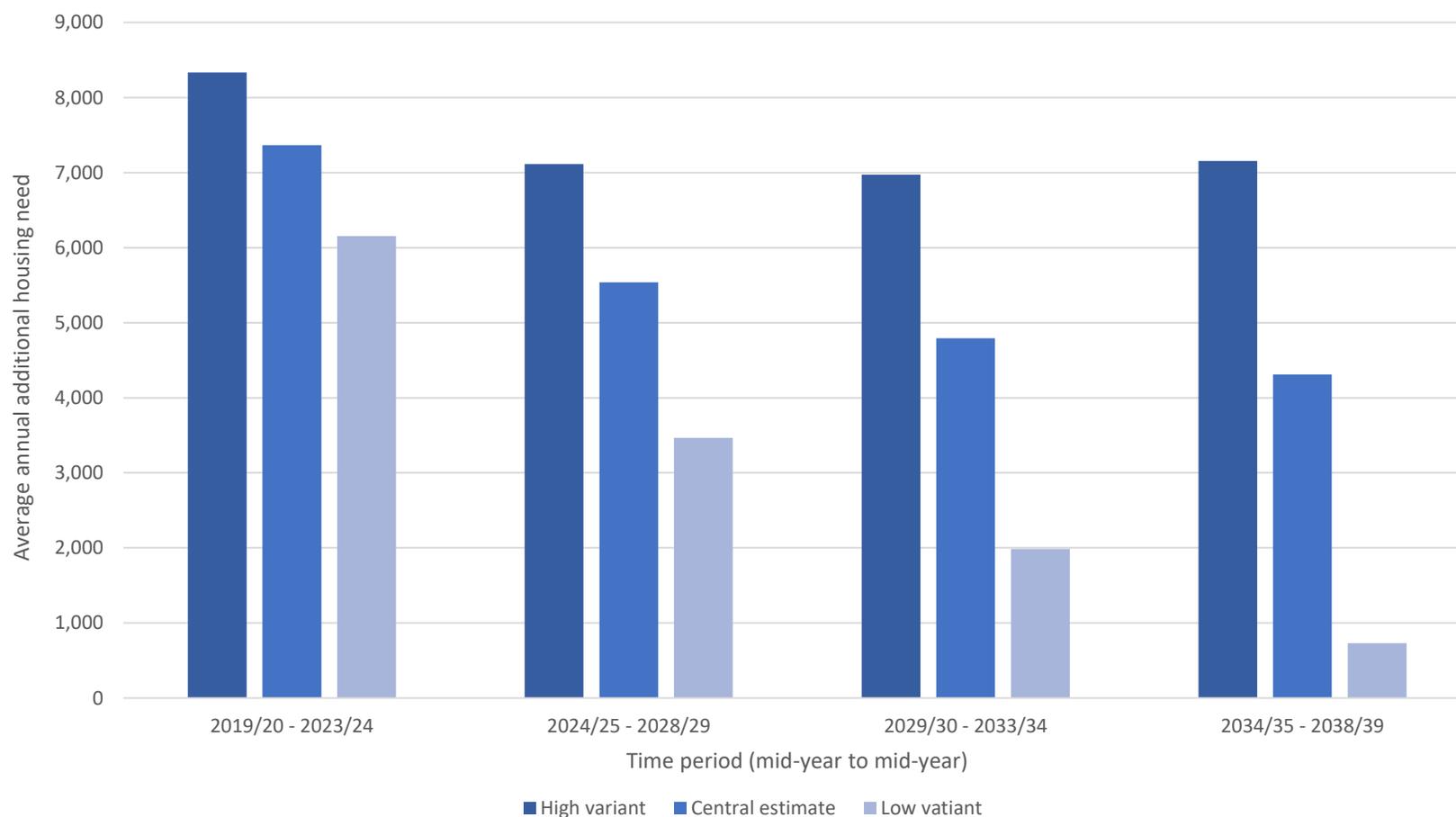
[Estimates of Housing Need \(Welsh Government, 2020e\)](#)



[StatsWales Household Projections \(Welsh Government, 2021c\)](#)

Additional housing units will be needed in the future to meet increasing demand

Figure 26. Average Annual Estimates of Housing Need (2019-based) by Variant and 5 Year Period (Welsh Government, 2020f).



As per 2019 estimates, between 6,200 and 8,300 additional housing units will be required per year up to 2023/24. Shown in **Figure 26**, this gives a projected central estimate of an additional 7,400 housing units annually during this period.

Estimates of additional housing need generally decrease after 2023/24 however, with central estimates for additional housing need dropping to 5,500, 4,800 and 4,300 over the three subsequent five-year periods.

References & Resources



[Estimates of Housing Need \(Welsh Government, 2020e\)](#)



[StatsWales Estimates of Housing Need \(Welsh Government, 2020f\)](#)

Additional housing need in the future will vary between regions in Wales

Figure 27. Annual average estimate of additional housing need by region, variant and 5-yearly periods (Welsh Government, 2020e).

Region	Variant	2019/20 – 2023/24	2024/25 – 2028/29	2029/30 – 2033/34	2034/35 – 2038/29
North Wales	Lower variant	968	368	60	-
	Central estimate	1,231	810	643	557
	Higher variant	1,443	1,148	1,115	1,177
Mid Wales	Lower variant	67	14	-	-
	Central estimate	133	128	75	32
	Higher variant	194	227	213	217
South West Wales	Lower variant	1,376	860	497	201
	Central estimate	1,642	1,311	1,120	1,041
	Higher variant	1,858	1,655	1,603	1,678
South East Wales	Lower variant	3,749	2,234	1,546	835
	Central estimate	4,358	3,291	2,956	2,681
	Higher variant	4,839	4,084	4,044	4,085

There are considerable differences in the projected additional housing need by geographical region.

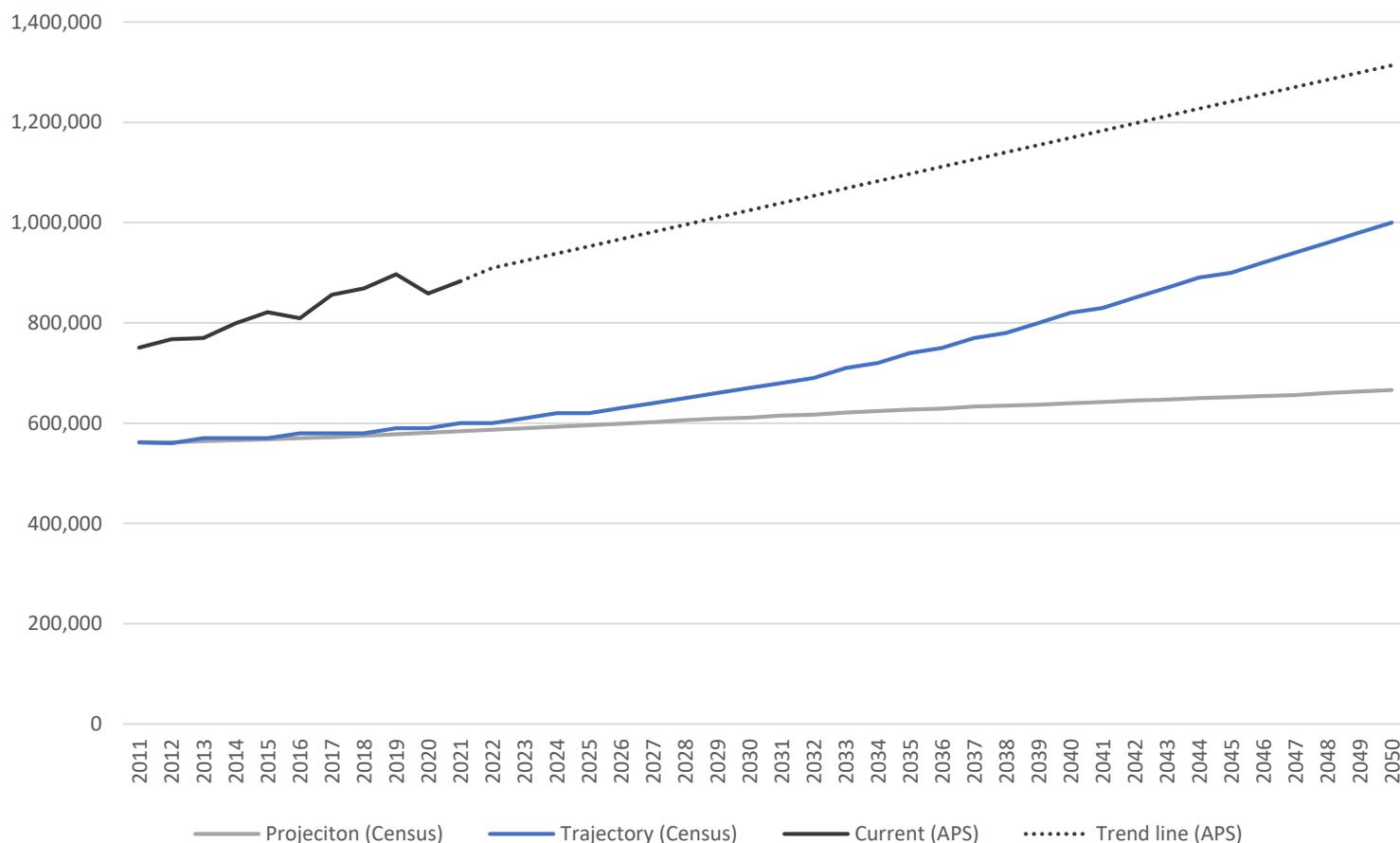
The region with the largest additional need is south east Wales, with an average central estimate of 4,358 additional housing units required per annum in the five year period between 2019/20 and 2023. Meanwhile, mid Wales is set to continue having the lowest housing need, with an average central estimate of only 133 houses required per year in the same time frame.

Reflecting the national trend, all regions are projected to have a decline in the need for additional housing units over the period up to 2038/39, with both mid and north Wales estimated to no longer have additional housing need by this time under the lowest projection variant.



The number of people speaking Welsh is projected to increase

Figure 28. Projection and trajectory for the number of Welsh speakers aged three and over, 2011 to 2050 (Welsh Government, 2017; 2021d).



Over time, the number of Welsh speakers in Wales is predicted to increase significantly. Projections based on 2011 census data, calculated in 2017 by the Welsh Government, estimated that there would be approximately 666,000 people aged three and over able to speak Welsh by 2050. This is equivalent to 21 per cent of the population and represents an increase of 100,000 Welsh speakers over the 40 year period.

Taking into account policy assumptions in line with the Welsh Government’s target to reach 1 million Welsh speakers by 2050, a separate ‘trajectory’ was produced indicating that this figure could be surpassed by 2030. Under this trajectory, the overall increase is assumed to be driven by younger age groups and maintained though future generations.

More recent data from the Annual Population Survey however, indicates that even the most ambitious estimates are currently being exceeded, with a reported 883,300 Welsh speakers aged 3+ in 2021. Despite a drop from 896,900 in 2019, the longer-term trend would suggest that the target of 1,000,000 Welsh speakers will be achieved far ahead of 2050, possibly even being surpassed within the next 10 years.

It should be noted, however, that the National Census and Annual Population Survey use different sampling methods and are not therefore directly comparable. A more accurate picture of current Welsh language trends will be evident with the forthcoming publication of 2021 National Census data.

References & Resources



[Projection and Trajectory of Welsh Speakers \(Welsh Government, 2017\)](#)



[APS - Ability to Speak Welsh \(Welsh Government, 2021d\)](#)

Overview

Inequalities are driving trends that impact across all areas of society and particularly the ability to provide opportunities to all populations and places.

Together with the economy, societal inequalities underpin trends in the development of jobs, skills, and the labour market in Wales. While changes in these areas may have the potential to drive development for certain people and areas, these trends are not experienced equally.

Where rates of inequality have improved, these effects are not always felt equally. This is evident when viewing data broken down by protected characteristic and geographical area. Unequal development may itself have direct impacts on trends facing future generations, for example; high and growing inequality can impact negatively on economic growth and trap people in cycles of poverty.

Similarly, poorer educational outcomes can lead to worse employment outcomes later in life and these disadvantages can be passed on to future generations who will consequently face the same barriers. Living in poverty has also been associated with poorer health and well-being outcomes which, if not addressed, can exacerbate existing inequalities.

Globally, taking income inequality as a measure, inequality has been decreasing since around 1990 and these trends are continuing.

This global average does not, however, represent the whole picture and the trend towards reducing inequalities is not being felt equally across the globe. Income growth has progressed more quickly among people in the middle and top of global wealth distribution than among the world's poorest. This is also the case within the UK.

Although more countries are experiencing a decline in income inequality, a growing share of the world's population actually live in countries that have been facing widening inequality.

Within Wales, the overall trend in income poverty points towards a slight reduction in poverty levels.

In recent years, poverty rates for children in Wales have been broadly similar to the UK as a whole, however poverty rates among both working-age adults and pensioners have been consistently higher. Poverty is also experienced unequally across groups in Wales, with available data showing that gaps in income poverty exist between disabled people and those in Black, Asian and minority ethnic groups.

Unemployment has been falling across Wales since around 2013 after a period of stagnation.

Increasing employment may provide more opportunities for people in Wales to improve their economic well-being, however there are still high rates of in-work poverty. Increasing employment also does not necessarily equate to

improved economic outcomes. Those in employment may still experience poor outcomes if the quality of employment is poor and other challenges to getting out of poverty remain as a result of economic policies. Job growth is also not occurring equally in Wales, with areas of south Wales in particular seeing both the highest growth in number of jobs and the steepest reductions in unemployment.

Mirroring the UK as a whole, the qualification profile of the Welsh population has improved markedly between 2008 and 2020. Gaps with the UK as a whole have generally widened slightly, but Wales continues to perform as well, or better, than most English regions outside London, the South East and South West, while trailing Scotland.

Lower qualification levels at school can decrease opportunities for further education and employment later in life. This contributes to the risk of trapping people within a poverty cycle and can contribute to inequality trends in future generations.

Several countries have experienced a decline in income inequality since the 1990s, but the share of wealth between the richest and poorest in society is increasing

Figure 29. Map of within-country inequality changes between around 1990 and the mid-2010s, Gini index (UN, 2020a).

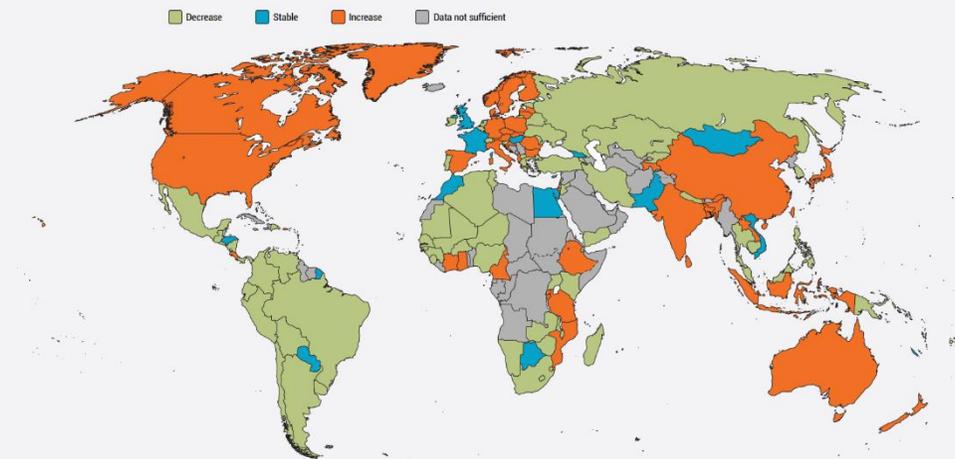
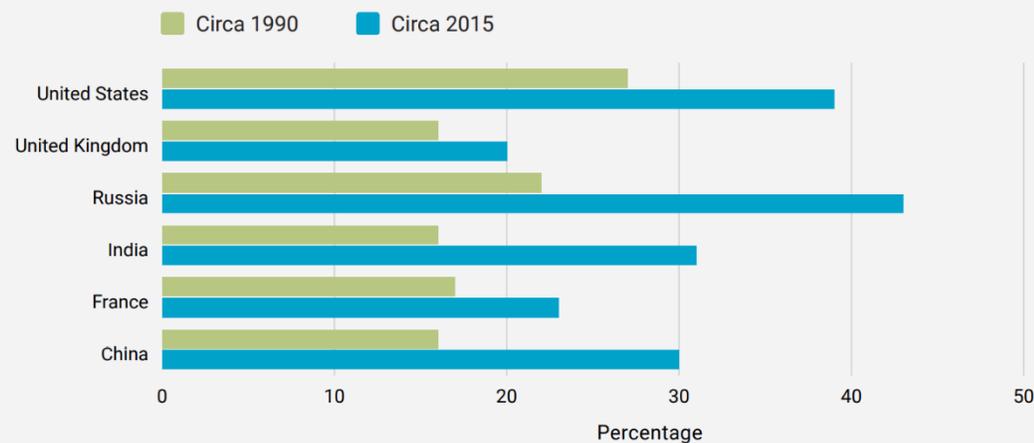


Figure 30. Share of wealth of the top 1 per cent in selected countries, 1990 and 2015 (UN, 2020a).



Data from 2015 points to a decline in global income inequality since around 1990, breaking a long-term trend of increasing global inequality.

Trends in inequality within countries, however, vary greatly among country groups. **Figure 29** shows country inequality changes between around 1990 and the mid-2010s using the Gini index (a measure of the distribution of income across a population). Over this period, more countries experienced a decline in income inequality (68 countries) than increases in inequality (45 countries).

In the United Kingdom and France income inequality remained relatively constant, while in other high-income European economies it decreased (Belgium, Ireland, the Netherlands, Portugal and Switzerland).

Despite reductions in income inequality, a gap still exists between the richest and poorest in society, including within the UK and Wales. **Figure 30** shows the share of wealth of the top 1 per cent in selected countries between around 1990 and 2015. Data between 1990 and 2015 points towards an increasing concentration of wealth among the top 1 per cent in countries with sufficient wealth evidence to analyse.

References & Resources



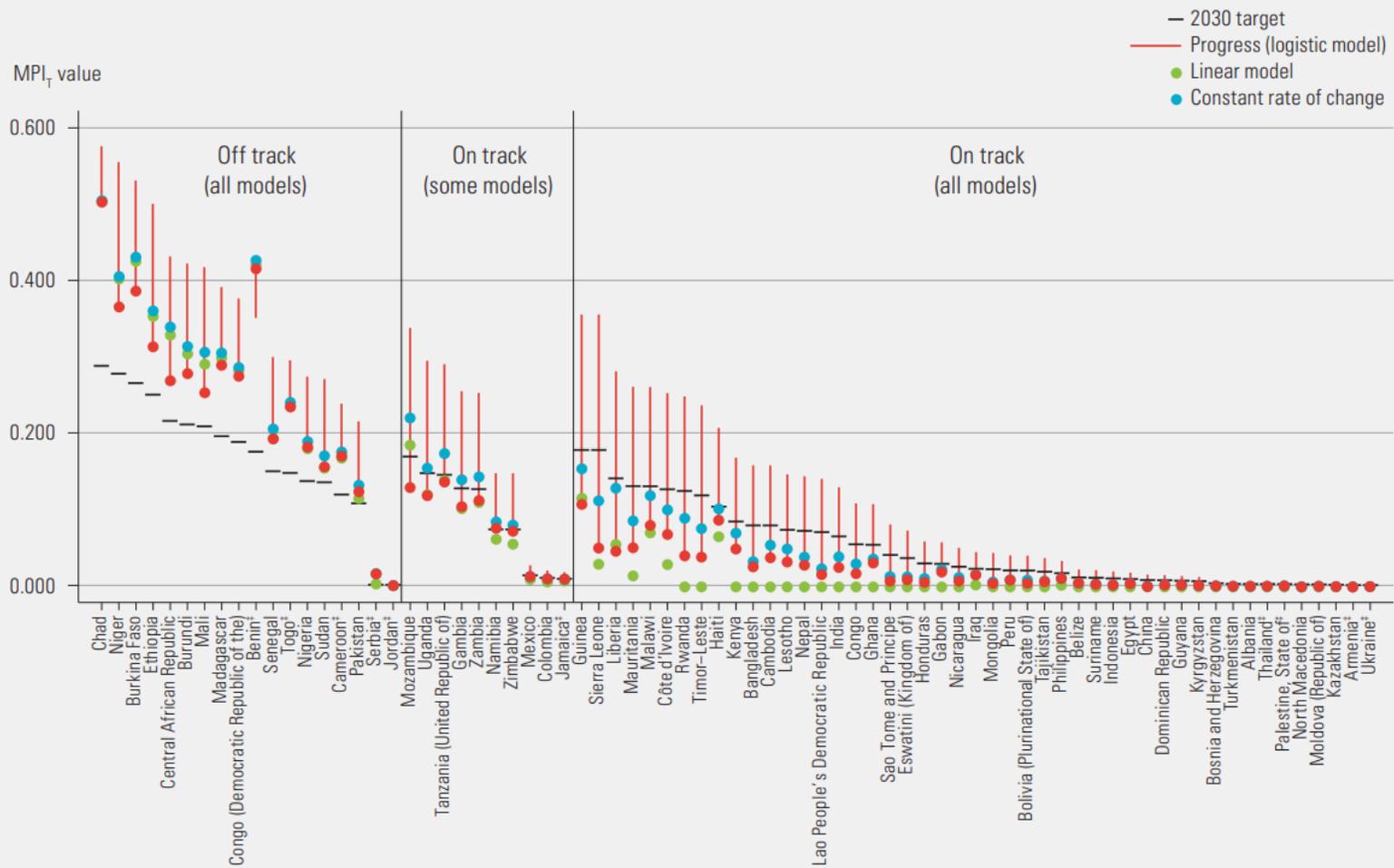
Shaping the Trends of Our Time (United Nations, 2020a)



World Income Inequality Database (United Nations, 2021)

While some countries are making progress towards targets for reducing multidimensional poverty, several remain off track if current trends continue

Figure 31. Country progress toward halving multidimensional poverty (UN, 2020b).



Income inequality is not the only measure of poverty, with other measures able to give valuable indication of progress towards reducing inequalities globally.

The UN 2020 global multidimensional poverty index (MPI) measures poverty not only in economic terms but includes peoples lived experiences and the multiple deprivations they face. It combines 10 indicators across health, education, and standards of living. In the index, people are counted as multi-dimensionally poor if they are deprived in one-third or more of 10 indicators.

Figure 31 opposite shows the trend in progress towards the goal of halving multidimensional poverty in selected countries globally by 2030 if observed trends continue. Before the COVID-19 pandemic, 47 countries were on track to halve multi-dimensional poverty by 2030, and 18 were off track if observed trends continue.

Of the 18 countries that were off track, 14 were in sub-Saharan Africa and were among the poorest, suggesting they will need a substantial boost in resources and action to halve multidimensional poverty.

References & Resources



Charting Pathways out of Multidimensional Poverty (UN, 2020b)

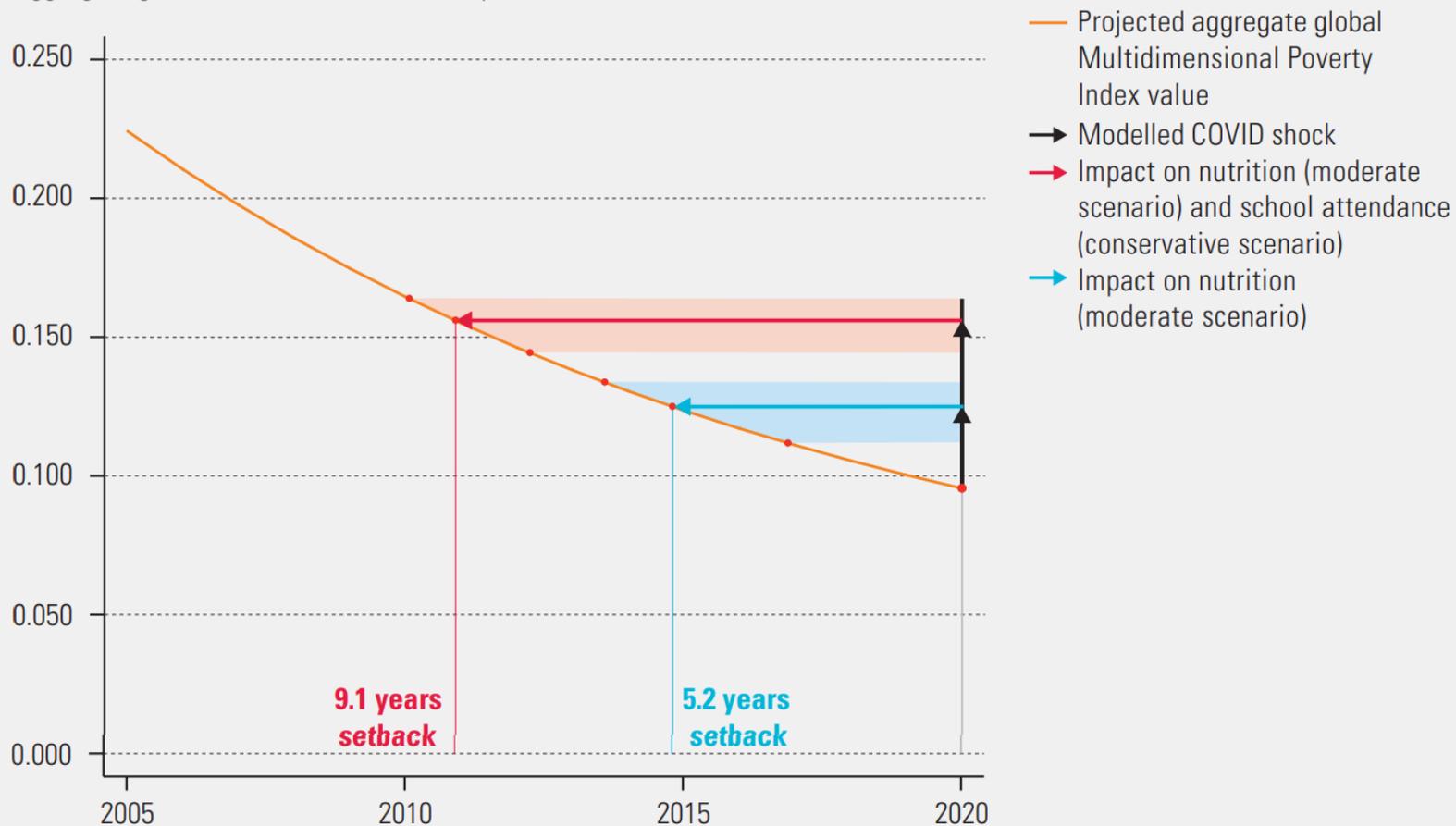


Multidimensional Poverty Index Data (United Nations, 2020c)

COVID-19 has the potential to disrupt trends where there has been progress towards reducing multidimensional poverty

Figure 32. COVID-19 impact on global multidimensional poverty (UN, 2020b).

Aggregate global Multidimensional Poverty Index value



Efforts to reduce multidimensional poverty have been impacted by the COVID-19 pandemic.

Substantial impacts on multidimensional poverty are expected through two indicators which the MPI is based on – nutrition and school attendance.

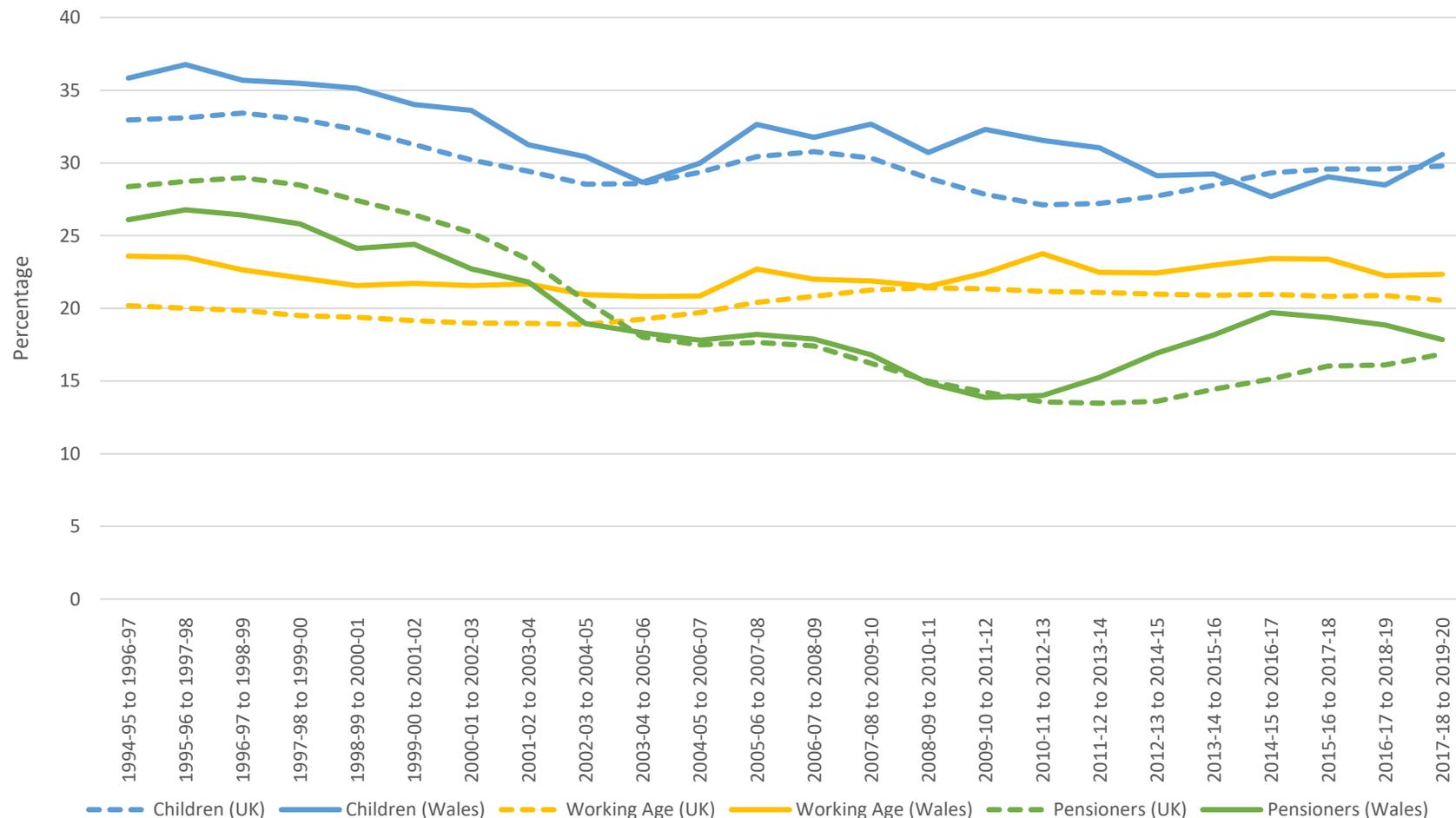
Under a conservative scenario of the impact of COVID-19 on these factors, it is estimated that the increase in deprivation may set poverty levels back by 9.1 years.

Therefore, the current expected trends towards reducing multidimensional poverty may be challenged by experiences brought about as a result of the pandemic.

Relative income poverty data in Wales points towards a trend of slightly reducing poverty levels since the 1990s

Figure 33. Percentage of people living in relative income poverty in Wales by age group

(Welsh Government, 2021a).



Using relative income poverty as a measure, levels of poverty across Wales are generally experiencing gradual reductions.

Figure 33 shows the percentage of people living in relative income inequality in Wales by age group.

In recent years, poverty rates for children in Wales have been broadly similar to the UK as a whole, however poverty rates among both working-age adults and pensioners have been consistently higher.

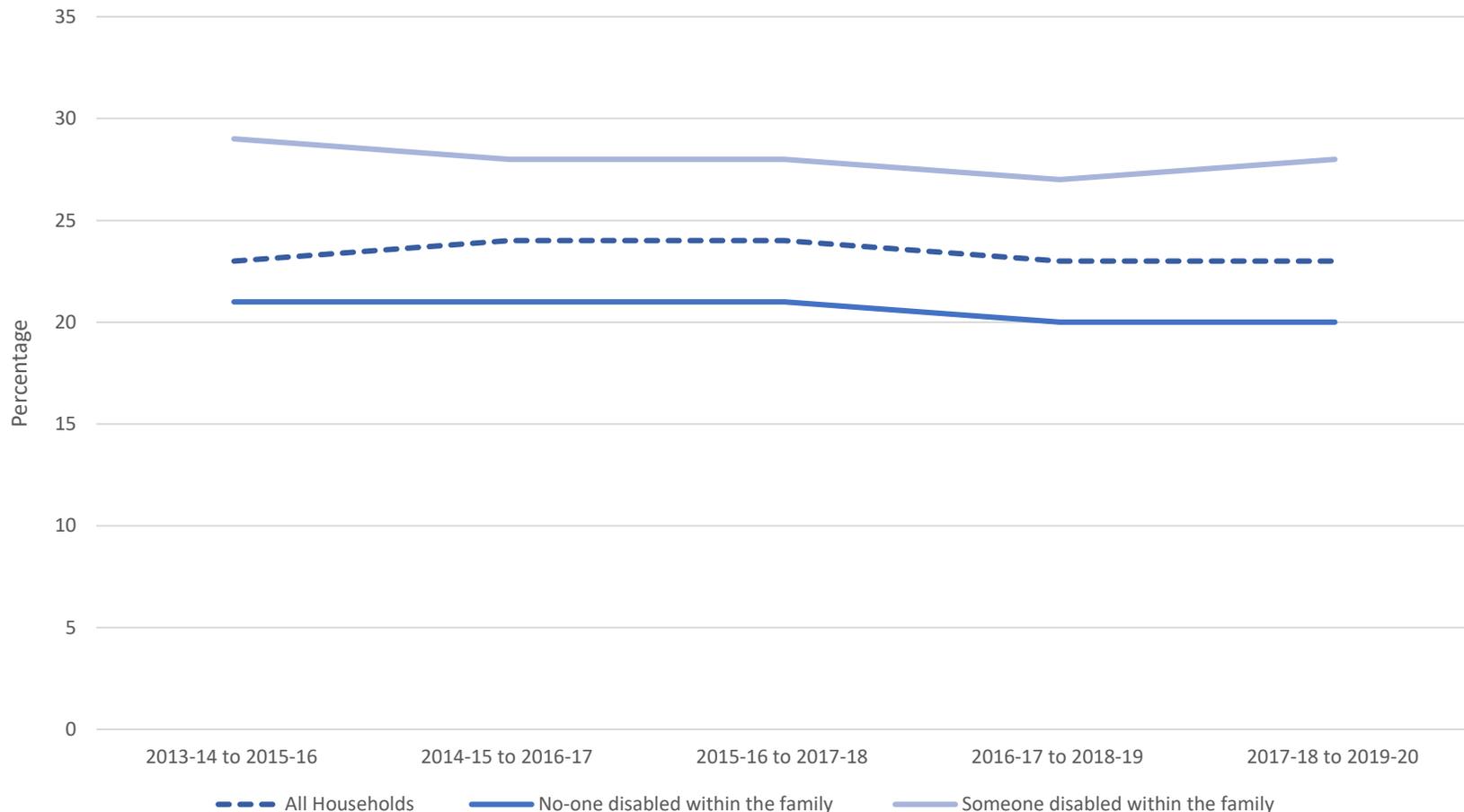
It is notable that the correlation between the level of poverty in an area and its overall economic performance is not consistently strong. In particular, London has both the highest average of household income in the UK and the highest poverty rates.

References & Resources



Reductions in income poverty are not occurring equally and gaps in income equality for certain groups still exist in Wales

Figure 34. People in relative income poverty in Welsh Households by whether there is disability within the family (%) (Welsh Government, 2021b).



While income poverty is decreasing overall in Wales, this trend is not experienced equally across all population groups. High-level figures, which take an average across the whole population, are useful for gauging national trends but often mask inequalities that exist between population groups.

Households in Wales with a disabled person in the family, for example, are far more likely to be living in relative income poverty (28 per cent) than those without (20 per cent). While both rates of poverty have decreased marginally over the last five-year period, the poverty gap has consistently remained at around 8 percentage points.

Those from Black, Asian and minority ethnic groups are also at a higher risk of being in relative income poverty.

Despite a widening of this inequality gap in the most recent period, significant progress has been made in recent years. From its worst point in 2010-2015, the percentage of minority ethnic group households at risk of relative income poverty almost halved by 2014-19 to 25 per cent.

Meanwhile the percentage of households at risk of relative income poverty from a white ethnic group has remained relatively consistent at between 22 and 24 per cent.

References & Resources



Income Poverty and Disability (Welsh Government, 2021b)



Income Poverty and Ethnicity (Welsh Government, 2021c)

Non-working households continue to be at greatest risk from relative income poverty

Figure 35. Working age adults in relative income poverty by economic status of household (Welsh Government, 2021d).

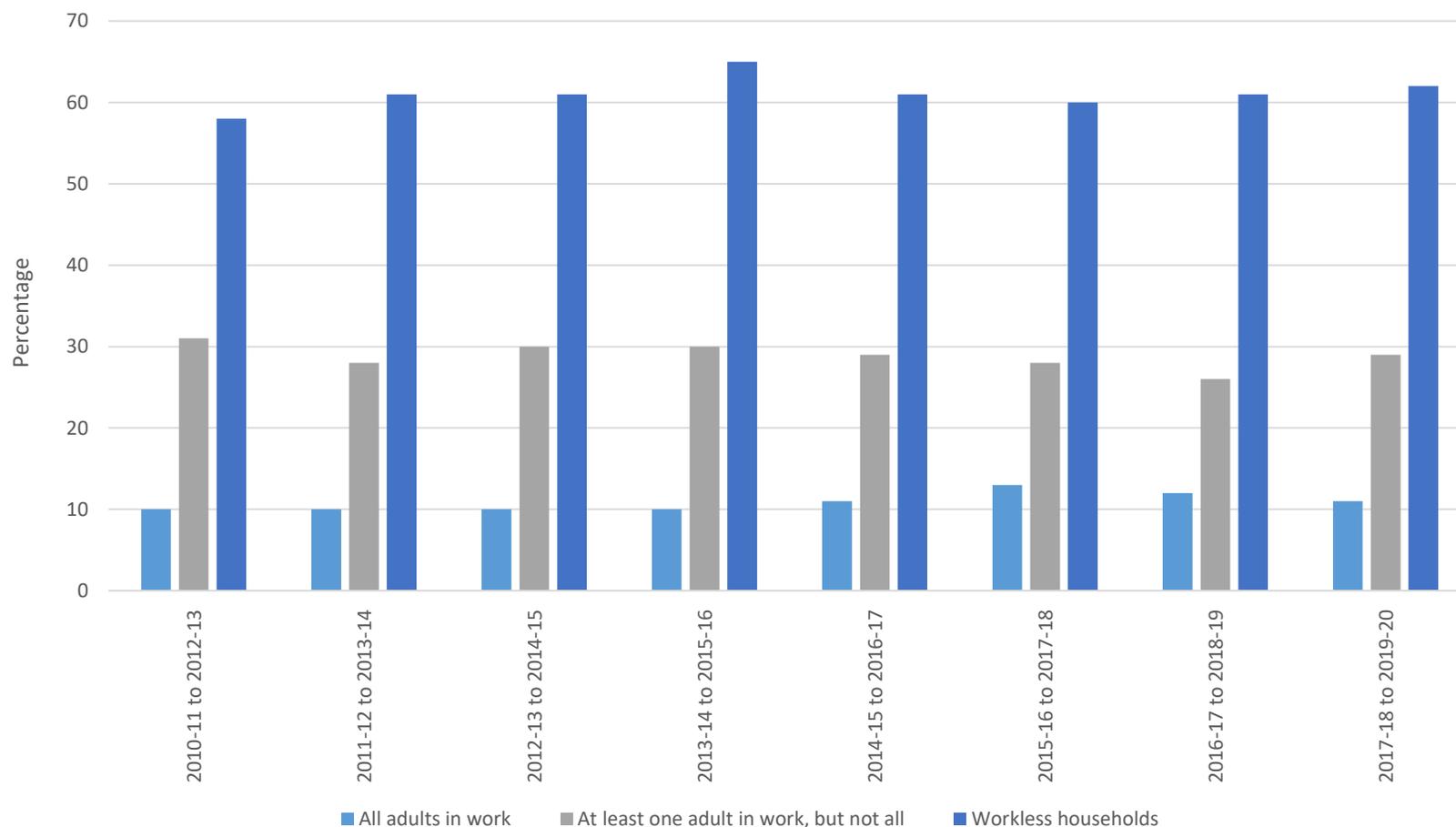


Figure 35 shows the percentage of working age adults in poverty by economic status of household.

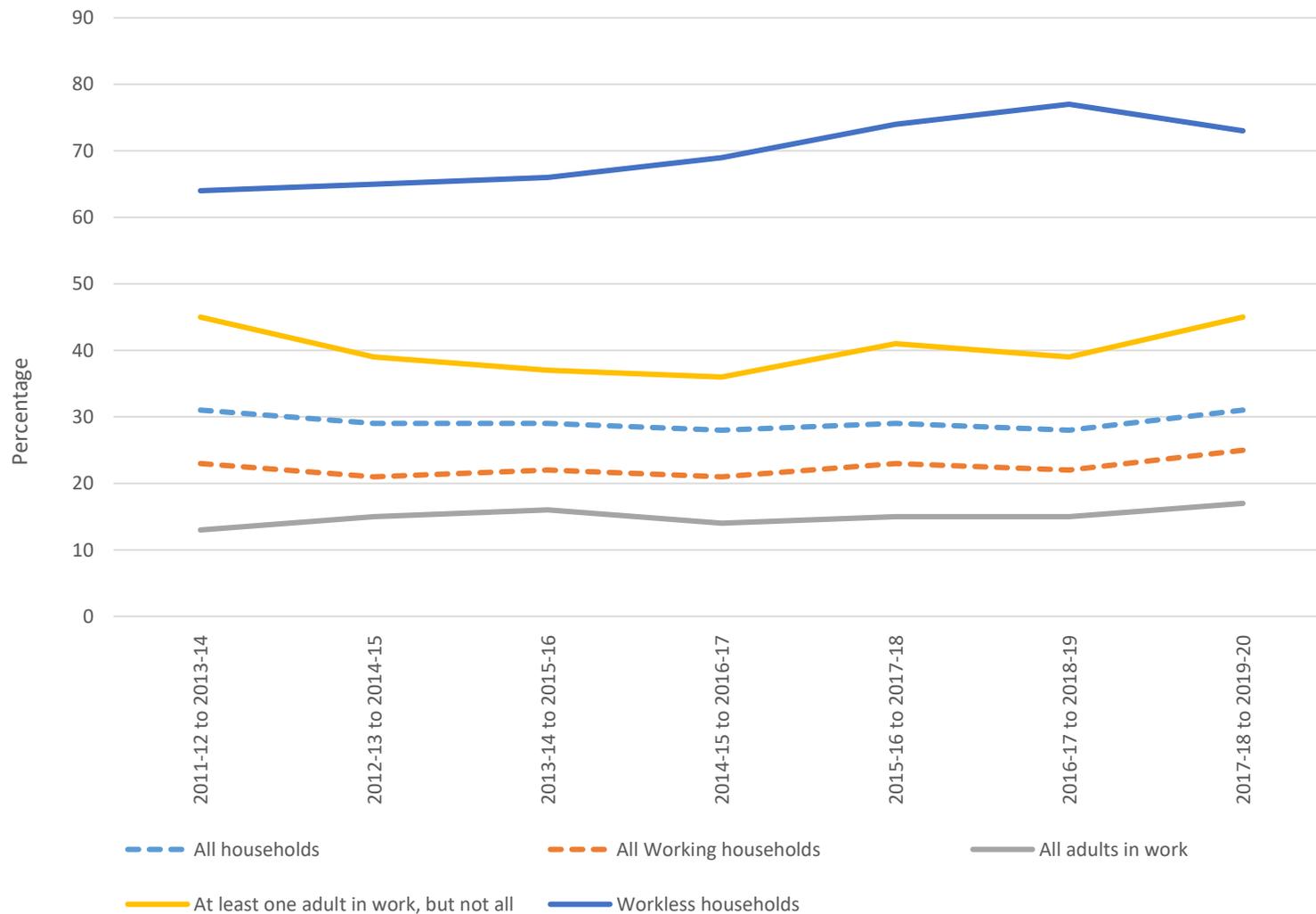
Over the last decade, rates of poverty have been consistently and significantly higher in workless households when compared to those with at least one adult in work.

Rates of relative income poverty have remained largely constant over this time period, fluctuating around 60 per cent for non-working households, 30 per cent for households with at least one working adult and 10 per cent for households in which all adults are in work.

Rates among the latter have been the least varied, indicating a marginal trend toward increasing poverty within this group.

The percentage of children living in relative income poverty since 2014/15 has increased, with levels highest amongst those living within workless households.

Figure 36. Children in relative income poverty by economic status of household (Welsh Government, 2021e).



Over the last ten years, the percentage of children in Wales living in relative income poverty has seen a slight increase overall. Despite a drop since the 2016-19 period, children in workless households have remained consistently more likely to experience relative income poverty than those from households with at least one working adult. The percentage of children from households where all adults are in work in poverty has also experienced a steady rise during this period.

Increasing income poverty among working households is in part driven by austerity cuts, reforms to tax and welfare policies such as universal credit, the benefits freeze, and the two child cap, with single working parent households particularly susceptible to poverty.

73 per cent of children living in a workless household were in relative income poverty compared to 25 per cent living in a working household in 2017 to 2020. Within working households, there was also a marked difference between the likelihood of poverty for children in households where all the adults work (17 per cent) compared to households where some (but not all) adults work (45 per cent).

In the most recent period, 71 per cent of children who were living in relative income poverty lived in working households (around 140,000) children. This has increased for the last five periods from 60 per cent in the period 2012 to 2015.

Children growing up in poverty are more likely to be in poverty in later life and this can perpetuate these trends, continuing the poverty cycle for future generations.

References & Resources



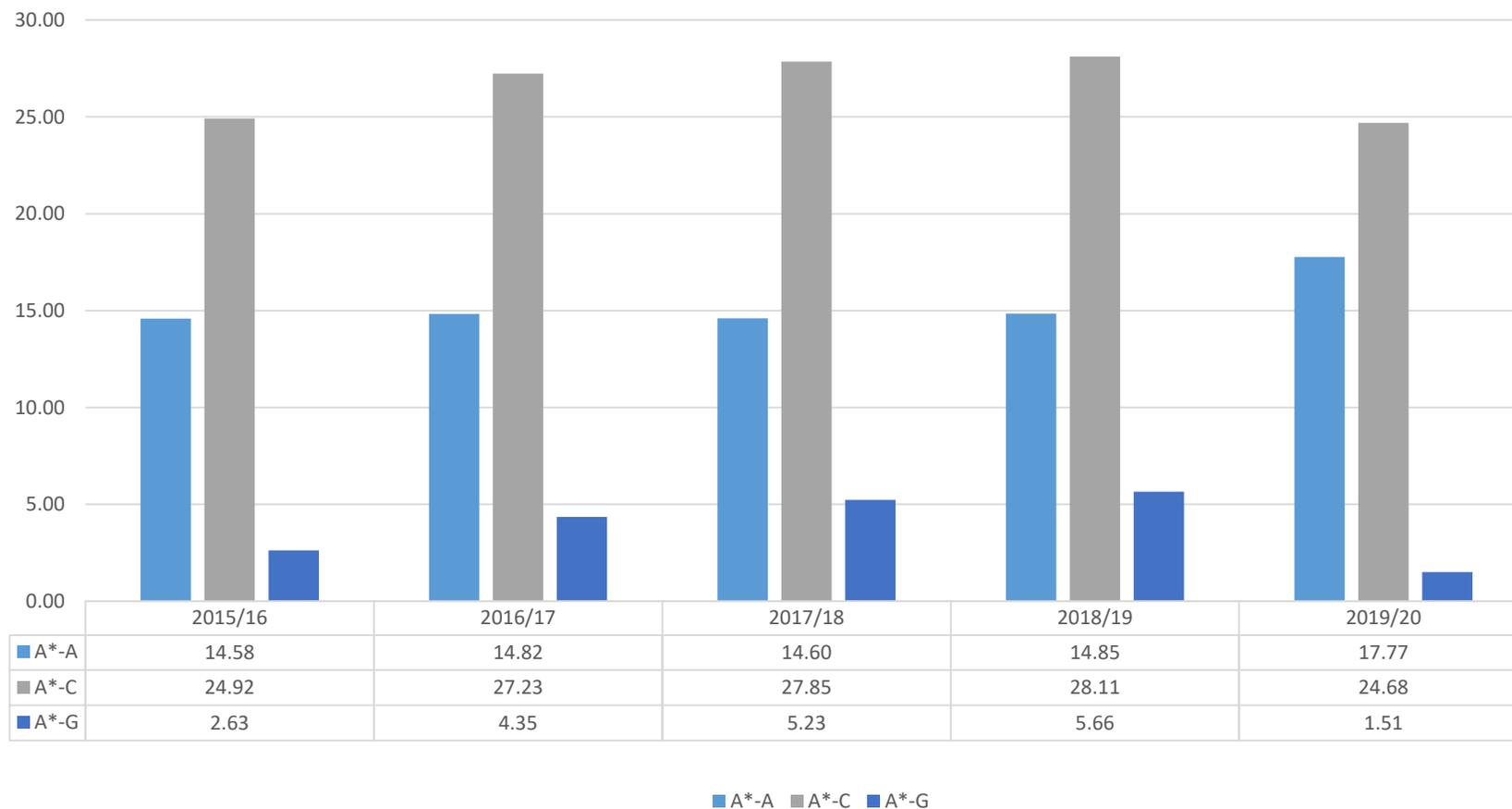
Child Poverty Progress Report (Welsh Government, 2019)



Children in Relative Income Poverty (Welsh Government, 2021e)

The educational attainment gap is persisting for pupils from a lower socio-economic background

Figure 37. Percentage point difference of GCSE entries awarded by grade range by FSM status (Welsh Government, 2020b).



While the overall qualification profile is increasing in Wales, an educational attainment gap remains. The increasing opportunities that may be driven by improving qualifications will not be felt equally if groups facing barriers to educational achievement are not reaching the same level.

Figure 37 shows the percentage difference of GCSE entries awarded by grade range by free school meal (FSM) status.

The gap between pupils not eligible for FSM and those eligible awarded grades A*-A has widened from 14.6 percent point difference in 2015/16 to 17.8 by 2019/20. Note however that this may be affected, in part, due to the suspension of normal examination processes during the COVID-19 pandemic.

Up until the most recent period, the gap in both A*-C and A*-G grades had also been widening, reaching their highest percentage point difference of 5.7 and 28.1 respectively in 2018/19. These both dropped in 2019/20 to their lowest point in the past 5 years.

Lower qualification levels at school can increase the likelihood of having poorer employment outcomes and lower earnings in adult life. This continuing attainment gap therefore is likely to have implications for persisting inequalities in outcomes for those from disadvantaged groups in the future.

References & Resources



Examination Results
2019/20 (Welsh
Government, 2020a)



GCSE Entries and Results
(Welsh Government,
2020b)

Living standards across different areas of Wales have become slightly more equal over time, although some progress has been reversed in recent years

Figure 38. Divergence in Household Income (GDHI) in Local Authority Areas in Wales

(ONS, 2021a).

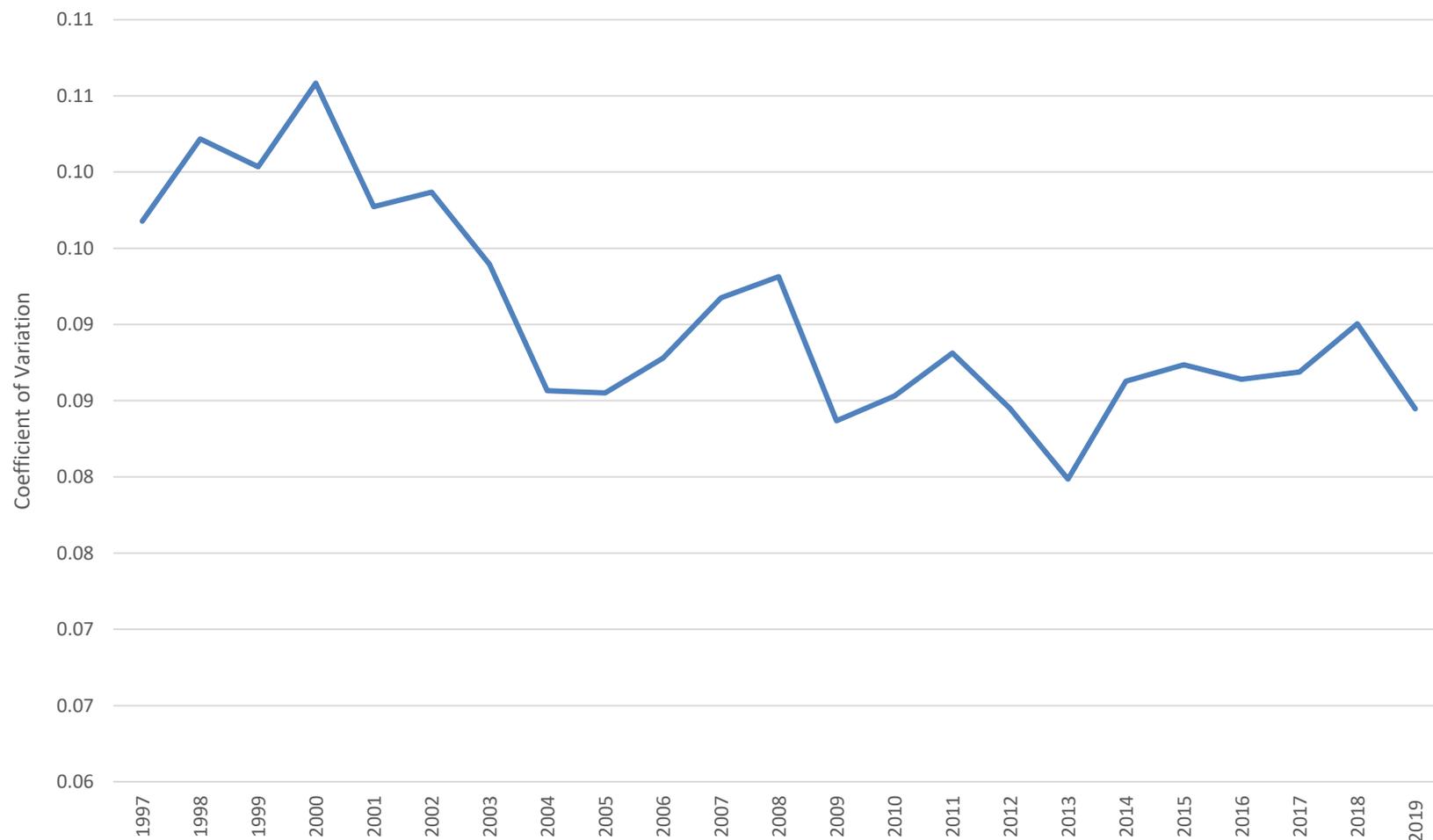


Figure 38 shows an indicator of convergence – the ‘coefficient of variation’ – in household incomes across local authorities in Wales, with a higher figure representing greater differences.

Under this measure, the evidence does not suggest that living standards across different areas in Wales have been diverging over the last two decades. It has been slightly improving, although slow convergence has been partially reversed over the last few years.

References & Resources



Chief Economist's
Report 2020 (Welsh
Government, 2020c)

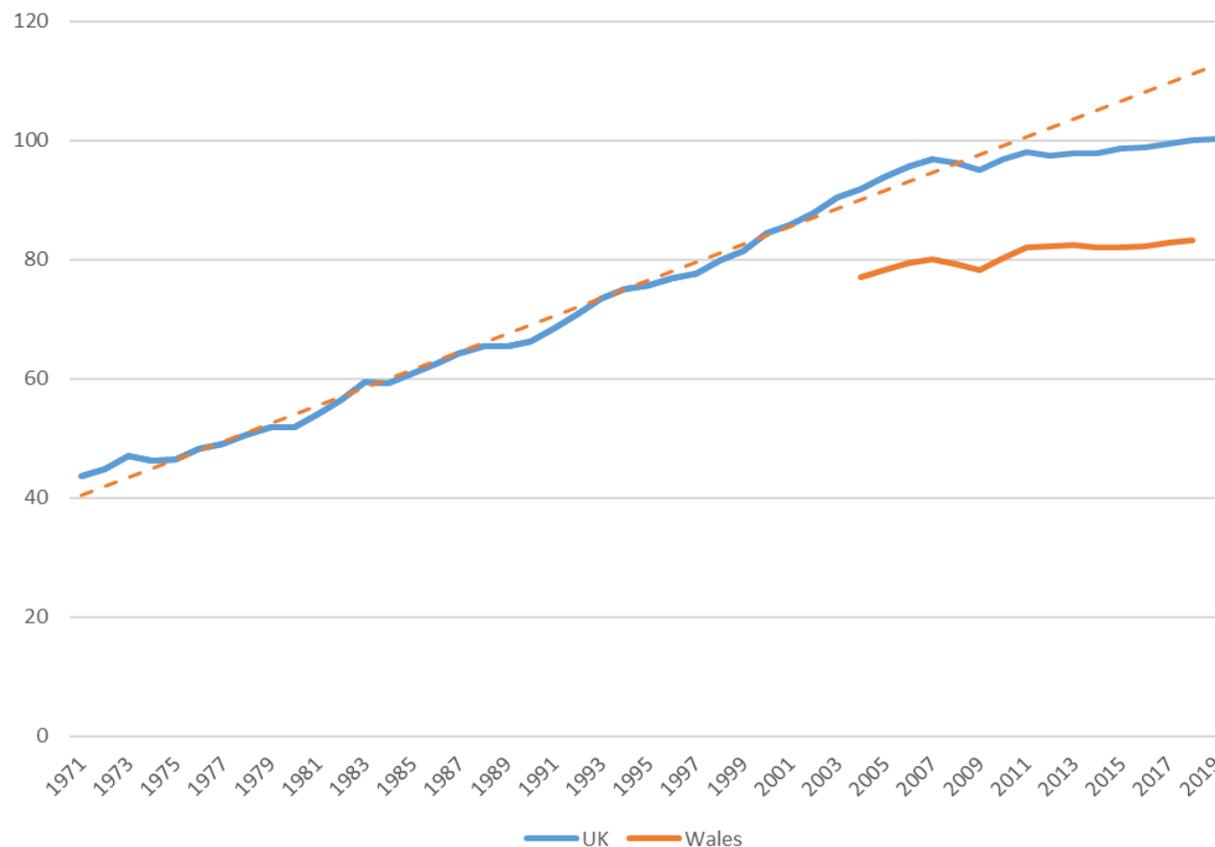


Regional Gross
Disposable Household
Income (ONS, 2021a)

Since the 2008 financial crisis, productivity growth in the UK has dropped well below the historic trend, with productivity in Wales lower than in any other UK region outside NI

Figure 39. Labour Productivity (Output Per Hour Worked), 2018=100

(Welsh Government analysis of ONS (2020b) data).



Over the medium and long term, productivity growth drives improvements in real wages, the tax base, and living standards.

Since the financial crisis of 2008, the productivity growth for the UK has dropped well below the historic trend. This has also happened in many other developed countries, but to a lesser extent.

Productivity in Wales is lower than in any other UK country or region except Northern Ireland (NI).

The most important single driver of productivity is the level of skill and qualification of the population. In addition, the distribution of the population is also important, with productivity tending to be lower in areas with relatively sparse population and a dispersed settlement pattern (as in Wales).

Relative wages in Wales are also well below UK levels, but similar to a number of English regions.



Productivity is higher in the south of Wales which is more urbanised and densely populated, although across Wales it is lower than the UK average

Figure 40. Regional disposable income (GDHI per capita) and productivity (GVA per hour worker), 2018 (ONS, 2021c).

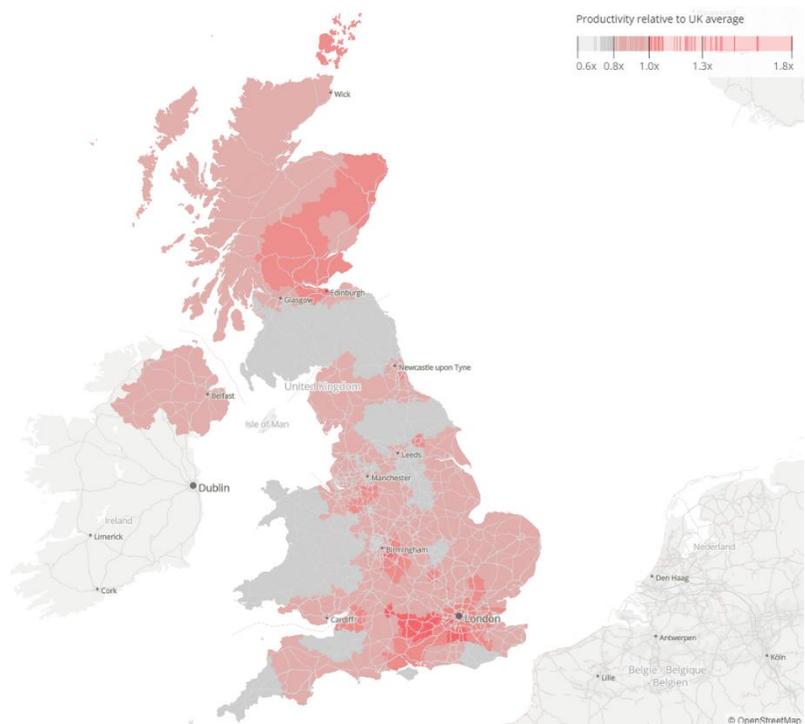
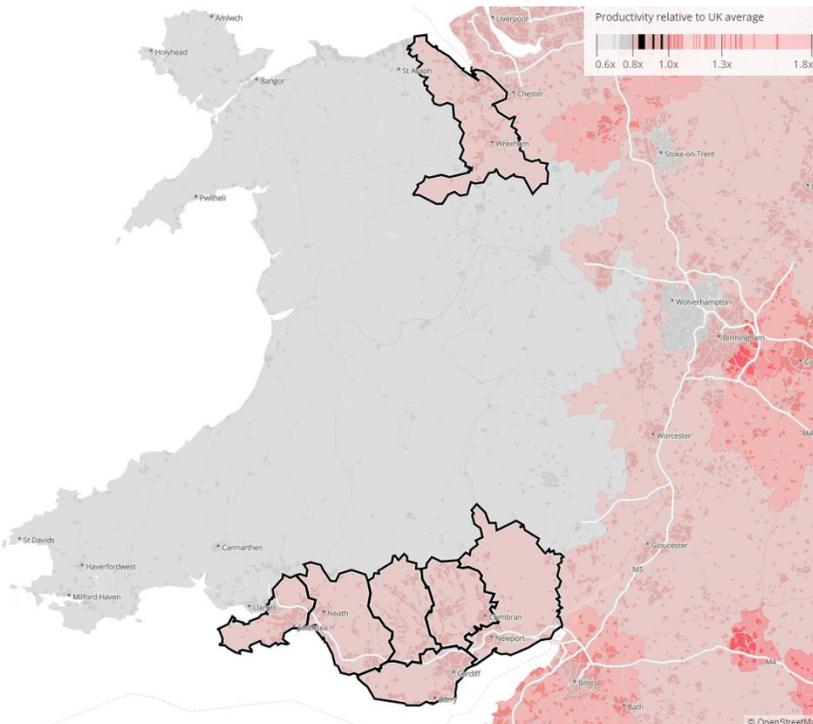


Figure 41. Variation in household income relative to UK average (ONS, 2021c).



While all parts of Wales have below average productivity, its areas of highest productivity are mainly in the south – the most urbanised and densely populated part of the country. Cardiff and Vale of Glamorgan has a productivity of £33.7/hour which is 0.96 times the national average.

Although this is below the national average it is higher than other areas. The equivalent value for Conwy and Denbighshire, for example, is £24.5/hour or just 0.7 times the national average. Powys has the lowest productivity rate of all sub-regions in Britain at £20.9/hour, owing in part to its rural setting and low population density.



The slow growth in productivity has also been reflected in slow growth in living standards

Figure 42. Median household income, England and Wales, 1977 to 2019 (Welsh Government, 2020c).

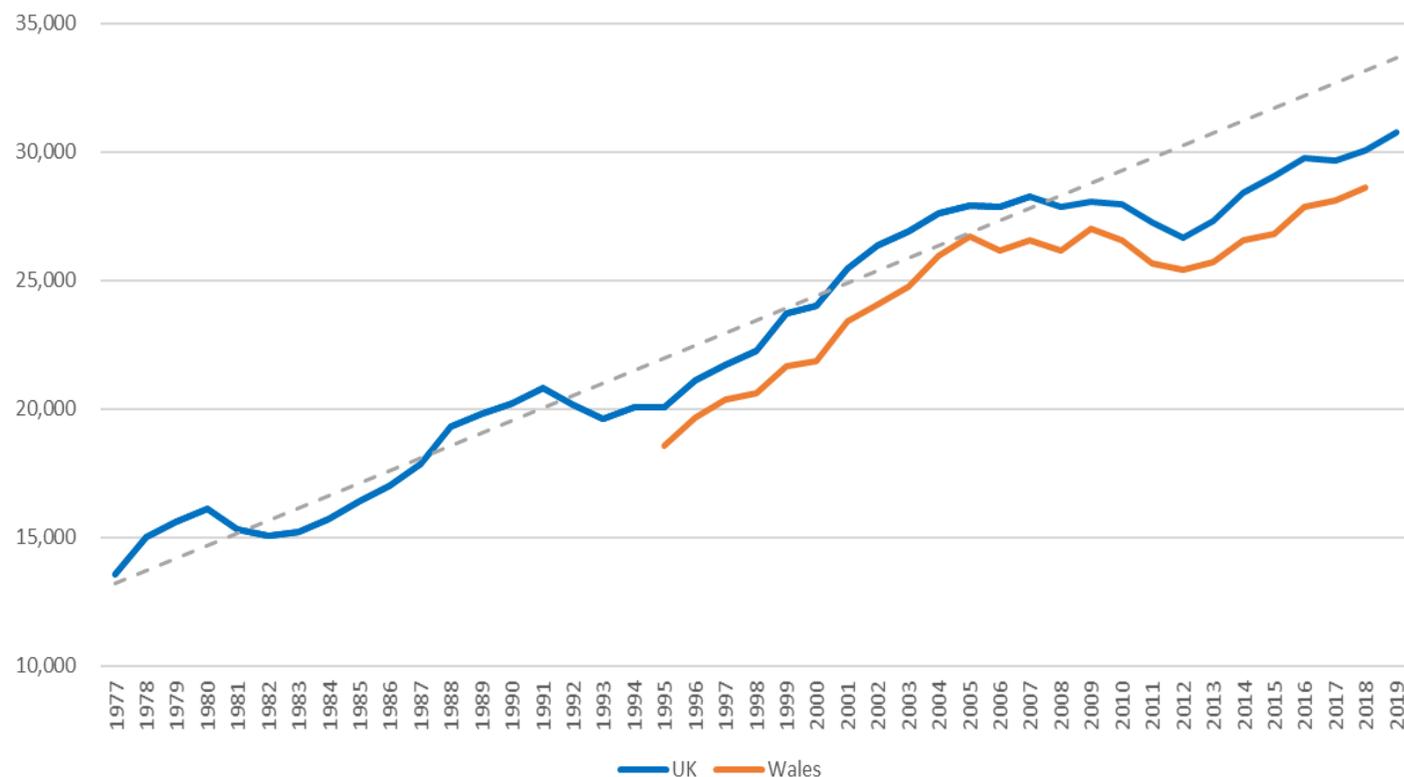


Figure 42 shows the long-run trend in real incomes for Wales and the UK. The data series shown is for ‘median household income’, a strong indicator of material living standards for ‘typical households’: those in the centre of income distribution.

Over the medium term, the income of the Welsh median household has been around 95 per cent of that of the UK as a whole, with incomes of typical Welsh households following a very similar trend to typical UK households.

Income growth forgone as a result of the financial crisis in 2008 has not been recovered, with incomes now around £3,000 lower than would have been expected had the previous trend continued.

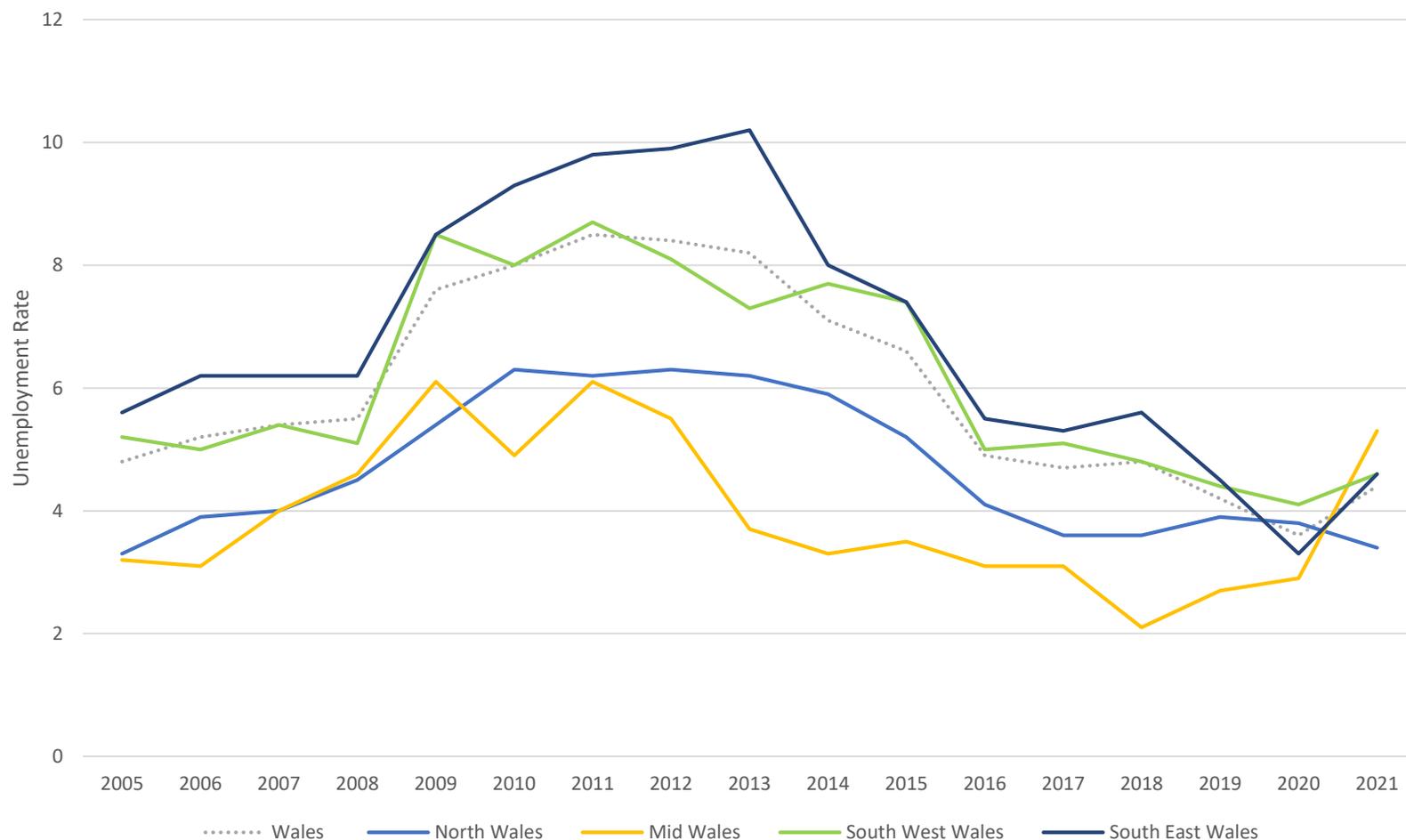
The growth in incomes that has occurred since the financial crisis has been driven in large part by increases in employment, which has partially ‘masked’ the slowdown in productivity growth.

Median household income also masks the gaps between the most and least wealthy in a country, and it is important to be aware of how poverty levels vary across Wales



Unemployment rates have been falling across Wales since 2013, although this is not occurring at an equal rate across the country

Figure 43. ILO unemployment rates by Welsh local areas and year (Welsh Government, 2021f).



Unemployment rates have been falling across Wales over the last decade, following a significant rise after the 2008 financial crisis and a brief plateau between 2010 and 2013.

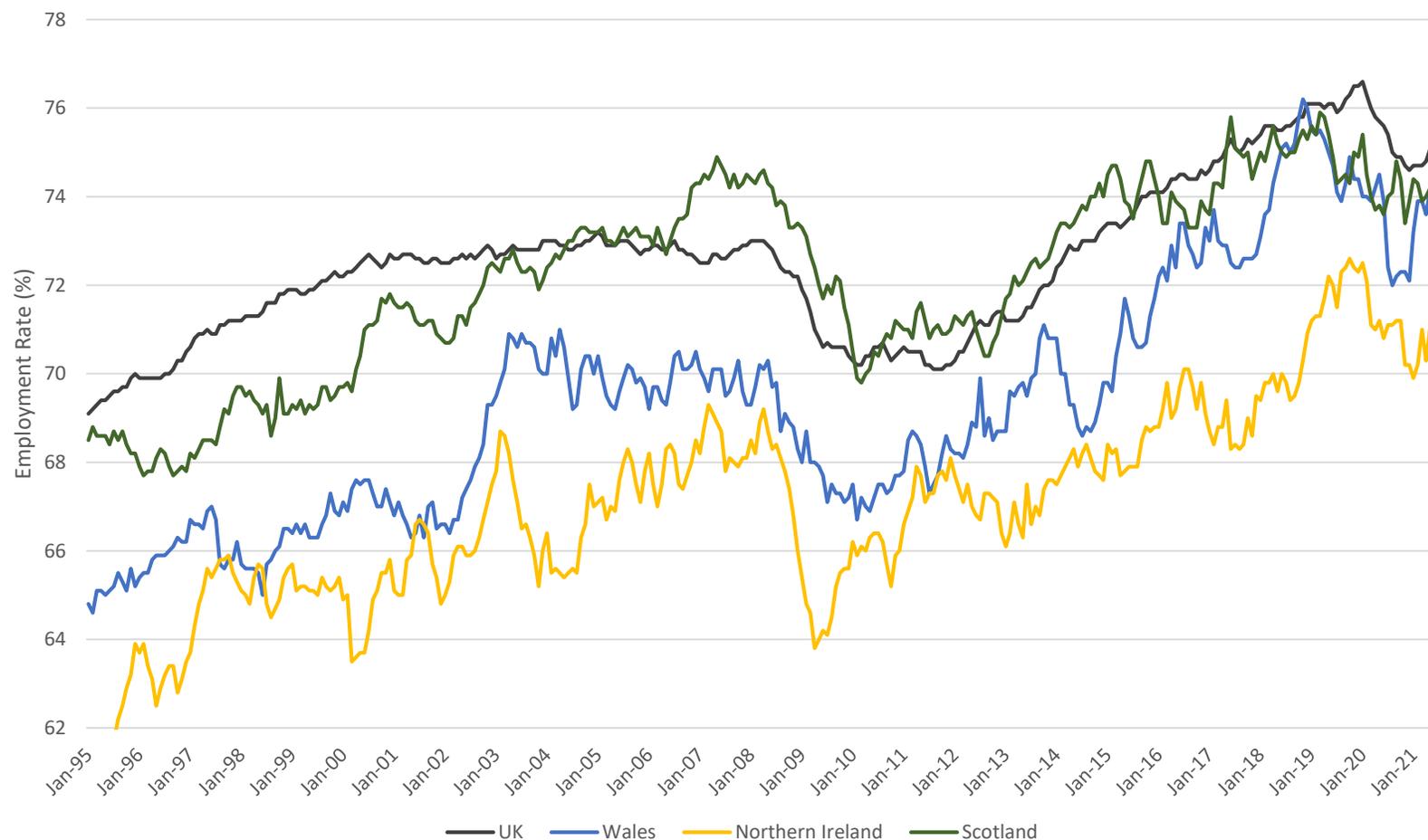
The overall unemployment rate in Wales decreased by 48 per cent in the ten year period from 2011 to 2021, however 2021 also saw the greatest rise in unemployment rate since 2009.

This was largely due to significant rises in both Mid Wales and South East Wales, where rates increased by 83 and 39 per cent respectively in the last year.



Despite historically lagging behind the UK as a whole, employment in Wales have seen significant improvement over the long-term

Figure 44. Employment rates by region of the UK (ONS, 2021d).



Over the medium term, employment rates in Wales have been below those for the UK as a whole. The gap is accounted for more by inactivity than by unemployment, and is greater for men than for women.

However, in recent years, the position in Wales has been better than in a number of other UK countries and regions, and contrasts markedly with the position before devolution, in the 1980s and 1990s, when Wales was a clear 'outlier' in respect of high inactivity and low employment.

There has been an historic improvement here, and that improvement has been concentrated in areas that originally had very low employment levels.

While there has been some growth in temporary and zero-hours employment, over the long run, the share of employment accounted for by permanent employees on full time contracts is broadly unchanged.

Based on UK data, average job tenure is also little changed, with a small decrease for men offset by a similarly small increase for women.

References & Resources



Labour Market
Overview (Welsh
Government, 2021g)

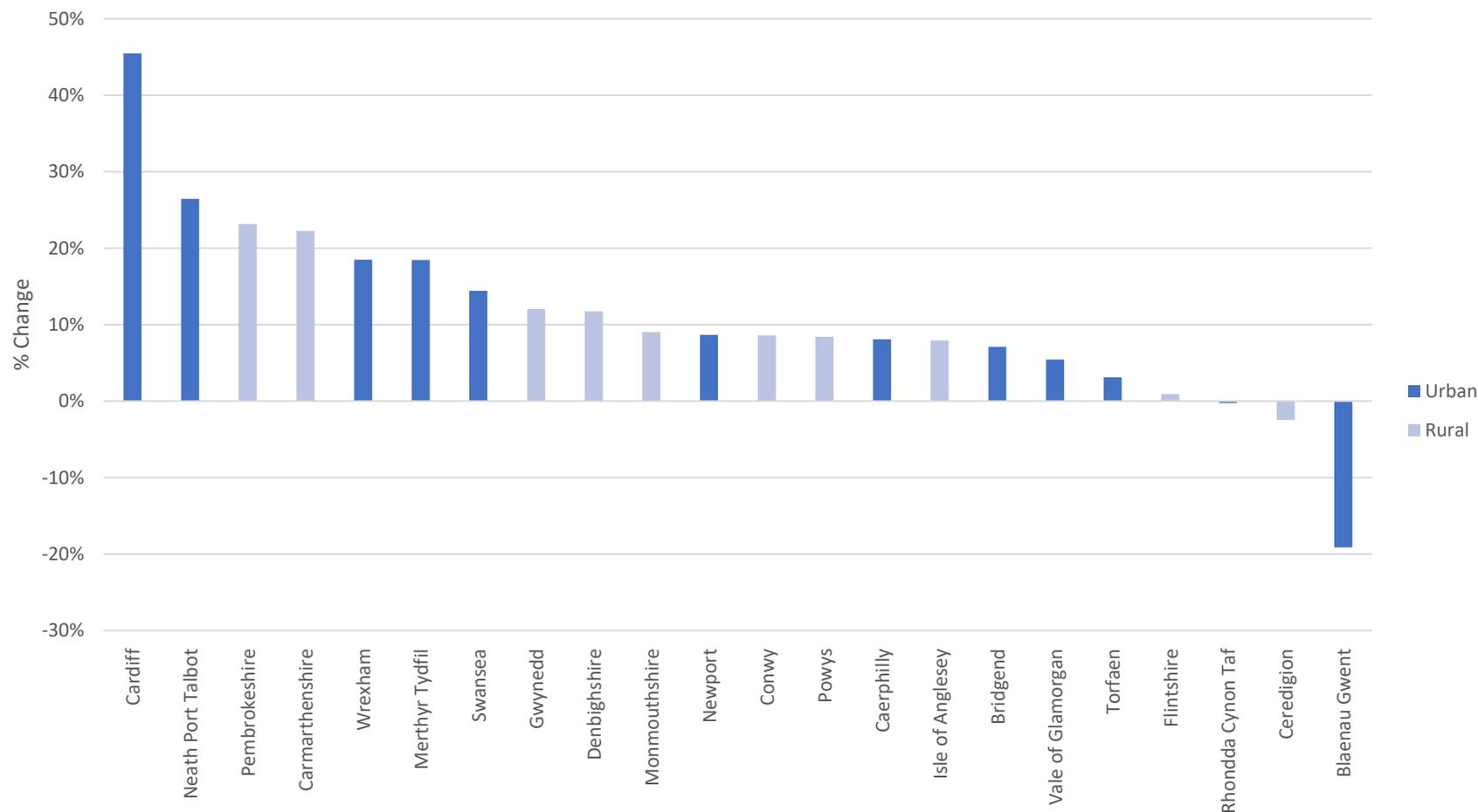


Labour Force Survey:
Employment Rate in
Wales (ONS, 2021d)

Trends in job creation have occurred unevenly across Wales

Figure 45. Percentage change in workplace employment between 2001 and 2019

(Welsh Government, 2021h).



Job creation has occurred unevenly across local authority areas in Wales. This is evident when looking at the change in number of jobs between 2001 and 2019.

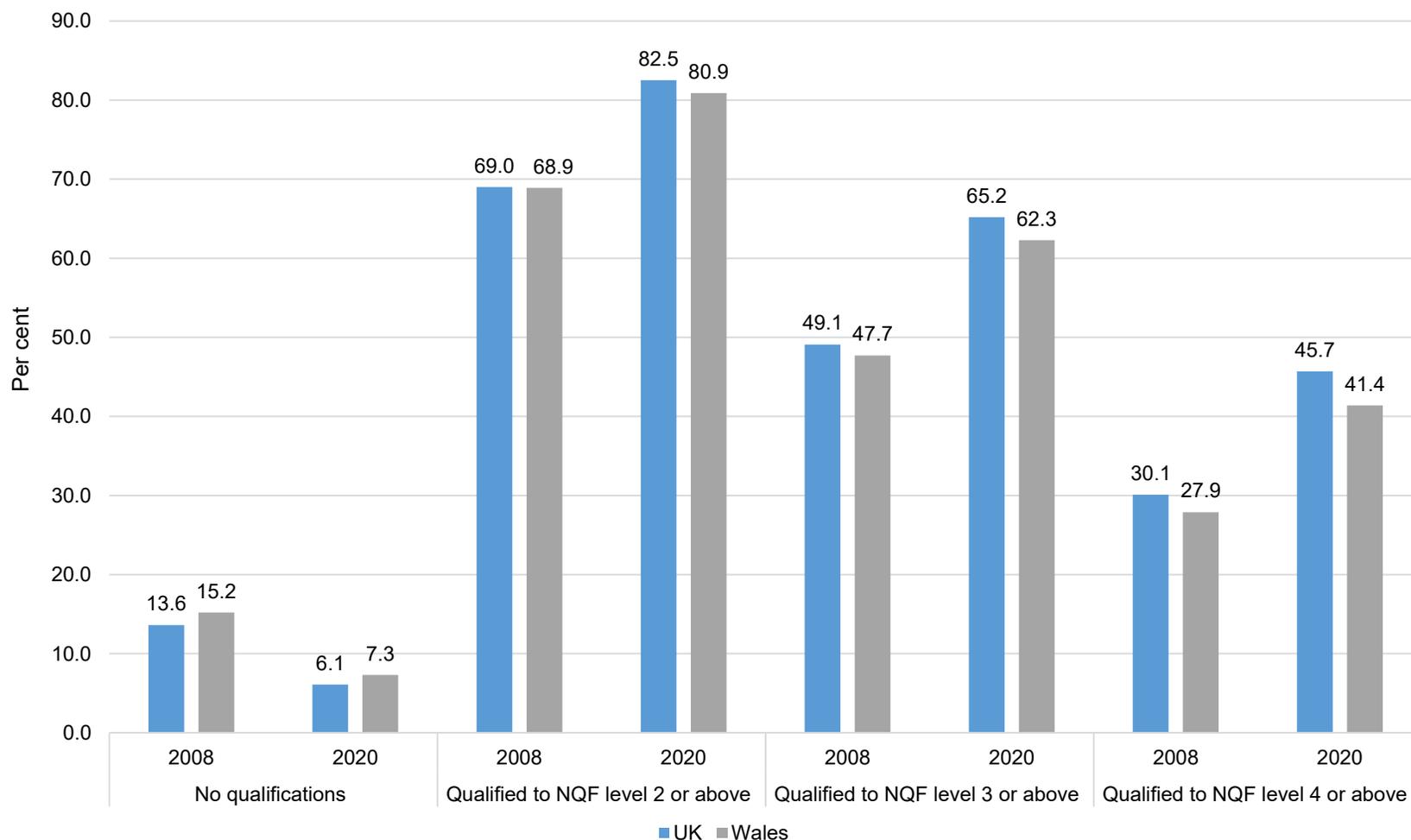
Of the 22 local authority areas in Wales, 19 have experienced a positive change in the number of jobs since 2001, with only Blaenau Gwent, Ceredigion and Rhondda Cynon Taf losing jobs during this period.

Cardiff has had the largest proportionate increase of jobs in Wales during this time with a 45.5 per cent rise, which is consistent with its population growth over the last two decades. Meanwhile, Blaenau Gwent has seen the greatest proportional decrease in jobs since 2001 at -19.1 per cent.



The qualification profile of the Welsh population has improved over time

Figure 46. Highest qualification level of working age adults (aged 18 to 64) in Wales, 2008 and 2020 (Welsh Government, 2021i).



The qualification level of a population is also important in providing better opportunities in the future for work and employment.

Mirroring the UK as a whole, the qualification profile of the Welsh population has improved markedly between 2008 and 2020, with more people earning qualifications at national qualification framework (NQF) levels: 2 (GCSE a-c equivalent), 3 (a level equivalent) and 4 (NVQ equivalent).

Gaps with the UK as a whole have generally widened slightly, but Wales continues to perform as well, or better, than most English regions outside London, the South East and South West, while trailing Scotland.

The number of young people not in education, training or employment in Wales has been falling following an increase at the start of the last decade

Figure 47. 16-24 year olds not in education, training or employment (NEET).

Wales, 2004 to 2020 (Welsh Government, 2021j).

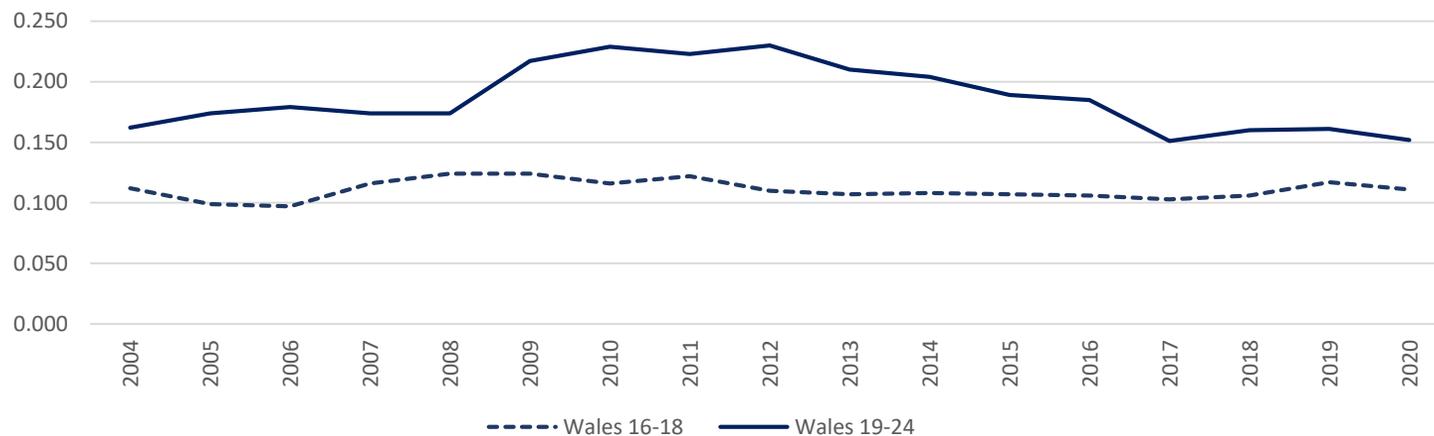
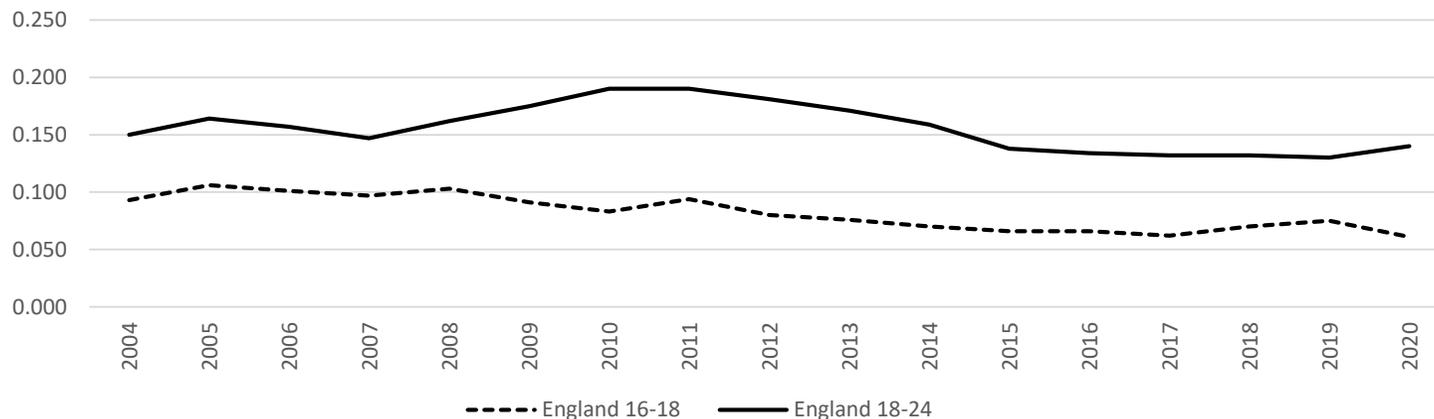


Figure 48. 16-24 year olds not in education, training or employment (NEET).

England, 2004 to 2020 (ONS, 2020).



Following the financial crisis in 2008, there was a substantial increase in the number of young people aged 19-24 not in education, training or employment (NEET) in Wales, with the proportion peaking at 23 per cent in 2012.

This proportion decreased in each subsequent year up to 2017. 2017-19 saw consecutive increases in both the 19-24 and 16-18 age groups before decreases in 2020, according to provisional estimates.

Moreover, NEET levels in Wales continue to exceed those in England according to estimates based on the Annual Population Survey.

While differences in data source and methodology do not allow for direct comparison, **Figure 47** and **Figure 48** give an approximation of the difference between the two countries.

For 16-18 year olds in particular, the gap between England and Wales has steadily grown since 2004, reaching its widest point of 5 percentage points in the most recent period.

It is currently unclear how economic shocks caused by the COVID-19 pandemic may impact on levels of young people not in education, training, but it will be important to follow data on this as it is released.

References & Resources



NEET Data - Wales (Welsh Government, 2021j)



NEET Data - England (UK Government, 2021)

Planetary Health and Limits

Overview

Overconsumption and overproduction are driving climate and nature emergencies, both in Wales and across the globe.

The changing planet and the ways in which trends are driving that change can be understood through a systems lens, which captures the links between consumption habits and production, food, transport and energy systems.

Currently, Wales is using both renewable and non-renewable resources at an unsustainable rate. In addition to the damage this causes to local ecosystems, negative impacts are also being felt on ecosystems worldwide due to the increasingly global nature of supply chains.

Global greenhouse gas emissions have grown at a rate of 1.5 per cent annually since 2009 and this rise is continuing on an upwards trend, with the impacts from rising emissions being distributed unequally across the globe. While the wealthiest countries, including the UK, tend to have the highest emissions it is often the least wealthy nations that are most vulnerable to the effects of climate change.

In addition, our consumption of goods and services in Wales is contributing to the depletion of natural capital elsewhere and, in turn, the poverty trap facing countries that are still reliant on their own natural capital for economic development.

The global climate is continuing to warm, with the mean global temperature for 2020 recorded as one of the three warmest years on record globally, with the last five and ten-year averages also the warmest on record.

By 2050, it is predicted that the average summer temperature in Wales will increase by 1.34 °c. Winter precipitation is expected to rise by 5 per cent in the same period while summer precipitation will decrease by 16 per cent and rises in sea levels are expected across the country.

This has numerous consequences including greater flooding risk, enhanced coastal erosion, species decline increased prevalence of pests and disease, more frequent droughts and warmer, drier summers affecting both soil conditions and landscape features. Crucially, these risks are not distributed equally and some of the most disadvantaged and socially vulnerable across Wales face the most severe impacts.

Declining ecosystem resilience in Wales threatens the ability of natural resources to provide a sustainable flow of benefits to current and future generations. However, people are now starting and continuing to modify and manage ecosystems to provide food, energy, building materials and other resources.

Despite this, of the 3,902 species assessed in the World Wide Fund for Nature's analysis in Wales ([State of Nature Partnership, 2019](#)), 73 have been lost already. Globally, around 1 million species face extinction and 1/8 of the species on the planet could be extinct within 20 years.

With a trend towards decreasing ecosystem resilience in Wales, natural resources are less able to resist, recover, and adapt to change and ultimately unable to provide benefits to people in the same way in the longer term.

Key social and economic systems are also putting pressure on Wales' environment. While energy consumption has been reducing, which contributes to decarbonisation, emission reductions have been slowing down over the last decade. Carbon emissions are not the only threat to Wales however, for example: in addition to being the third largest source of greenhouse gas emissions in Wales, transport creates air, water, light, and noise pollution, which has significant impacts on ecosystems and human health.

The actions associated with feeding our population have also continued to inflict significant environmental damage and destruction through pollutant emissions, resource depletion, and the use of nitrogen based fertiliser contributing to loss of biodiversity among other consequences.

Planetary Health and Limits

These drivers of Wales' environmental change are highly complex and interlinked with human action. The actions and effects often behave in chaotic, dynamic and unpredictable ways.

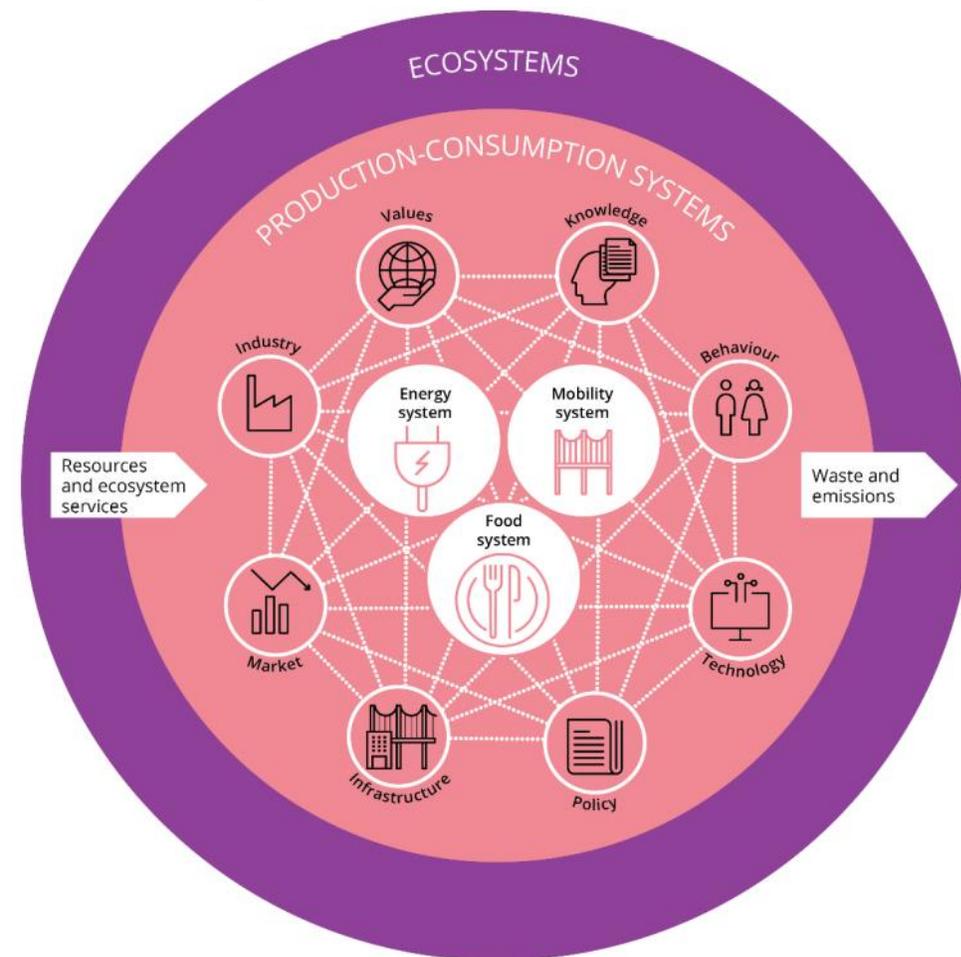
It can be difficult to attribute cause and effect, especially when key processes and interrelationships may be only partly understood, and evidence is often fragmented. Nevertheless, given the scale of the challenge facing Wales in its response to climate change and the environmental crisis, decisions have to be made in the absence of complete knowledge by looking more deeply at how human and natural processes interact. These sorts of situations are sometimes described as 'wicked' or 'super-wicked' problems [Sediri et al \(2020\)](#).

Living within planetary limits is a complex issue and any solutions are usually contested across sectors and disciplines. However, it is broadly accepted that Wales is over

consuming its share of global resources at a rate of around 2.5:1 [SEI \(2015\)](#).

This means that if everyone in the world were to consume the same as the average Welsh citizen, it is estimated that just over 2.5 planets would be required. By understanding human systems more thoroughly, we can intervene in the most effective ways by spotting challenges and opportunities that trends are creating and understanding how best to intervene.

Figure 49. Ecosystems and production-consumption systems
(European Environment Agency, 2019).



The average global temperature continues to increase at an unprecedented rate

Figure 50. Global average mean temperature difference from pre-industrial conditions (1850-1900) (Met Office, 2020).

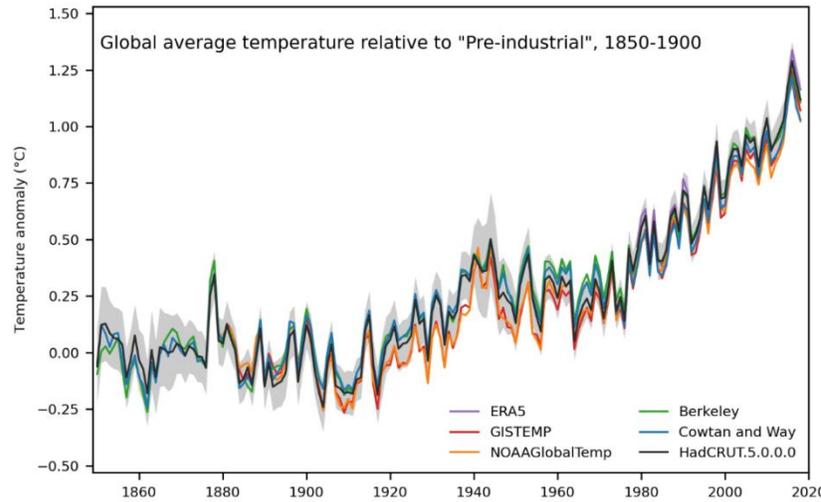
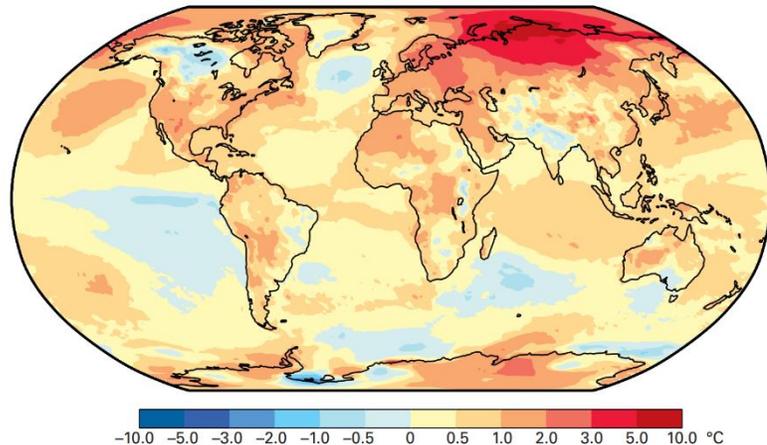


Figure 51. Temperature anomalies relative to the 1981-2010 long term average in 2020 (World Meteorological Office, 2021).



The global mean temperature for 2020 was 1.2 °C above the 1850-1900 baseline (as shown in **Figure 50**). This makes it one of the three warmest years on record globally.

The warmest year on record to date, 2016, began with a strong El Niño – a phenomenon which contributes to elevated global temperatures. Despite comparatively weak El Niño conditions early in 2020 and La Niña conditions developing by late September, the warmth of 2020 was comparable to that of 2016.

The last five-year (2016-2020) and 10-year (2011-2020) averages were also the warmest on record.

Figure 51 shows variation in temperature anomalies (departures from the average temperature) in 2020 relative to the 1981-2010 long term average. Although the overall warmth of 2020 is clear, there were variations across the globe.

While most land areas were warmer than the long-term average (1981-2010), one area in northern Eurasia stands out with temperatures of more than five degrees above average.

References & Resources



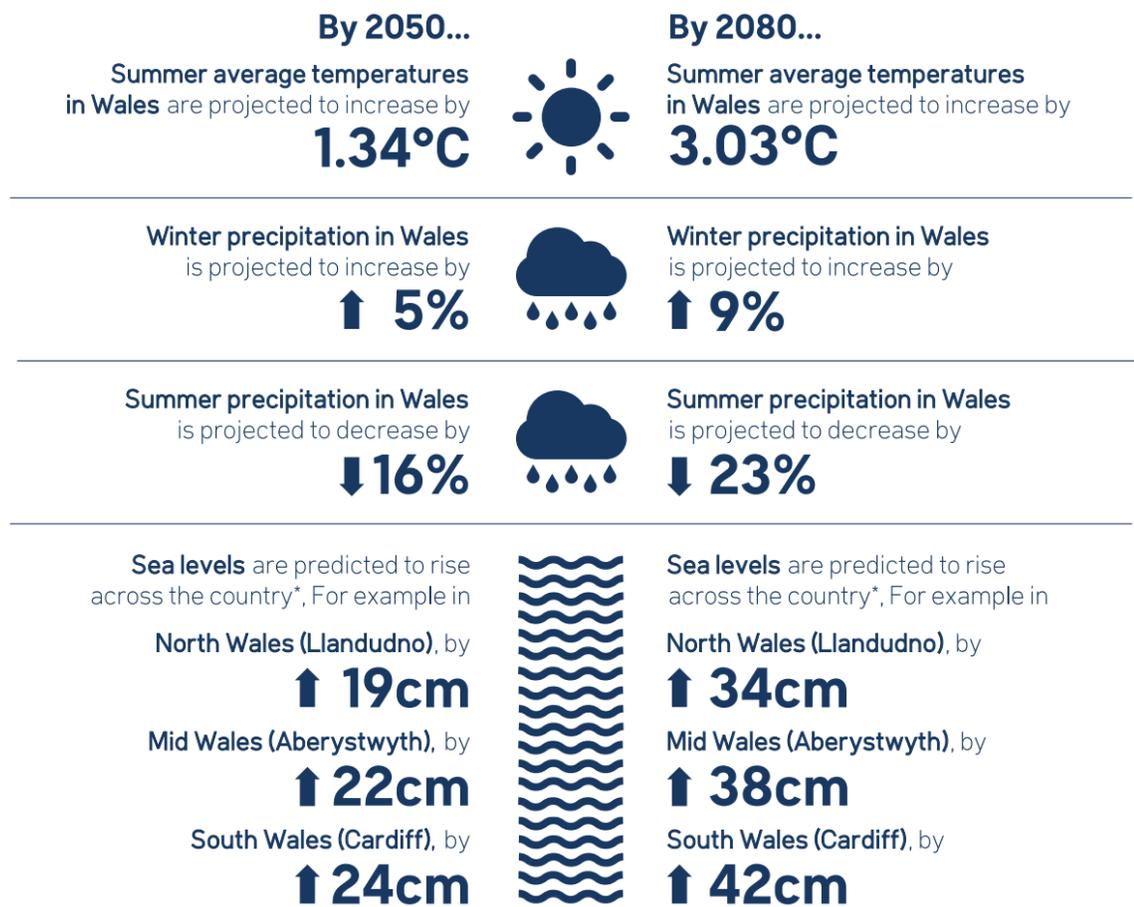
State of the Global Climate (WMO, 2021)



Global Temperature Data Update (Met Office, 2020)

Wales will continue to feel the effects of global climate change

Figure 52. Climate change predictions by 2050 and 2080 taken from the UK Climate Projections (UKCP18) dataset (Cadw, 2020).



Wales will also feel the effects of global climate change, with a number of stark trends projected for the mid to long term.

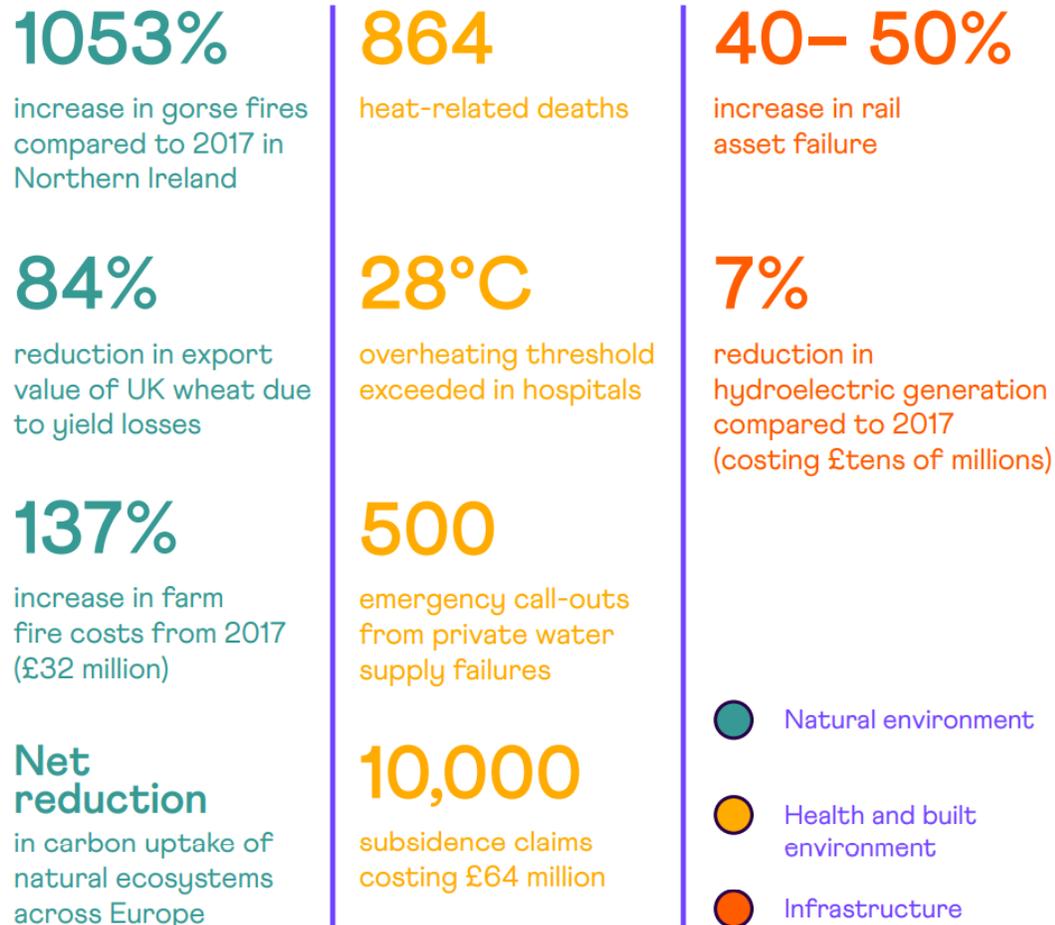
Average summer temperatures are expected to continue rising, with increases of 1.34 °C by 2050 and 3.03 °C by 2080. This will contribute to changing rain patterns, with precipitation levels projected to climb 5 per cent by 2050 and 9 percent by 2080. This is in direct contrast to summer rainfall projections, which show precipitation levels falling by 16 percent and 23 per cent across the same periods.

Sea levels are also predicted to rise significantly across the country. While the extent by which sea levels rise is dependent on the location, areas in Wales could see rises of up to 24cm by 2050 and 42cm by 2080.

References & Resources

The changing climate will create several key risks for Wales and an increasing number of extreme weather events

Figure 53. The 2018 heatwave in numbers (Climate Change Committee, 2021a).



Recent emissions of greenhouse gases caused by human activities are the highest in history (IPCC). The impact of these emissions on our climate and weather systems is being experienced already, and these impacts will continue to increase until at least 2050. The following impacts for Wales have been identified by CCRA3.

- Hotter, drier summers.
- Low flows in rivers and more droughts.
- Milder, wetter winters.
- Greater flooding both on the coast and inland.
- Increased coastal erosion and coastal squeeze.
- Impacts on species and ecosystems, soils, agriculture and forestry.
- More invasive species, pests and diseases.
- Increased risks in relation to supply chains and international aspects.

As with the rest of the world extreme weather events in the UK and Wales are also expected to continue to worsen and increase in frequency. Research has shown that across the UK:

- The number of extremely hot days could increase four fold from 10 days a year exceeding 25 °C currently to between 18 to 34 under different warming scenarios, with high risk to human health from extreme heat.
- The number of days of high impact heavy rainfall leading to severe weather warnings in the UK could rise by three days per year
- Droughts are projected to become more frequent and severe, with droughts at least as severe as in 2010 increasing by 146 per cent at a 4 °C level of global warming and 86 per cent more frequent by 2 °C.

References & Resources



UK Climate Risk (Climate Change Committee, 2021a)



Future Changes to High Impact Weather in the UK (Hanlon et al. 2021)

Increasing climate risks will affect all of Wales, but some people and areas are especially vulnerable to change with a risk of exacerbating inequalities

Figure 54. Relative flood disadvantage in Wales as a composite of flood exposure and socio-spatial flood vulnerability (Lindley et al., 2011).

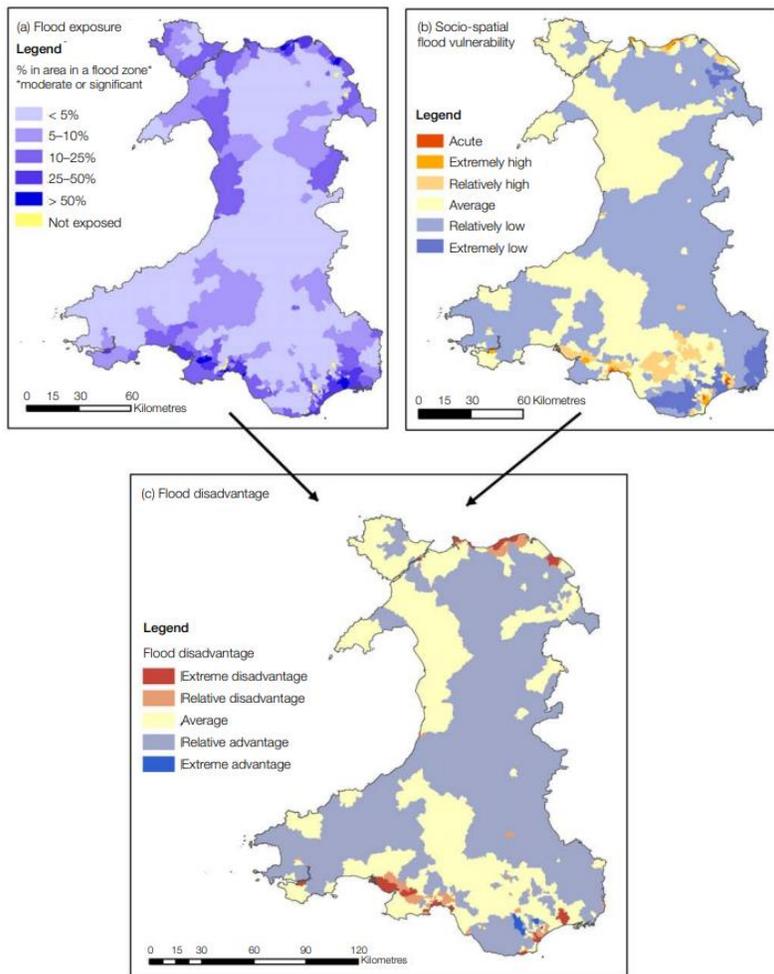
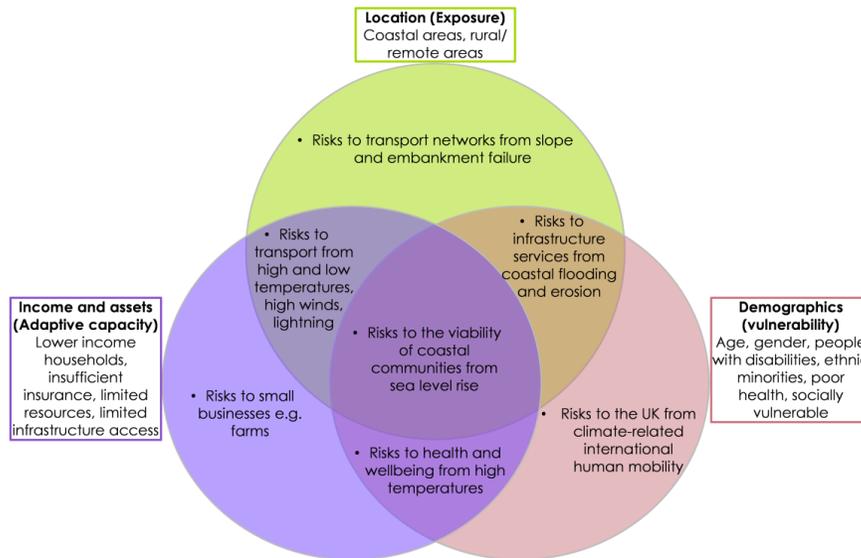


Figure 55. Examples of climate risks with distributional effects (Climate Change Committee, 2021a).



Climate change and extreme weather can exacerbate health and wellbeing inequalities, while there is also a risk that responses to climate change can place disproportionate burdens on people and communities who are already vulnerable. Research from the Joseph Rowntree Foundation (JRF) describes how low-income households, for example, can face injustice as they tend to:

- contribute the least to emissions
- pay, as a proportion of income, more towards implementation of certain policy responses
- benefit less from those same policies
- be most negatively affected by climate impacts
- be less able to participate in decision-making on policy responses and in determining practice

For example, lower-income households are less able to make their property resilient, or to recover and respond to, the impacts of floods.

Figure 54 highlights socio-spatial climate vulnerability through flooding risk in Wales. Areas with higher risk of flood exposure and socio-spatial vulnerability have a higher flood disadvantage risk. This means that whilst areas may have a similar number of properties at risk of flooding, particular areas have higher vulnerability to impacts on their health and wellbeing as a result of floods and so have a higher level of flood disadvantage.

Similarly, disadvantaged groups are more likely to live in buildings that are poorly adapted to high temperature conditions. This, combined with increased prevalence of existing health issues, is likely to see the risk of heat-related deaths triple by the 2050s.

References & Resources



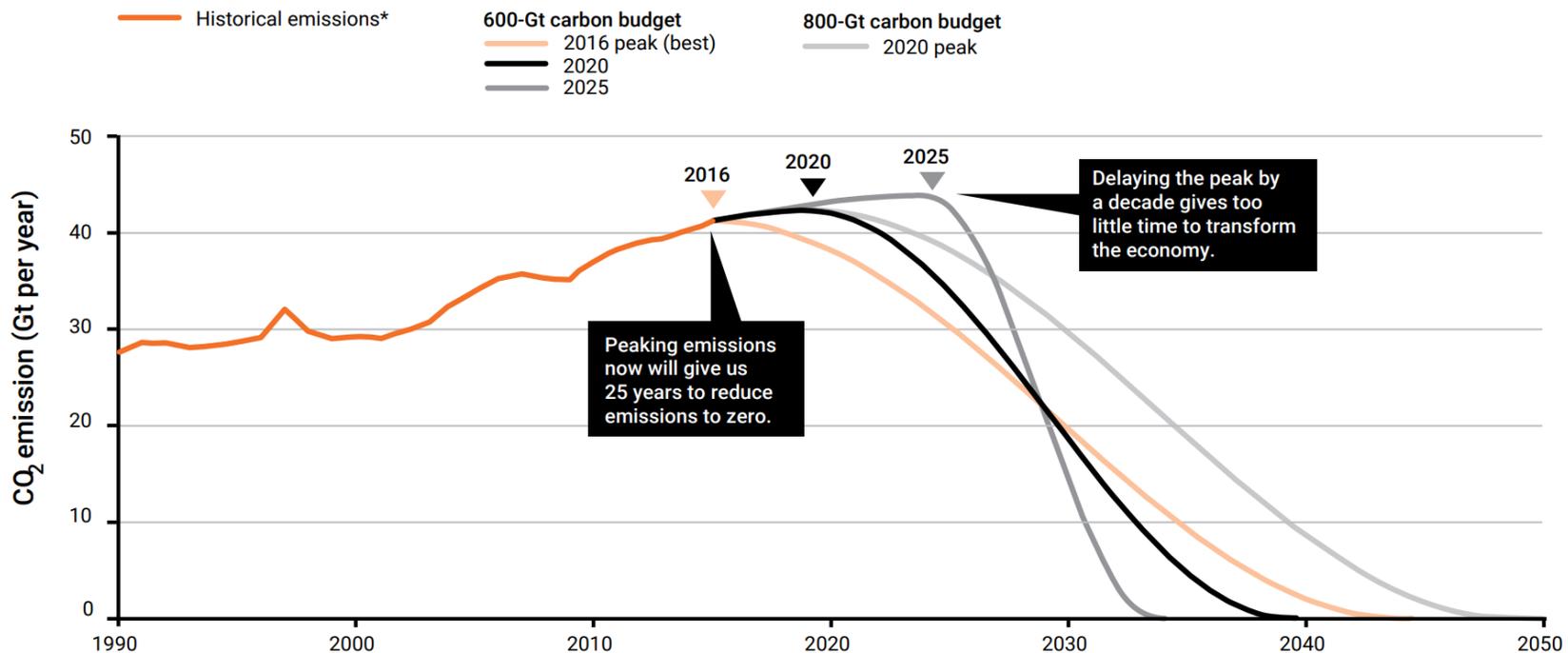
UK Climate Risk (Climate Change Committee, 2021a)



Climate Change, Justice and Vulnerability (Lindley et al. 2011)

Global greenhouse gas emissions are increasing, and have grown at a rate of 1.5 per cent annually since 2009

Figure 56. Global emission estimates under various carbon budget scenarios (Climate Change Committee, 2021b).



Global greenhouse gas emissions have grown every year since 2009, at a rate of 1.5 per cent annually.

Figure 56 opposite shows global emission estimates under carbon budget scenarios. To keep the global temperature rise below the target set within the Paris agreement on climate change, 2°C above pre-industrial levels, the carbon budget that remains is between 150 and, at most, 1,050 gigatons of carbon dioxide, after deducting past emissions.

A mean cumulative emissions budget of around 600 gigatons of carbon dioxide can still be emitted before the planet warms by more than 2°C. Increasing the carbon budget to 800 gigatons would buy another 10 years but would likely lead to the temperature limit being exceeded. At current annual emissions rates, the lower limit of this range (150 gigatons) will be crossed in four years, and the midpoint (600 gigatons) in 15 years.

Realistically however, the global temperature rise needs to be limited to an even greater extent, not exceeding 1.5°C. Estimates show that to achieve this, global emissions would need to decline by 7.6 per cent every year from 2020 to 2030.

References & Resources



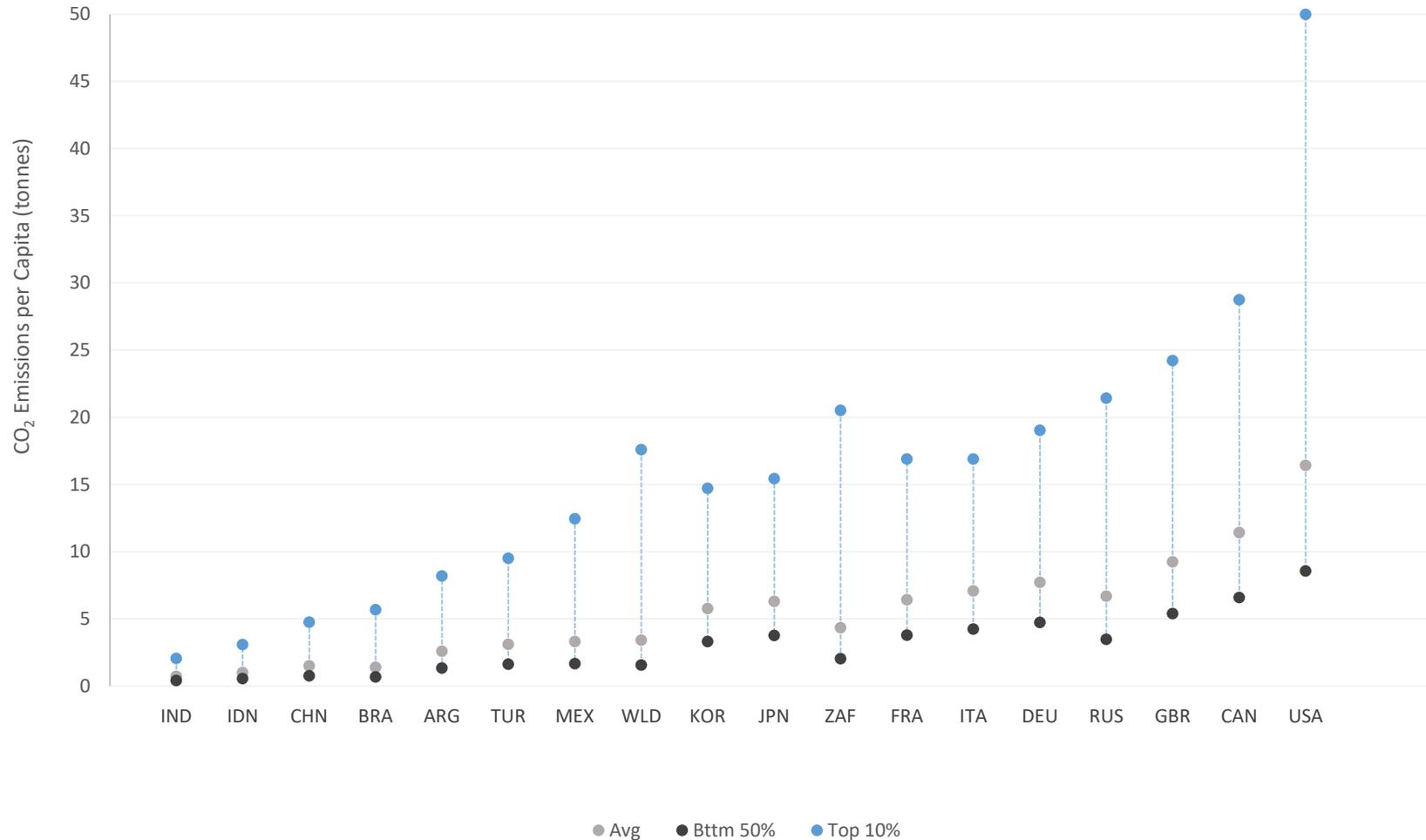
Shaping the Trends of Our Time (United Nations, 2020a)



Global Carbon Budget Data (Global Carbon Budget, 2021)

Since 1990, CO₂ emissions for the wealthiest 5 per cent have surged, with 25 per cent of UK emissions produced by the wealthiest 10 per cent of the population in 2015

Figure 57. Household CO₂ emissions per capita for selected G20 countries (Oxfam, 2015).



Inequalities in production and growth of emissions are evident both within and between countries.

Between 1990 and 2015, the richest 5 per cent of the population were responsible for 37 per cent of total global emissions growth, with the richest 10 per cent responsible for 46 per cent of growth. This is in direct contrast to the poorest 50 per cent of the population, who only accounted for 6 per cent of emissions growth across the same period.

Within countries a similar pattern can be seen. According to the latest available figures, the poorest 50 per cent of the UK population are responsible for around 5 tonnes of CO₂ emissions per person per year in 2015, while the richest 10 per cent are responsible for approximately 22 tonnes per person. This gave a total of 0.17 gigatons and 0.14 gigatons respectively in 2015.

The UN have stated that limiting temperature rises to 1.5°C (to meet the target set by the 2015 Paris Agreement), would require the richest 1 per cent to cut their carbon footprint by 2030 by a least a factor of 30.

References & Resources



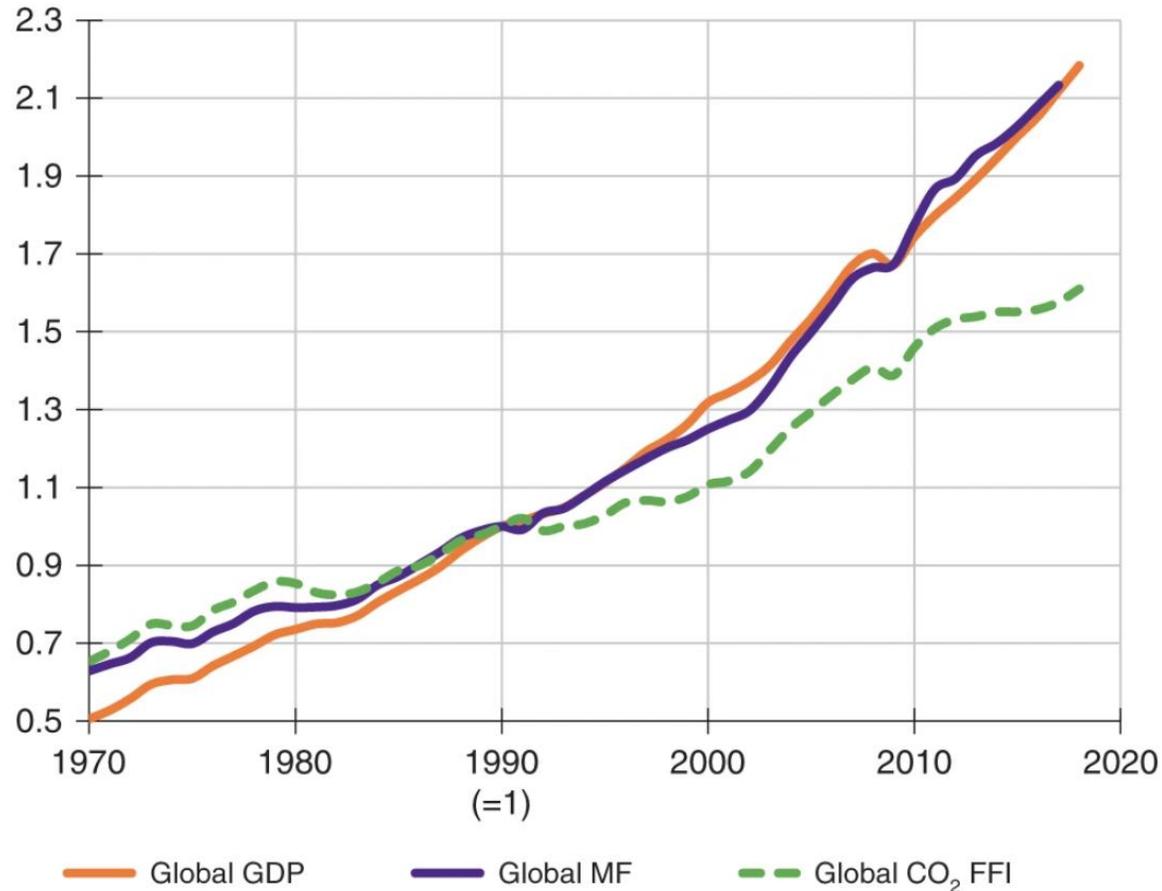
Carbon Emissions and Income Inequality (Oxfam, 2015)



Emissions Gap Report 2020 (United Nations, 2020b)

Wales is using both renewable and non-renewable natural resources at an unsustainable rate

Figure 58. Relative change in main global economic and environmental indicators from 1970 to 2017 (Wiedmann et al., 2020).



As with other countries across the globe, Wales is using both renewable and non-renewable natural resources at an unsustainable rate, with current estimates indicating that Wales is consuming resources at a higher level than the global average.

The total ecological footprint of Wales is estimated to be 10.05 million global hectares, the equivalent of 100,500 square kilometres. According to the most recent calculations, this works out at 3.28 global hectares per person in Wales, approximately 1.2 times the global average. While this is not uncommon among developed countries, the biocapacity of 2.5 planets would be required if the entire world were to consume at the same rate as the average Welsh citizen (Welsh Government)

As we have already seen this is severely damaging our ecosystems. Continuing in this way threatens the well-being of future generations, not only in Wales but across the globe.

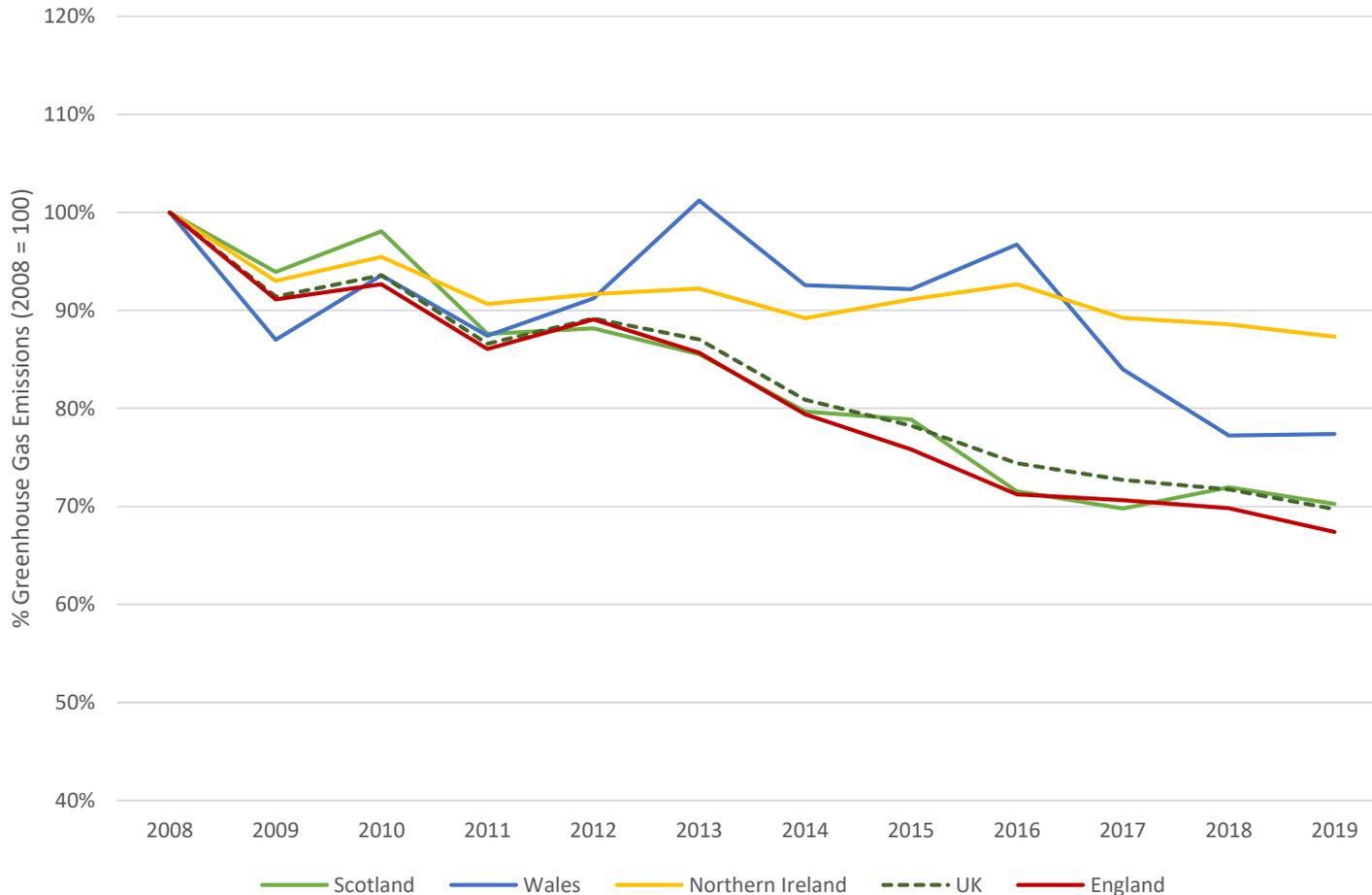
If consumption habits do not change, the ability of future generations' to use and benefit from Wales' natural resources will be severely threatened. Moreover, these consequences are not confined by geographical boundaries and have a detrimental impact on wellbeing and ecosystems globally.

The domestic consumption of goods from overseas contribute to the depletion of resources and production of harmful emissions in other countries, directly affecting their environmental resilience and impacting their ability to safeguard future generations.



Greenhouse gas emissions in Wales are reducing

Figure 59. Greenhouse gas emissions in Wales, Northern Ireland, Scotland and England, 2008-2019 (NAEI, 2021a).



As shown in **Figure 59**, the rate of decarbonisation in Wales has been slower than the UK average. Even so, total carbon emissions have dropped 23 per cent, from 49.7 metric tons of CO₂ equivalent (MtCO₂e) in 2008, to 38.5 MtCO₂e in 2019.

The most significant factor determining the relative rates of decarbonisation in Scotland, Wales and Northern Ireland compared to the UK average has been the speed and scale of power sector decarbonisation.

Total energy supply, as defined by the UK National Atmospheric Emissions Inventory (NAEI), has accounted for the greatest proportion of carbon emissions in Wales since 2000 and made up 28.7 per cent of total emissions as of 2019. While this figure has fallen fairly consistently since a peak of 42.8 per cent in 2012, progress over the longer term has been minimal.

While accounting for a considerably smaller proportion of total emissions, the agriculture sector has seen a consistent increase in emissions, growing by 10 per cent since 2008. Even so, emissions remain 10 per cent below the recorded base year level.

In contrast, the waste management and residential sectors have fallen considerably during the same period, dropping by 40 per cent and 19 per cent respectively.

References & Resources



Progress Report (Climate Change Committee, 2021b)



Devolved Administration Emission Inventories (NAEI, 2021a)

The consumption of goods and services in Wales is contributing to the global depletion of natural capital and furthering the poverty trap facing countries that are most vulnerable to its effects

Figure 60. Changes in worldwide inclusive wealth per capita and other indicators, 1992 to 2014 (United Nations, 2018).

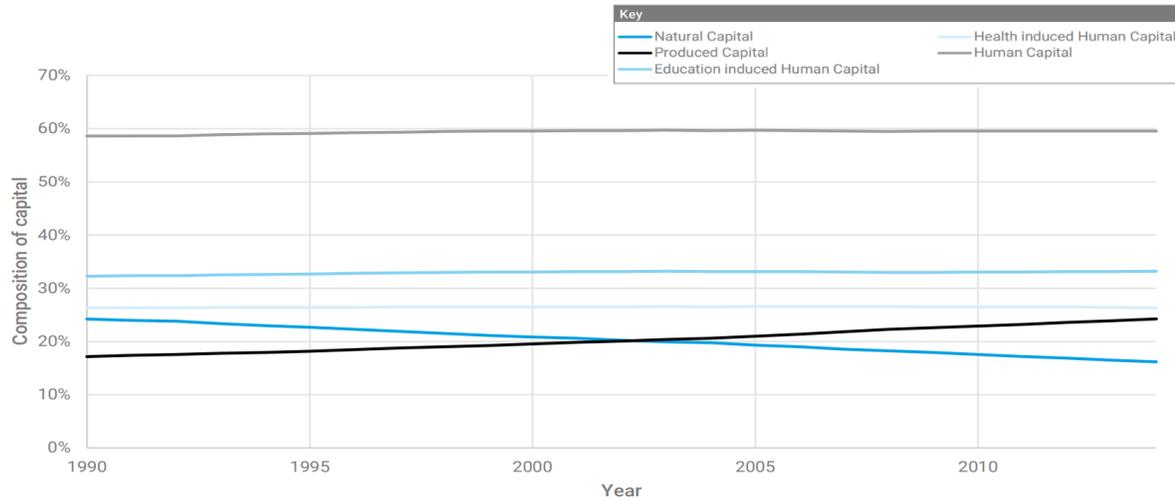
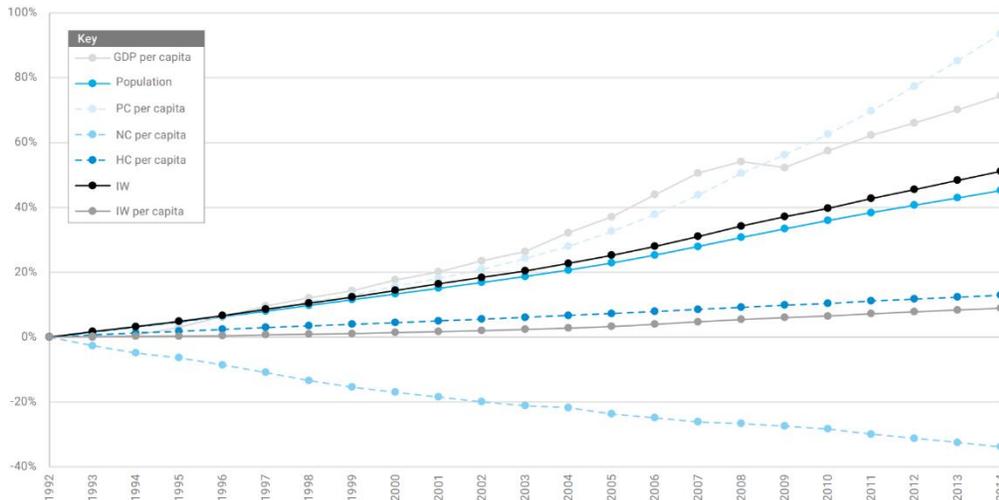


Figure 61. Global trends in per capita inclusive wealth, 1992-2014 (United Nations, 2018).



Inclusive Wealth (IW) is the social value of the sum of produced, human and natural capital. This includes forests, plants, fossil fuels, fisheries, agricultural land, rivers and estuaries, oceans, the atmosphere and subsoil resources.

Whilst estimates for recent decades indicate that trends in aggregate produced and human capital have been largely positive, natural capital by contrast has been declining. It has declined by nearly 40 per cent between 1992 and 2014, according to UN calculations.

The estimated shares of produced, human, and natural capital can vary greatly between countries. In Wales there has already been observed degradation of some natural capital assets. In central Africa, South America and western Asia natural capital remains a substantial portion of estimated wealth, though with widely reported specific demands and pressures on some natural resources.

The consumption of goods and services in Wales, with embedded inputs derived from particular natural resources, is contributing to the depletion of natural capital elsewhere. Such trade may support incomes, but can also place pressures on local natural resources and have implications for future opportunities.

References & Resources



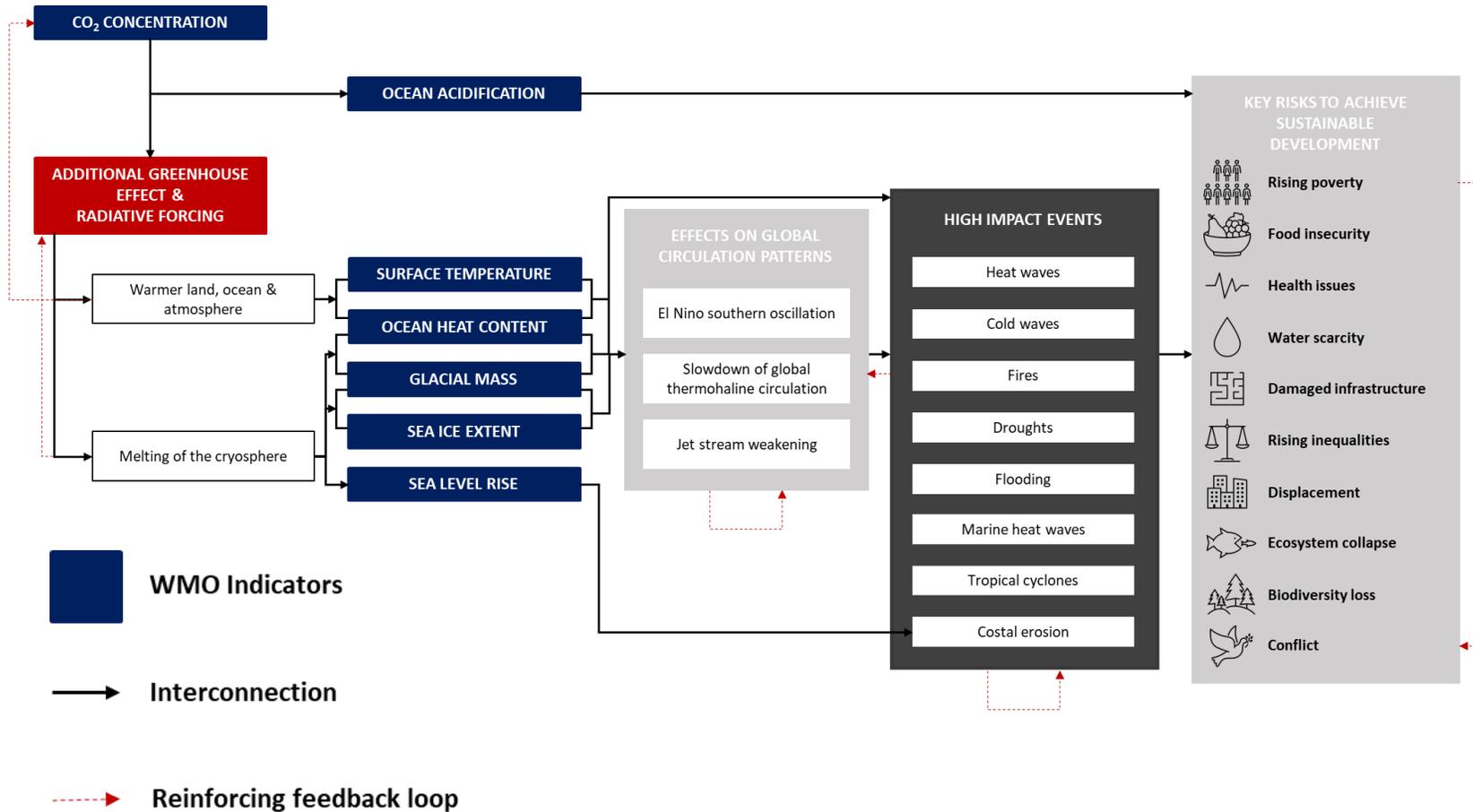
Shaping the Trends of Our Time (United Nations, 2020a)



Inclusive Wealth Report (United Nations, 2018)

Emissions can add to the greenhouse effects and climate changes leading to increasing numbers of high-impact events

Figure 62. Selected climate change-related risks to the Sustainable Development Goals (WMO, 2021).



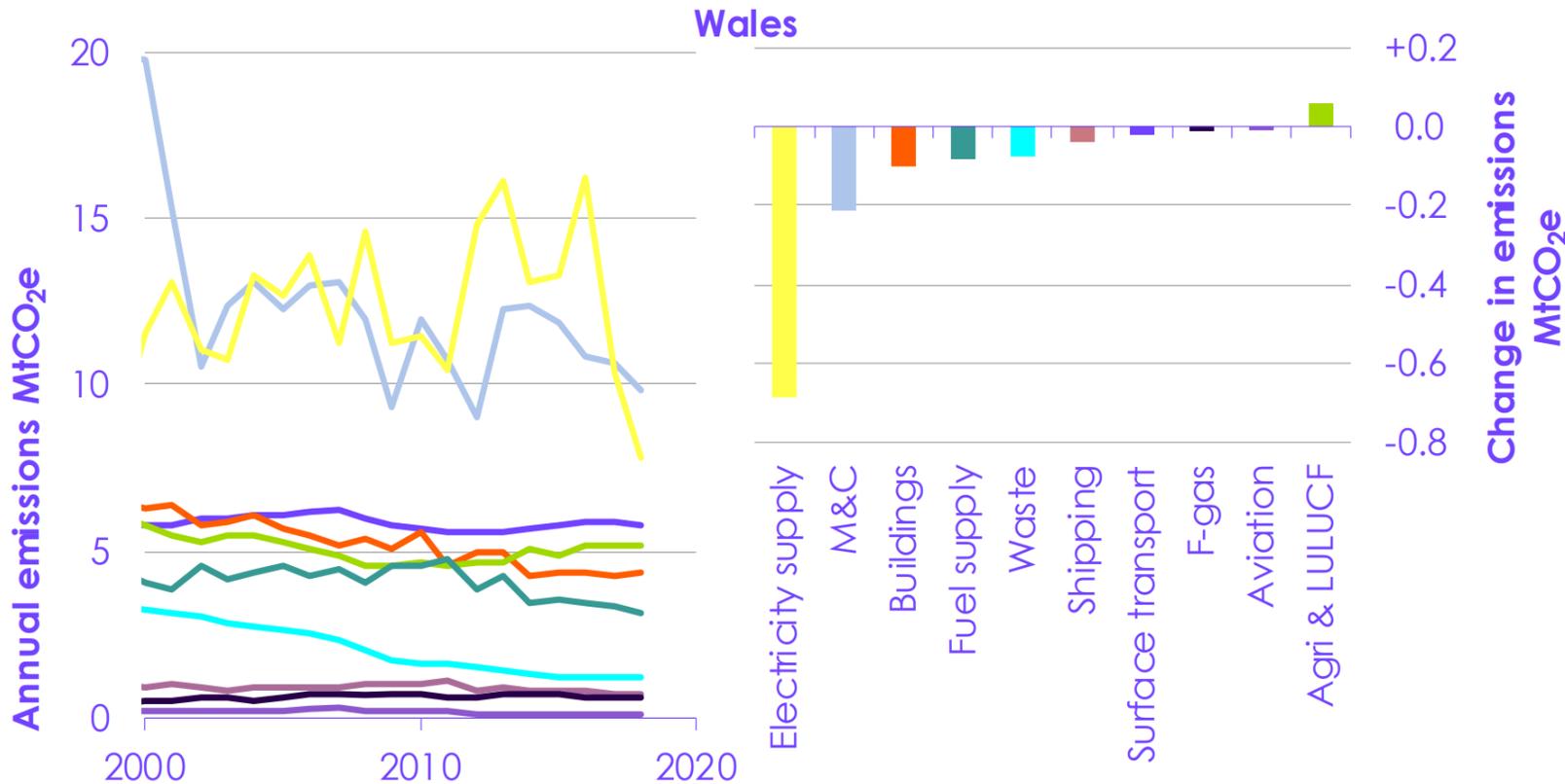
Some of the most acute impacts of climate change are linked to extreme meteorological events such as heavy rain and snow, droughts, heatwaves and storms. These can cause or exacerbate other high impact events such as flooding, landslides, wildfires and avalanches.

Rising carbon dioxide emissions link to climate systems via impacts on ocean acidification, surface temperatures, ocean heat content, glacial mass, sea ice extent and sea level rise. Some of these processes also have the potential to lead to further warming by releasing further greenhouse gases into the atmosphere.



Emissions have been decreasing since 1990, although over recent years the rate of this reduction has slowed

Figure 63. Sectoral emissions in Wales, 2008-2018 (Climate Change Committee, 2021b).



With the global energy system contributing so significantly to the climate emergency, the transition to renewable energy sources has become essential to sustainable development.

Figure 63. Shows both the sectoral emissions in Wales between 2000 and 2018 (left) and the change in these emissions levels over the decade between 2008 and 2018 (right).

While ‘electrical supply’ and ‘manufacturing & construction’ have historically been the leading sources of greenhouse gas emissions, these sectors have also seen the greatest improvement, dropping by approximately 0.7 and 0.2 MtCO₂e respectively during this period.

The production and consumption of energy in Wales creates a wide range of pressures for ecosystems and public health here and across the planet. The generation of energy (both from fossil fuel and renewable sources) drives a number of local and global pressures, including:

- Consumption of natural resources.
- Production of atmospheric emissions.
- Consumption of water.
- Generation of waste.
- Increase in land use.
- The installation of infrastructure.

These pressures have a broad impact, for example, on human health, ecosystems (and their ecosystem benefits), and infrastructure.

References & Resources



Progress Report
(Climate Change
Committee, 2021b)



Devolved Administration
Emissions by Source
(NAEI, 2021b)

The power sector is decarbonising and renewable energy generation is increasing

Figure 64. Electricity capacity trends in Wales, 2007-2019 (Welsh Government, 2020a).

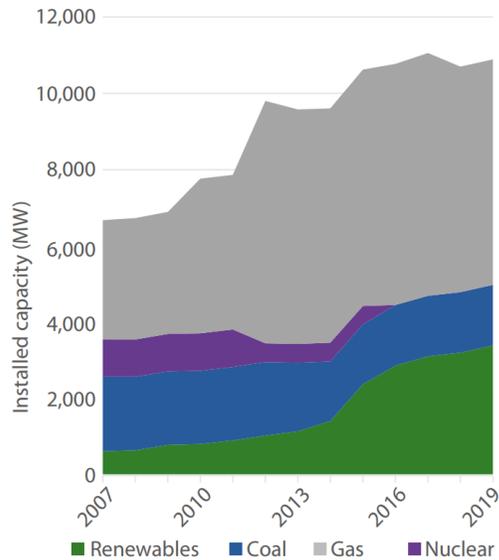


Figure 65. Electricity generation trends in Wales, 2007-2019 (Welsh Government, 2020a).

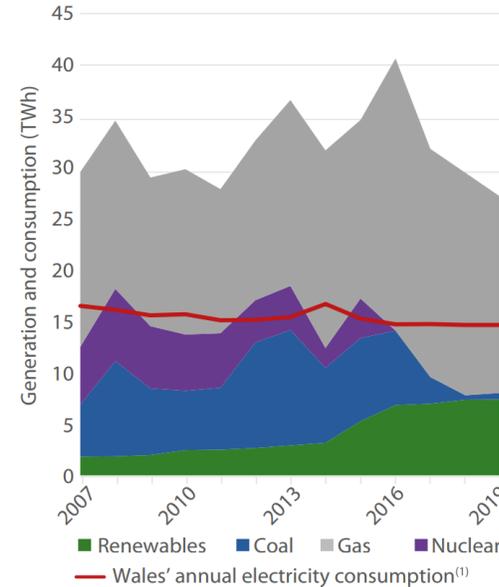
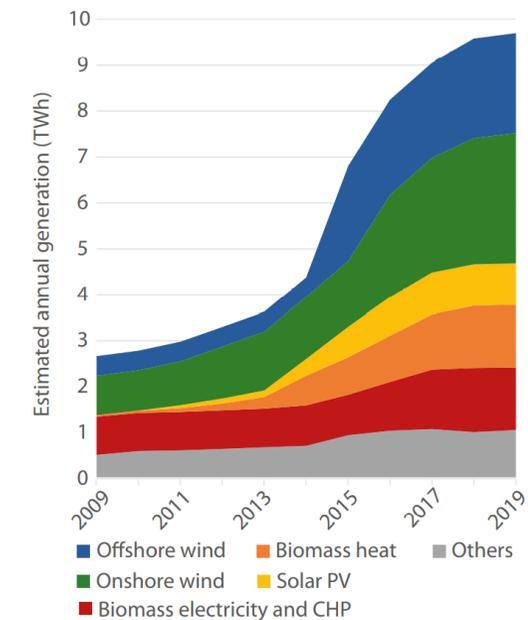


Figure 66. Renewable energy generation trends in Wales, 2000-2016 (Welsh Government, 2020a).



As the Power Sector is the largest contributor to Wales' greenhouse gas emissions (29 per cent), decarbonisation will need to continue in this sector to achieve emissions targets.

Following the closure of Aberthaw Power Station in March 2020, Wales' energy production is now coal-free five years ahead of the UK-wide target of 2025.

However focus remains on addressing the emissions from gas and ensuring that renewables to generate electricity equal to 70% of Wales' consumption by 2030.

Falls in the price of renewable energy has made it increasingly cost-competitive with gas, resulting in significant capital investments in the short-term.

Whilst previous years have seen a rapid increase in the proportion of Wales' existing demand met from renewable energy – at the end of 2019, 51% of electricity consumption came from renewable sources.

References & Resources



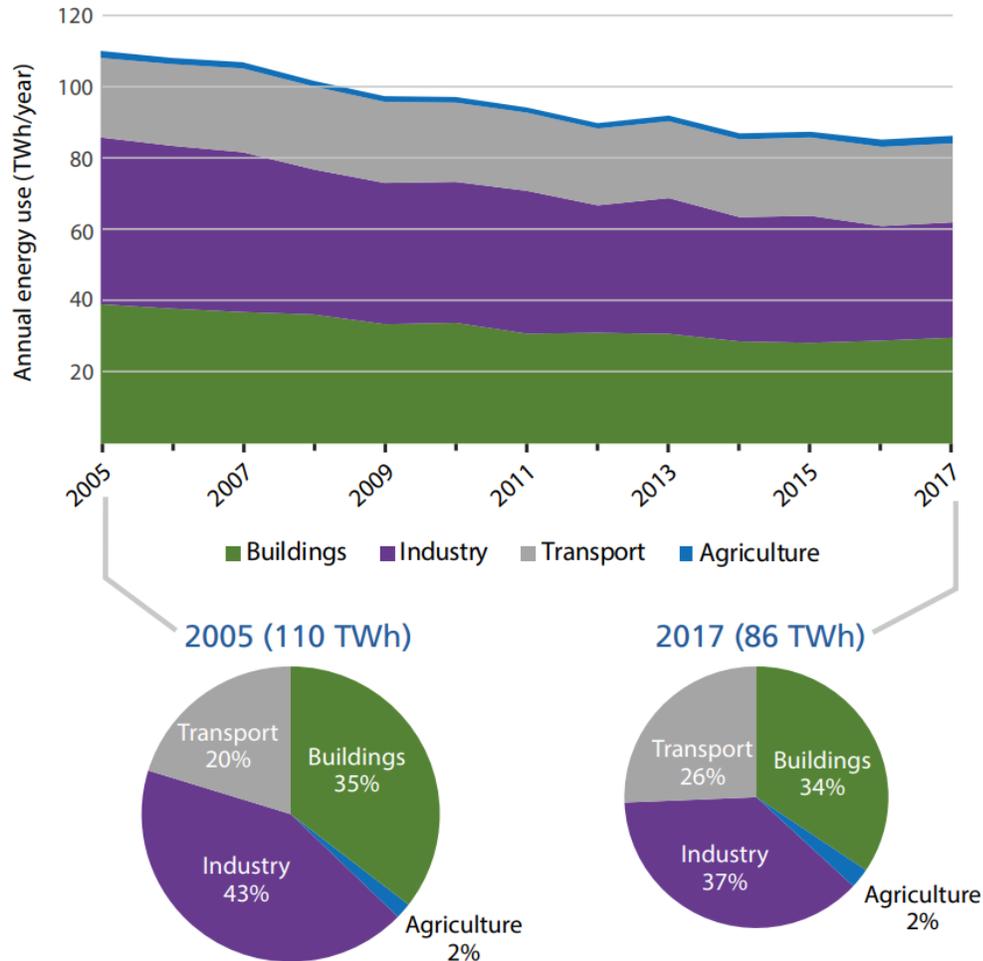
Net Zero Wales (Welsh Government, 2021)



Energy Generation in Wales 2019 (Welsh Government, 2020a)

Energy use has been decreasing however with the expected rise in electrification this is projected to rise

Figure 67. Energy use by sector in Wales, 2005 to 2017 (Welsh Government, 2020b).



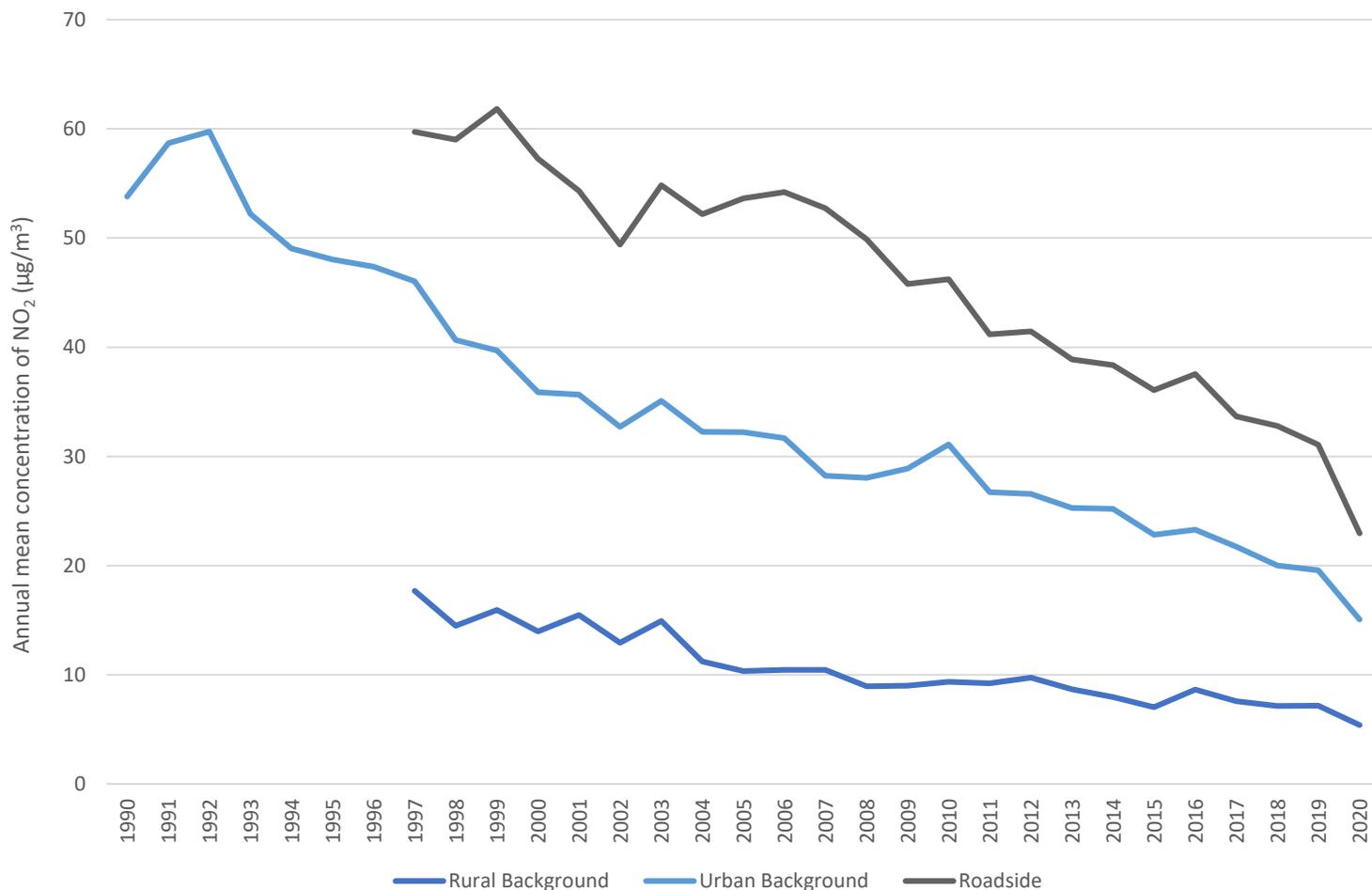
Despite the growth in population between 2005 and 2017, energy usage in Wales has steadily decreased, which is likely a result of wider energy efficiency measures brought into effect during that period.

As shown in **Figure 67**, whereas the proportion of energy consumed in buildings and by the agriculture sector has remained relatively consistent during this period, the industry sector is now accounting for 6 per cent less of Wales' total energy use, while transport now accounts for 6 per cent more.

Despite the overall reduction in energy use however, the Committee on Climate Change has advised that electricity demand in Wales will likely double by 2050 due to new demands within building and from the transport and industry sectors as they move to renewable electricity sources of supply. Therefore further renewable generation will be necessary to keep up with this demand.

Exhaust emissions have fallen considerably in Wales over the last two decades, however levels of non-exhaust particulate matter remain high and are predicted to increase

Figure 68. Annual mean concentrations of NO₂ in the UK, 1990 to 2020 (DEFRA, 2021a).



According to Public Health Wales (PHW), poor air quality contributes to an affect equivalent of between 28,000 and 36,000 deaths per year in Wales.

This risk is greatest for people living within the most deprived areas, where health and air quality tend to be poorest and where deprivation and poor health influences can inhibit an individual’s ability to cope with the impacts of exposure to air pollution.

As shown in **Figure 68**, while levels of harmful nitrogen dioxide emissions continue to fall across the UK, concentrations remain notably higher in roadside and urban areas than in rural settings. In addition to air, water and noise pollution, urban transport has also been associated with social and economic impacts resulting from congestion and a lack of transport opportunities.

In addition to exhaust pollutants, non-exhaust emissions (NEE) make up a significant proportion of total air pollutants in the UK. These are minute particles that are released into the air from the wearing down of tyres, vehicle breaks and road surfaces during transport.

Projections from the Air Quality Expert Group (2019) suggest that while exhaust emissions are likely to continue to fall, following a move toward electric and ultra-low emission vehicles, non-exhaust emissions are likely to grow in line with increasing traffic levels.

References & Resources



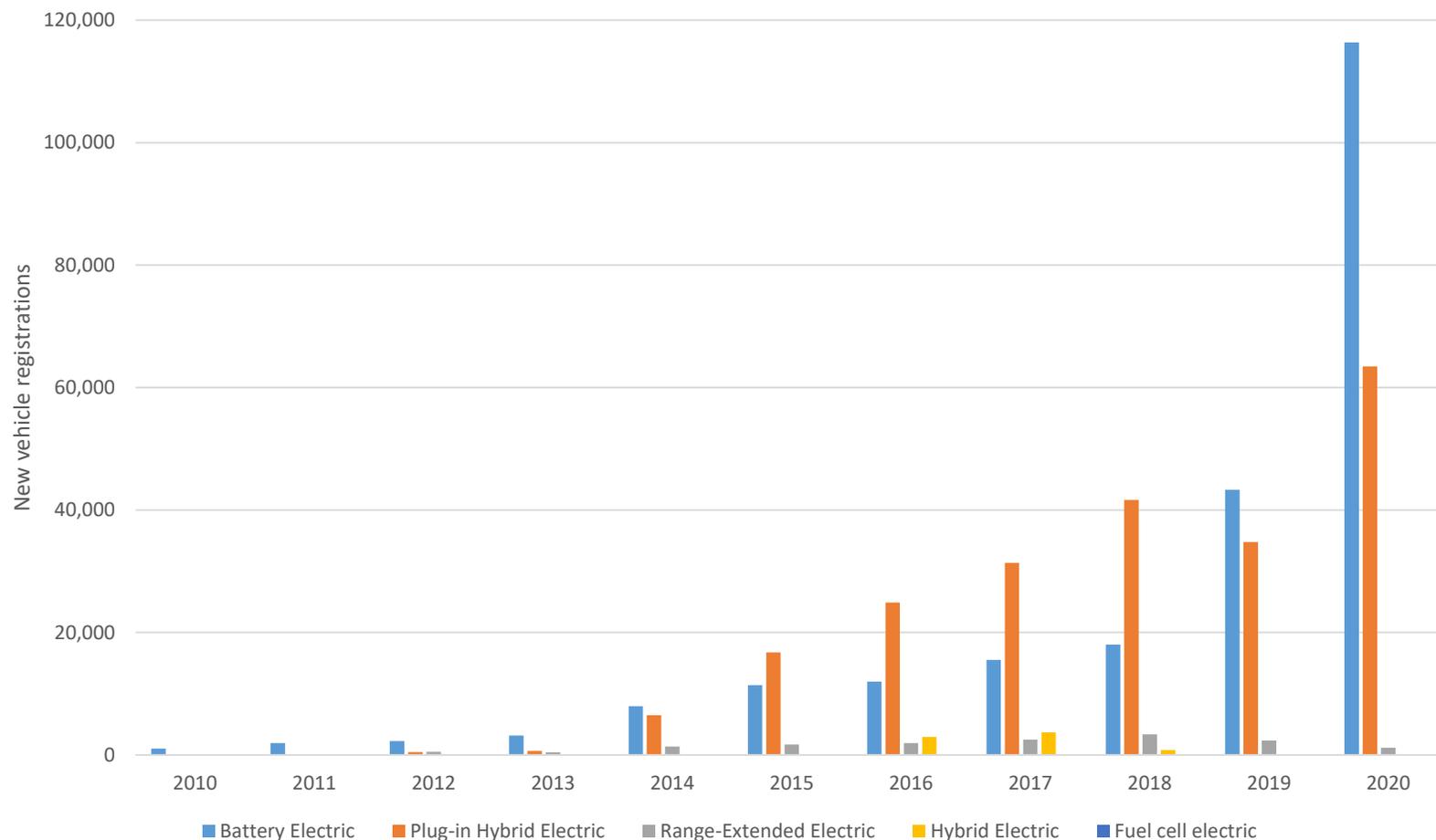
Concentrations of Nitrogen Dioxide (DEFRA, 2021a)



Non-Exhaust Emissions Report (Air Quality Expert Group, 2019)

Purchases of electric vehicles have increased in recent years

Figure 69. Ultra-low emission vehicles registered for the first time, UK (Department for Transport, 2021a).



Electric cars are growing in popularity, with purchases of both battery powered electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) increasing steadily in recent years, with combined new registrations increasing from 28,150 to 179,811 in the 5 years between 2015 and 2020.

According to Climate Change Committee statistics, this has seen the combined market share of these vehicles increase from 1.1 per cent of total UK car sales to 10.6 per cent across the same period.

This has coincided with substantial improvements in electric vehicle infrastructure, such as the number of public charging points rising from 16,500 to 20,800 between 2019 and 2021 alone. There has also been positive development in the price and performance of new electric vehicles, largely attributed to a 13 per cent fall in the price of batteries during this period.

Rapid falls in the cost of electric vehicles mean that they are becoming closer to being at cost-parity with fossil fuel alternatives in large parts of the world and they may become cheaper by the mid-2020s.

References & Resources



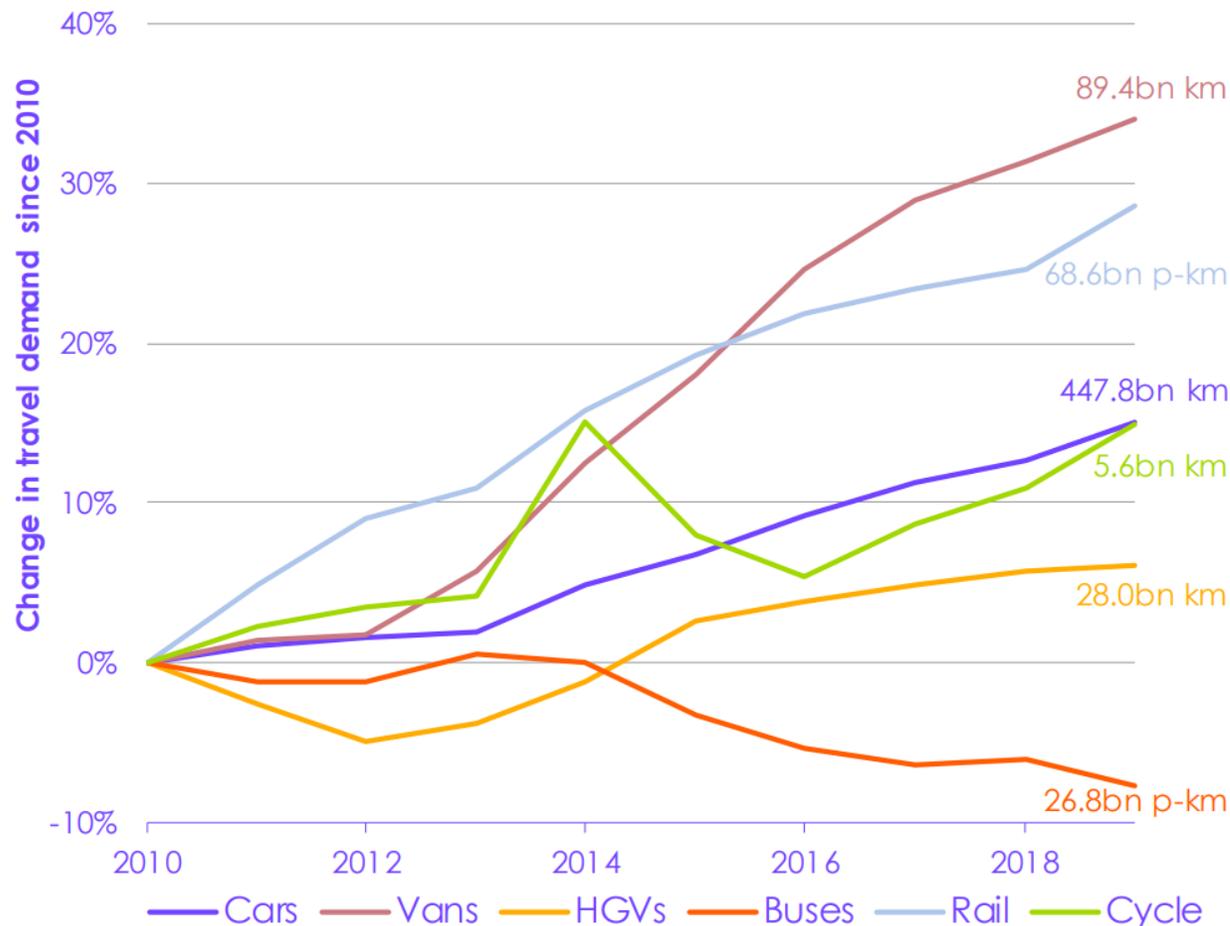
[Progress Report \(Climate Change Committee, 2021b\)](#)



[Statistical Dataset \(Department for Transport, 2021a\)](#)

Travel behaviours and patterns are changing in the UK

Figure 70. Changes in travel demand by mode since 2010 (Climate Change Committee, 2021b).



Owing to the cost of driving increasing at a slower rate than wages and the cost of living, road transport demand in the UK has continued to rise over the past decade. The only major form of land transport to see a reduction during this period was bus travel, which experienced an 8 per cent drop in demand between the 2009/10 and 2018/19 financial years, largely attributed to rising fare prices.

Vans saw the largest percentage increase over the last decade, with demand climbing 34 percent between 2010 and 2019, while cars and taxis remain the dominant mode of travel in terms of kilometres travelled, accounting for five times the distance travelled by vans at 447.8 bn km.

Travel demand in Wales followed a broadly similar pattern, with bus travel again the only form of transport to experience a drop in percentage demand between 2010 and 2019 (33 per cent). Vans again experienced considerable proportional growth during this period, rising 38.5 per cent, while cycling demand more than doubled (107.7 per cent).

References & Resources



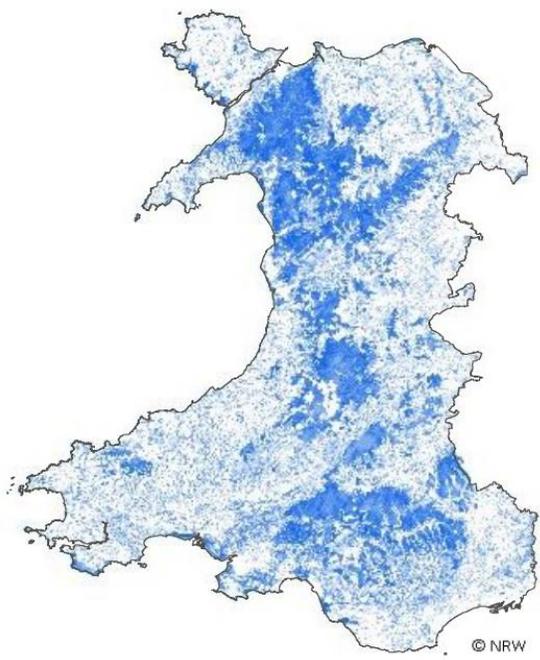
Progress Report (Climate Change Committee, 2021b)



Transport Statistics Table Catalogue (Department for Transport, 2021b)

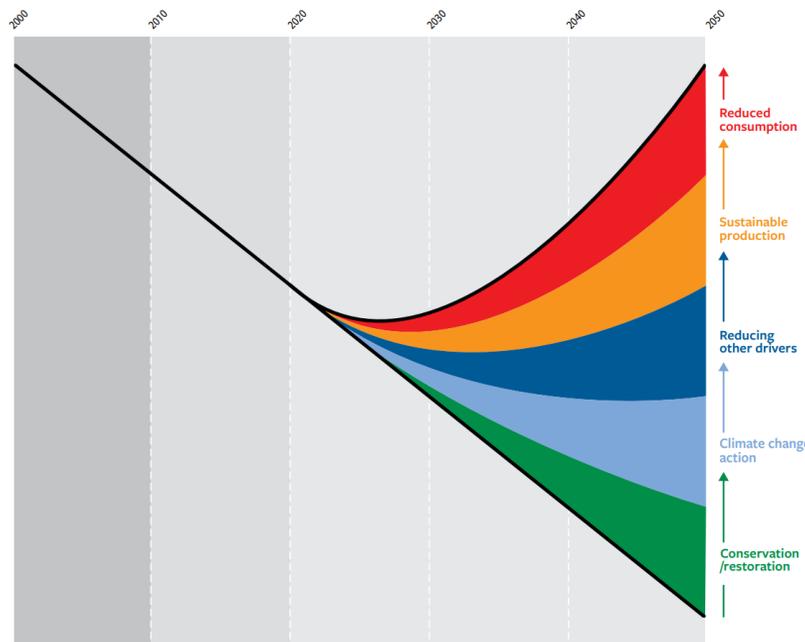
Ecosystem resilience in Wales is declining

Figure 71. Semi-natural habitat connectivity for a range of terrestrial habitats combined, based on maps of least-cost habitat networks (NRW, 2016).



Note: Depth of blue reflects the overall strength of connectivity between habitats.

Figure 72. A portfolio of actions to reduce loss and restore biodiversity (Convention on Biodiversity, 2020).



A resilient ecosystem can respond to stresses by resisting, recovering from, and adapting to change.

Ecosystem resilience is declining globally, with Wales also being impacted by this trend. The attributes of ecosystem resilience include diversity, extent, condition, connectivity and adaptability of habitats.

Declines in ecosystem resilience impact the ability of our natural resources to provide services and benefits to people and nature in the long term.

A resilient ecosystem can recover from past, resist current, and adapt to new stresses. However, a declining ecosystem impacts the ability of natural resources to provide a sustainable flow of benefits to current and future generations, undermining their well-being.

The ways people interact with and manage ecosystems to provide food, energy, building materials, and other resources, as well as to filter water, control infectious diseases, decompose wastes and connect with nature can influence ecosystems. These connections between nature, economy and society are driving both the climate emergency and nature crisis.

Trends in biodiversity are projected to continue to decline if future trajectories follow business as usual scenarios (as shown in trend line on **Figure 72**). Various actions could potentially alter the course of these trends, however they cannot do this alone or in partial combinations.

References & Resources



SoNaRR Chapter 4 - Resilient Ecosystems (NRW, 2016)



Global Biodiversity Outlook 5 (Convention on Biological Diversity, 2020)

Species are declining globally. The same pattern is occurring in Wales and the UK, with evidence of several species being at risk in the future

Figure 73. Estimated extinction rates in various animal groups through time, expressed as extinctions per million species per year (Johnson, 2021).

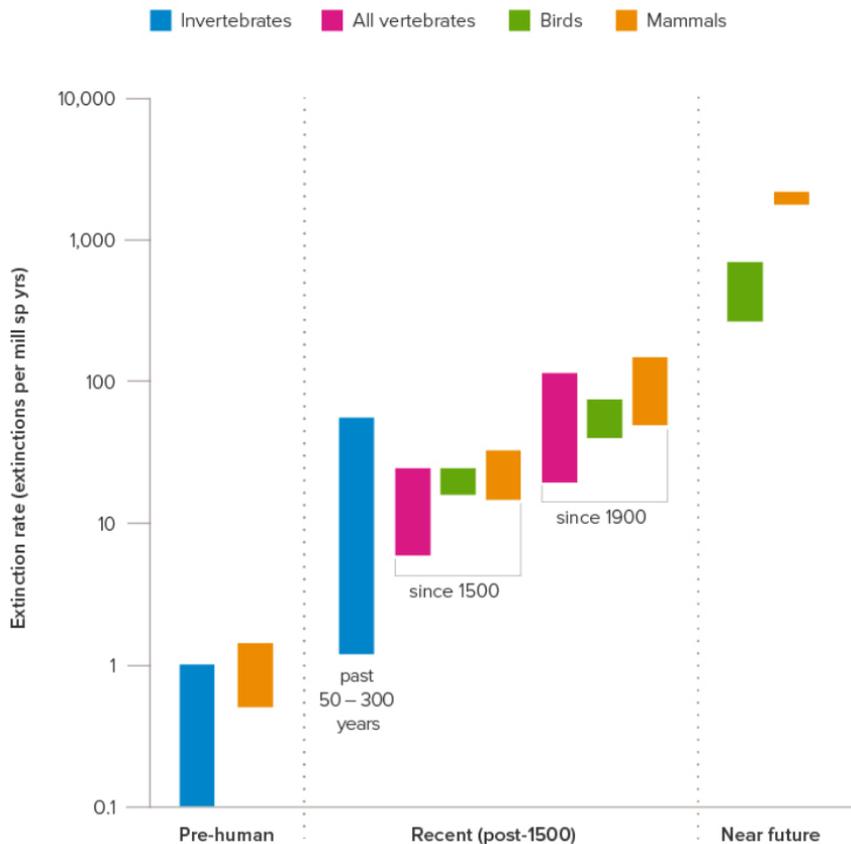
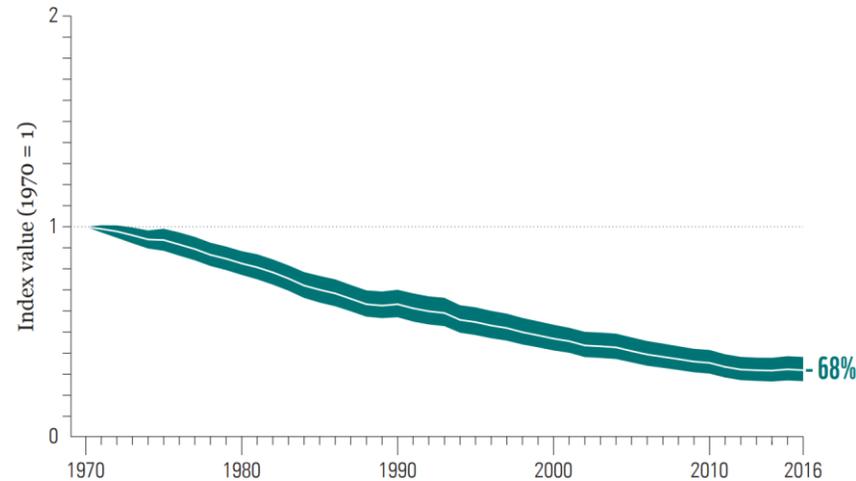


Figure 74. The global Living Planet Index, 1970 to 2016 (WWF, 2020).



There is substantial evidence indicating a decline in species across both animal and plant groups in all parts of the world.

On average, 25 per cent of species in assessed animal and plant groups are threatened globally, with numbers across species groups either decreasing or remaining consistent since 1990. The UN predicts that 1 in 8 species on the planet will be extinct within 20 years. Since 1970, evidence from the global Living Planet Index shows that of the species it monitors, the average abundance of populations across the globe declined by 68 per cent. As with the global picture, this trend is occurring in Wales. According to the most recent State of Nature report, of the 6,500 species found in Wales that were assessed using the International Union for Conservation of Nature (IUCN) red list criteria, 8 per cent are in danger of becoming extinct throughout Great Britain.

The list of threatened terrestrial and freshwater species includes 202 plants, 97 fungi and lichens, 86 vertebrates and 138 invertebrates. Nevertheless, certain species are flourishing in the current climate. Between 2006 and 2016, common breeding birds and wintering water birds have seen respective increases of 10 and 20 per cent, although the abundance of butterfly species have dropped 14 per cent over the same period.

Key pressures driving trends in biodiversity loss include:

- agricultural management
- climate change
- population growth
- urbanisation
- pollution
- hydrological change
- invasive non-native species
- woodland management

References & Resources



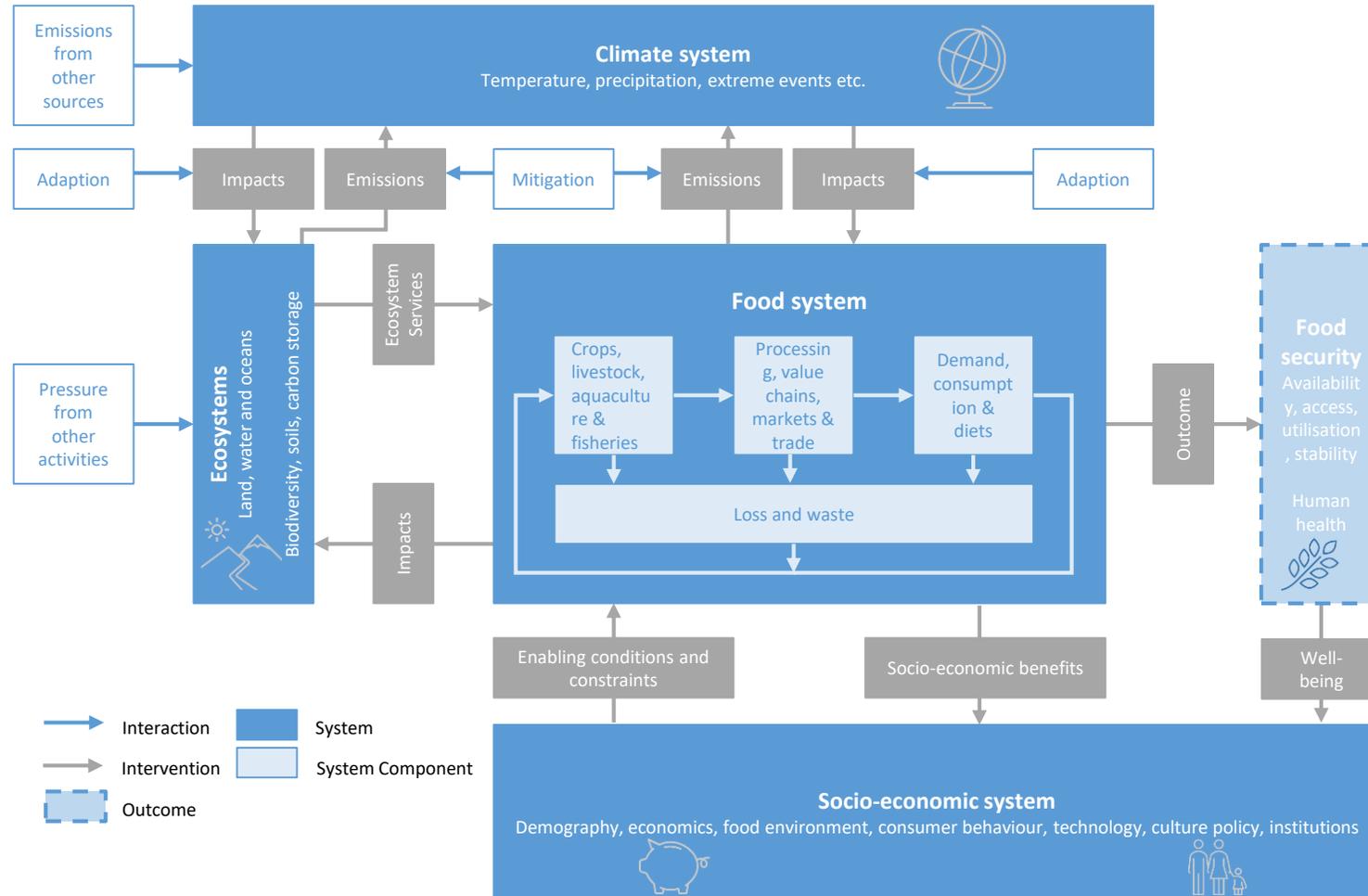
Past and Future Decline and Extinction of Species (Johnson, 2021)



Living Planet Report (WWF, 2020)

The actions associated with feeding our population are driving significant environmental damage

Figure 75. Changes in travel demand by mode since 2010 (IPCC, 2019).



The actions associated with feeding our population have led to significant environmental damage. At present, between 21 and 37 per cent of total global greenhouse gas emissions are attributable to the food system via agriculture, land use, storage, transport, packaging, processing, retail and consumption. If current behaviours remain unchanged, emissions from each of these are predicted to increase between 30 and 40 per cent by 2050. This is in addition to the continued resource depletion, loss of biodiversity and ecosystem degradation related with unsustainable food production on such a massive scale.

Alongside the environmental and socio-economic dangers posed by current systems, food production itself is threatened by unsustainable practices. Threats to food security are projected to increase cereal price by 1 to 29 per cent by 2050, driving an increase in global food prices and putting low-income consumers at severe risk of hunger. Moreover, increased levels of CO₂ threaten to lower the nutritional value of available food, with certain crops being shown to produce lower levels of zinc, iron, protein and multiple vitamins when grown within high CO₂ environments. This will contribute to an estimated 138 million people at risk of new zinc deficiency by 2050.

References & Resources



Special Report on Climate Change and Land - Ch. 5 (IPCC, 2019)



SoNaRR 2020: Bridges to the Future (NRW, 2020)

Emissions from our food production systems are driving biodiversity loss and reducing ecosystem resilience

Figure 76. Relative change in agricultural emissions between 2030 BAU (WM) and 2017 baseline (JNCC, 2020).

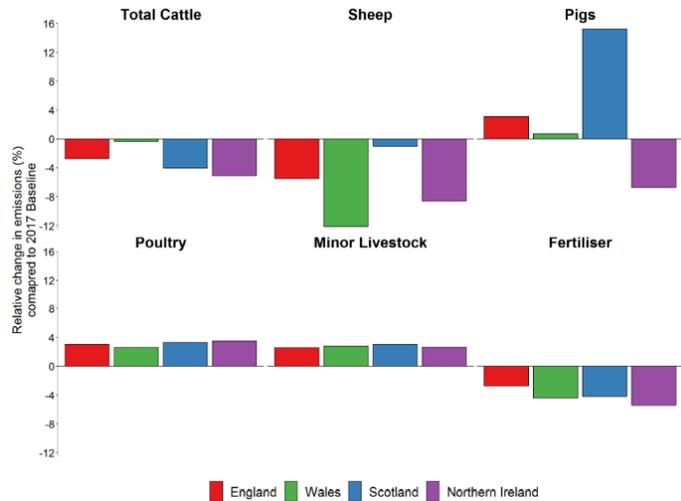


Figure 78. Comparison of NO_x emission baselines: 2017, 2030 BAU (WM) and 2030 NAPCP+DA (JNCC, 2020).

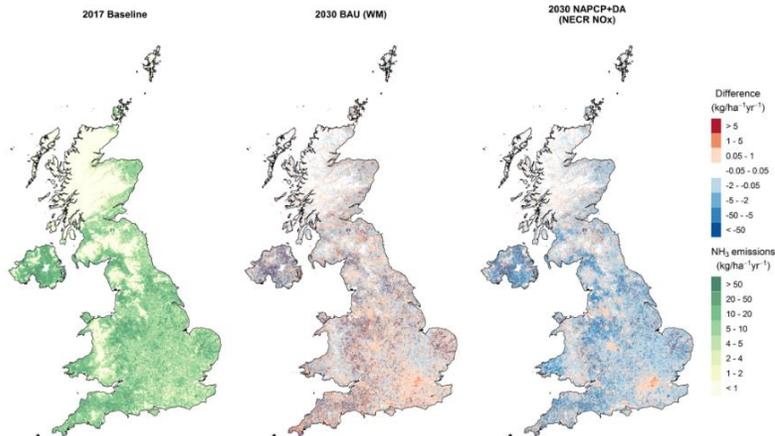


Figure 77. Comparison of NH₃ emission baselines: 2017, 2030 BAU (WM) and 2030 NAPCP+DA (y Cyd-bwyllgorr Cadwraeth Natur, 2020).

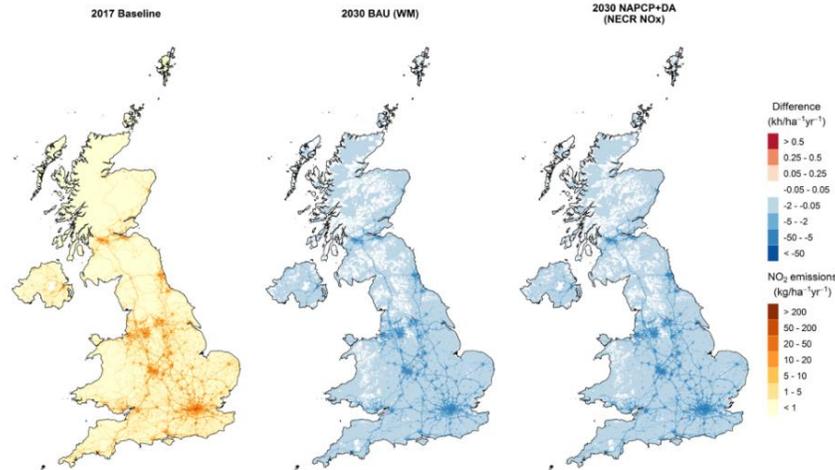
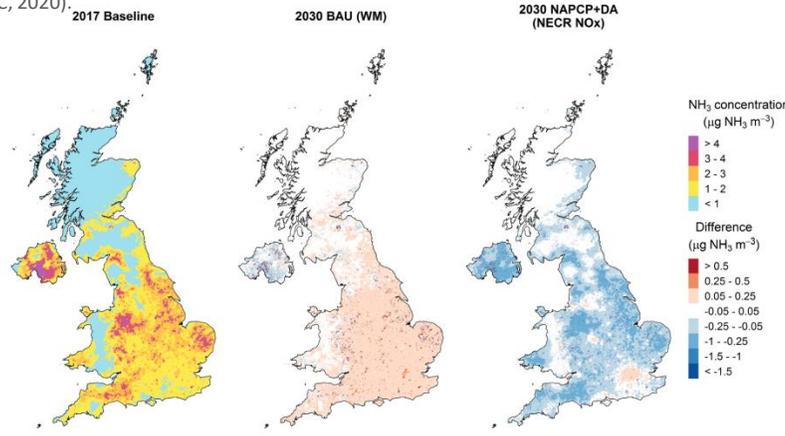


Figure 79. Ammonia concentration baselines: 2017, 2030 BAU (WM), difference to 2030 NAPCP+DA (JNCC, 2020).



In addition to its risk to public health, nitrogen pollution is a major threat to UK biodiversity, resulting in the loss of sensitive species of plants, lichens and animals. There is strong evidence that nitrogen pollution has driven local extinctions of plant and lichen species across the UK and increasing evidence of impacts on fungi, insects, birds and other animals..

The key atmospheric nitrogen pollutants are ammonia (NH₃) originating mainly from agricultural sources and oxides of nitrogen (NO_x) mainly from combustion sources. Effects on ecosystems occur through direct impacts from elevated concentrations in the air, and through deposition of nitrogen compounds onto vegetation and soils which can lead to acidification and over-enrichment (eutrophication).

While UK NO_x emissions decreased 72 per cent between 1990 and 2019 through mitigation efforts, ammonia emissions decreased by less than 15 per cent over the same period, with certain localised areas of the UK seeing some increase.

Current business as usual (BAU) projections show that total NH₃ emissions from agriculture are expected to drop 2 per cent by 2030, with sheep accounting for the greatest percentage reduction in emissions. Cattle meanwhile, are projected to experience marginal reductions of 0.4 per cent, while emissions from both poultry and minor livestock are estimated to increase by 2 per cent.

Further mitigation especially of NH₃ emissions is needed to meet policy objectives to improve air quality and lower the impact of atmospheric pollution on the environment and public health. Key policy objectives are those set by the National Emissions Ceilings Regulations (NECR), the UK Government's Clean Air Strategy (CAS) and 25 Year Environment Plan, and equivalent strategies in the Devolved Administrations.

References & Resources



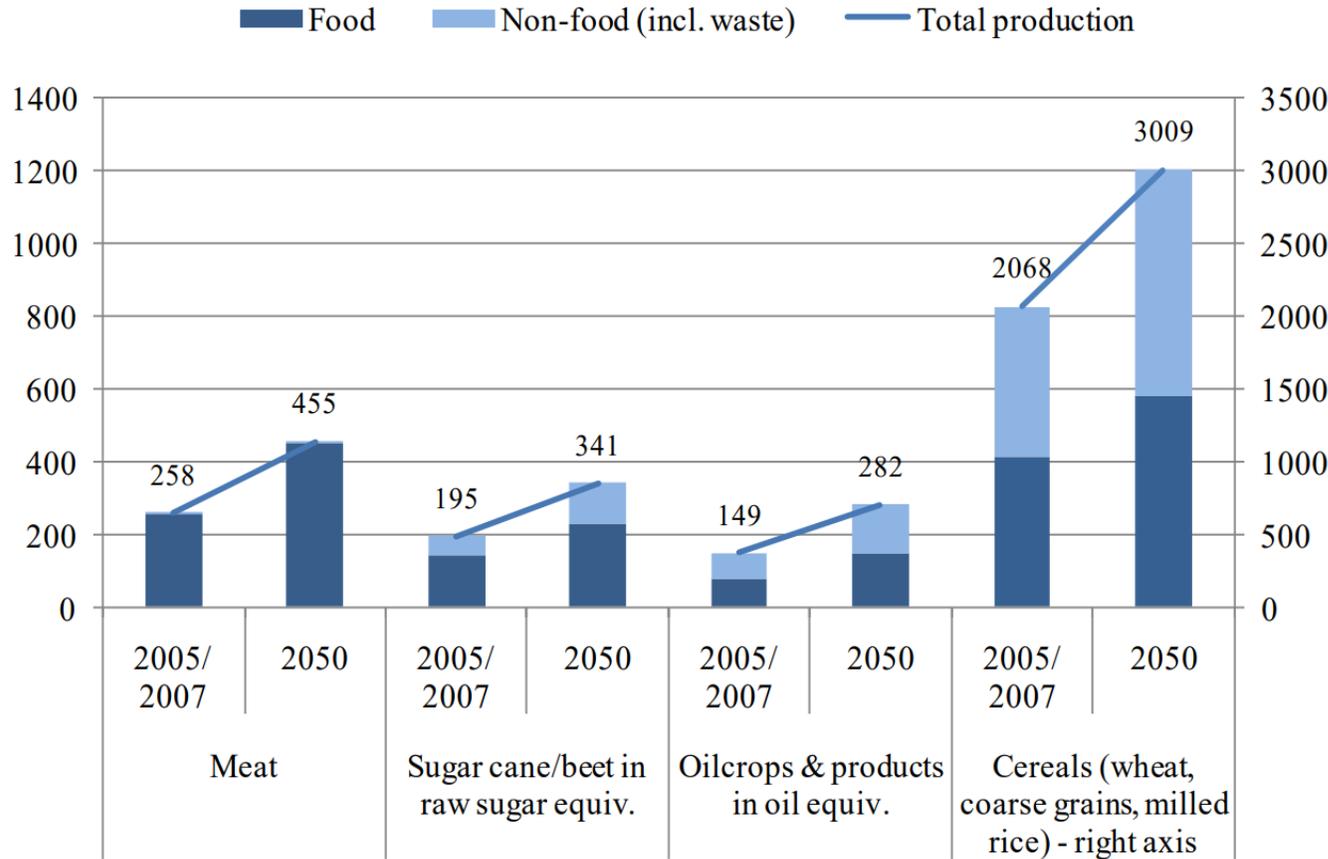
Nitrogen Futures Report (JNCC, 2020)



UK Air information Resource (DEFRA, 2021b)

Demand for food is increasing globally, driven by population growth and changing diets

Figure 80. World production and use, major products (million tonnes), 2007 and 2050 (FAO, 2012).



Rising demand for food is driven by population growth, changes in dietary preferences, and income growth. By 2050, the global population is expected to exceed 9 billion people, with trends in economic development suggesting that individual calorie consumption will increase despite rising food prices, largely due to the average person having more income to spend on food.

To meet this increasing demand for food it is predicted that global agricultural production will need to increase by 50 per cent from the 2012 baseline by 2050.

While increasing food production will result in lower levels of undernourishment, particularly in developing countries, there is also likely to be growth in food waste, emissions and levels of obesity.

Growth in food demand is a complex picture, however, and this baseline projection could be impacted by changing consumer diets and technological change. Investments in controlled farming and meat and protein alternatives could also mean that traditional farming might not keep expanding as predicted

References & Resources



World Agriculture
Towards 2030/2050
(FAO, 2012)



Agricultural Production
(Our World in Data,
2020)

Countries most vulnerable to climate risks are particularly vulnerable to decreasing crop yields, with the UK being increasingly reliant on supply from climate-vulnerable countries

Figure 81. Projected changes in global crop yields
(Challinor et al., 2014).

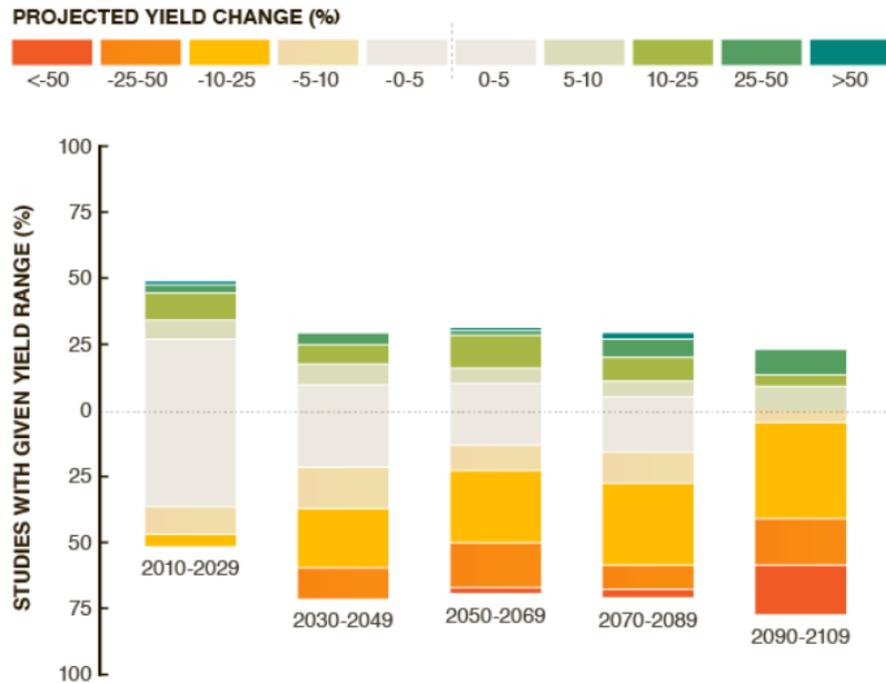
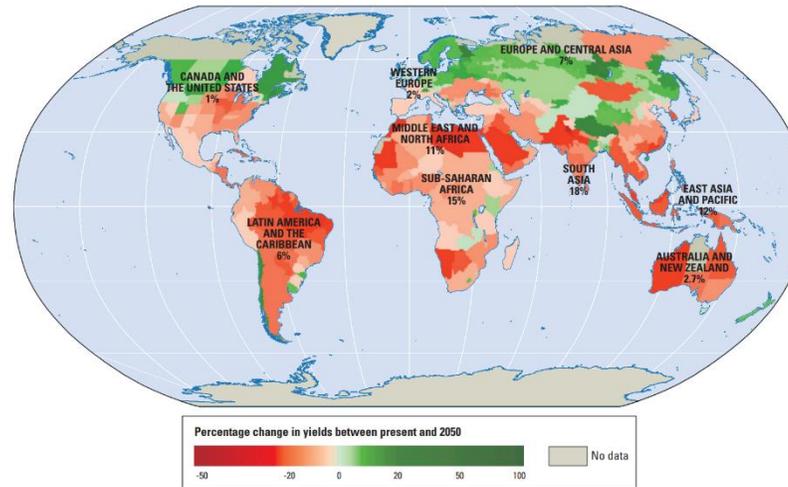


Figure 82. Percentage change in yields between present and 2050 by region (World Bank, 2010).



The impact of climate change on crop yields are projected to be negative from around 2030 onwards, with nearly half of projections beyond 2050 indicating yield decreases greater than 10 per cent.

These changes will not occur evenly throughout the world, with some areas even projected to see an increase. Decreases will be most pronounced in countries particularly vulnerable to climate impacts.

Moreover, while the above figures give an idea of general high-level trends, it is difficult to summarise the many differences between various food products.

As with the rest of the UK, Wales is currently reliant on food imports from other countries. These countries are often vulnerable to the impacts of climate change, with food production at particular risk.

Recent research, for example, shows that the UK’s fruit and vegetable supply is increasingly dependent on imports from climate-vulnerable producing countries, with the contribution of domestic production to total fruit and vegetable supply in the UK decreasing from 42 per cent in 1987 to 22 per cent in 2013 (Scheelbeek et al, 2020).

References & Resources



Big Facts Web Resource (CGIAR, 2021)



World Development Report 2010 (World Bank, 2010)

Overview

The evolution of technology is expected to continue to pave the way in defining how modern societies and economies will interact and develop into the future.

Technology is continually evolving into new areas and disciplines, spreading its reach and impact across the globe. Wales will not be isolated from the impact of technological advancement. As the Brown Review ([Welsh Government, 2019](#)) explored, all partners in Wales are in a position to positively shape the next phase of industrial development and these advancements in technology are frequently referred to as the Fourth Industrial Revolution.

The COVID-19 pandemic has accelerated the application of technology in a number of areas, not least our approach to social interactions, where we work, and how we access key services like education, health and social care. There are a number of positive examples of where the rapid rollout of new technology has supported new products and services to come forward at pace in Wales in order to address the unique challenges posed by the pandemic.

Technology is also a key factor in driving a number of critical policy areas going forward. Climate change is one area where technological advancements have the ability to make a significant and positive contribution in supporting the implementation of widespread change. Not just in terms of the physical technologies that are able to produce renewable energy or facilitate reuse and recycling, but also the digital systems used to support changes in working habits or to evaluate data in order to draw out efficiencies and process improvements that reduce waste and energy use.

There are also negative impacts however, such as threats to privacy and cyber security, which may only become more prevalent with the continued development and uptake of certain technologies.

The trend of increasing internet usage is not occurring equally across the country, with a digital divide remaining between those who have access to digital technologies and those who do not. Despite improved digital inclusion across the board, there is evidence that an inclusion gap remains between certain demographic and socio-economic groups.

Delivering the benefits of technological evolution equally across society poses a particular challenge for Wales. This will mean ensuring the people and places of Wales are not left behind as technology evolves.

Further issues regulation may be required to support the ethical use of technology and safeguard those most vulnerable to cybercrime. More will need to be done to improve digital literacy across all demographics and socio-economic and to ensure that the opportunities presented by the advancement of technology are available to all people throughout Wales.

Some of these challenges are particularly difficult given both the pace at which certain technologies are evolving and the lack of ability, or willingness, of regulatory and ethical standards organisations to keep pace.

Internet usage has continually increased over the last decade

Figure 83. Number and percentage of adult non-internet users, UK, 2013 to 2020 (ONS, 2021).

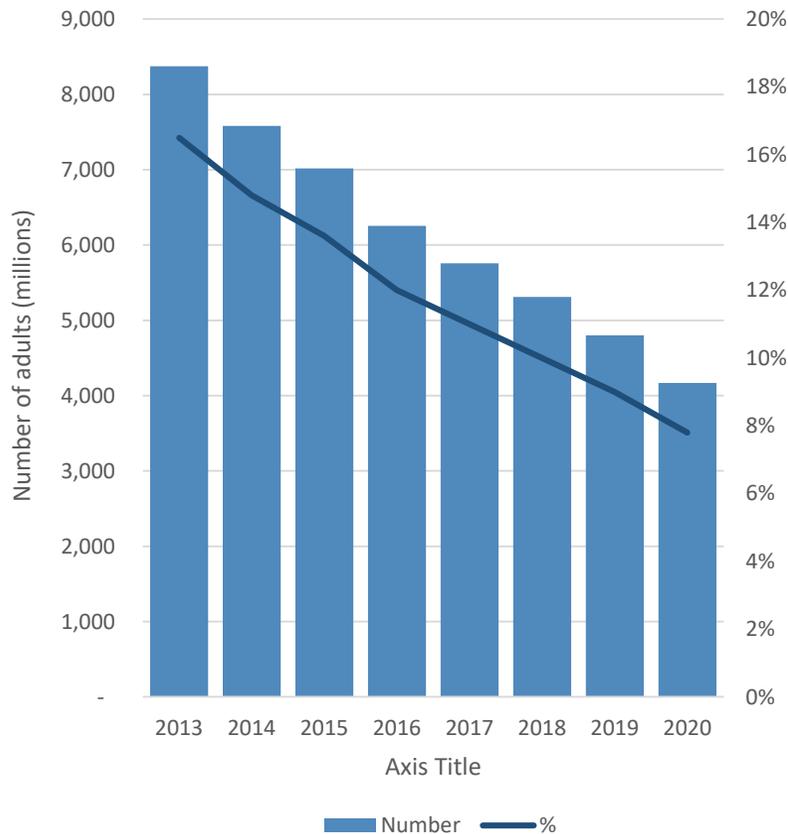
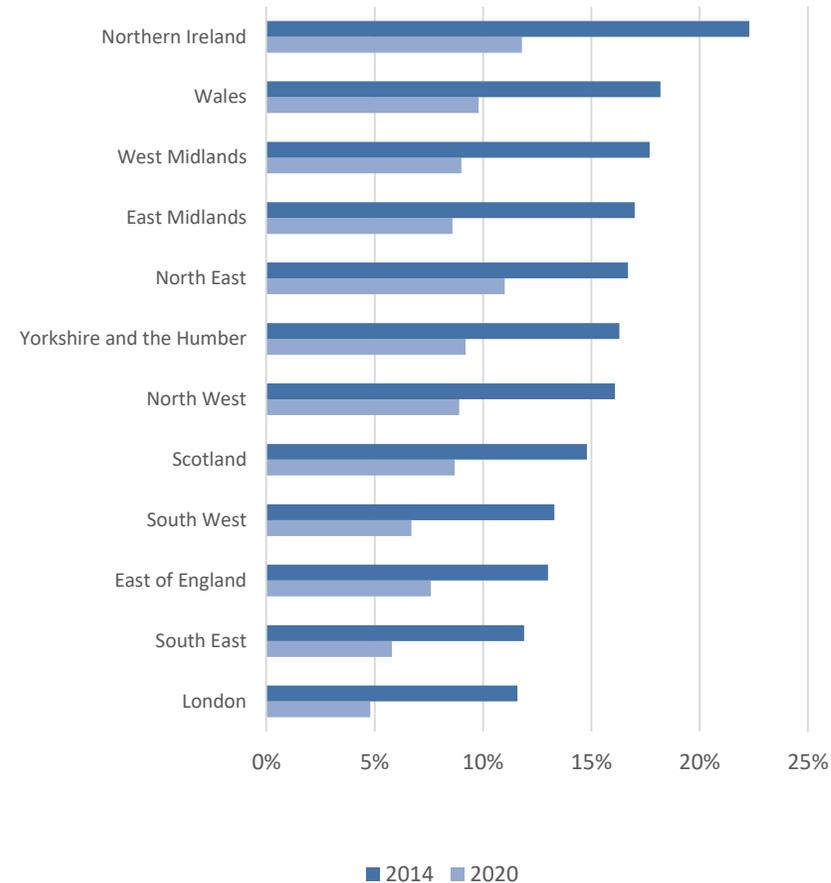


Figure 84. Percentage population of internet non-users by region, UK, 2014 and 2020 (ONS, 2021).



Internet usage is increasing across Wales and the UK as a whole.

Between 2012 and 2020, the number of adults in the UK that were classed as 'non-internet users' dropped from 8.4 million to 4.2 million. This does however mean that, at last count, around 8 per cent of adults in the UK were still classed as 'non-internet users'.

This pattern is echoed in Wales, where the percentage of non-users among adults decreased from 18.2 per cent to 9.8 per cent during the same period.

As of the 2020-21 period, 91 per cent of surveyed households in Wales reported having access to the internet, demonstrating an increase of 7 percentage points over the last 5 years.



The trend of increasing internet usage is not occurring equally across the country. A digital divide remains between those who have access to digital technologies and those who do not

Figure 85. Digital exclusion in Wales by priority group, 2017-18 to 2020 (Welsh Government, 2021).

	2017-18 NSW	2018-19 NSW	2019-20 NSW	Q1 2021 NSW
Adults (16+)	15%	11%	10%	7%
Aged 50 and over	28%	22%	19%	14%
50-64 year olds	13%	9%	7%	6%
65-74 year olds	29%	21%	19%	13%
75 plus	60%	51%	48%	33%
Residents of social housing	24%	19%	17%	12%
Employed	5%	3%	3%	2%
Unemployed	10%	6%	7%	4%
Working age economically inactive (18-64)	11%	6%	9%	4%
Limiting long term illness	26%	21%	18%	13%

Having the skills, confidence and technology to access online services will be key considerations in ensuring that people and communities in Wales are not left behind as technologies continue to evolve.

Despite improved digital inclusion across the board, there is evidence that an inclusion gap remains between certain demographic and socio-economic groups. For example, those aged 75 and over (33 per cent) and those with long-term illnesses (13 per cent) are at far greater risk of exclusion than the Wales average (7 per cent).

This has the potential to exacerbate future inequalities, creating barriers to future opportunities for those who are digitally excluded and resulting in social and economic consequences for the excluded individuals.

The survey also identifies five core digital skills: handling information and content, communicating, transacting, problem solving, and being safe and legal online.

According to the latest survey results, 77 per cent of people surveyed had utilised each of these skills within the last 3 months, a marginal improvement from 73 per cent in 2019-20. This percentage dropped considerably with age, those aged 75 and over again recording the lowest result of any socio-economic group at 36 percent.

With both the greatest increase in internet use and the lowest percentage of digital skills, older demographics are at growing risk from online threats. Using the internet without the skills to do so safely can leave individuals vulnerable to malicious software, online scams and breaches of personal data.

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When compared with the rest of the UK, Wales currently has the lowest proportion of people with a foundational digital skill set, restricting their ability to benefit from digital services

Figure 86. Percentage of the population with no digital skills by country of the UK, 2020 and 2021 (Lloyds Bank, 2021).

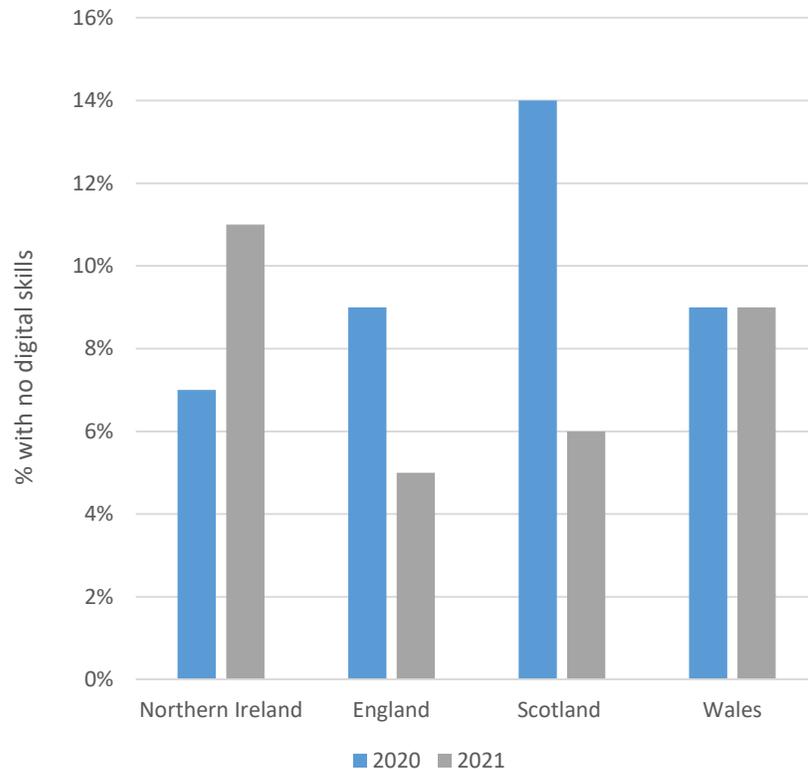
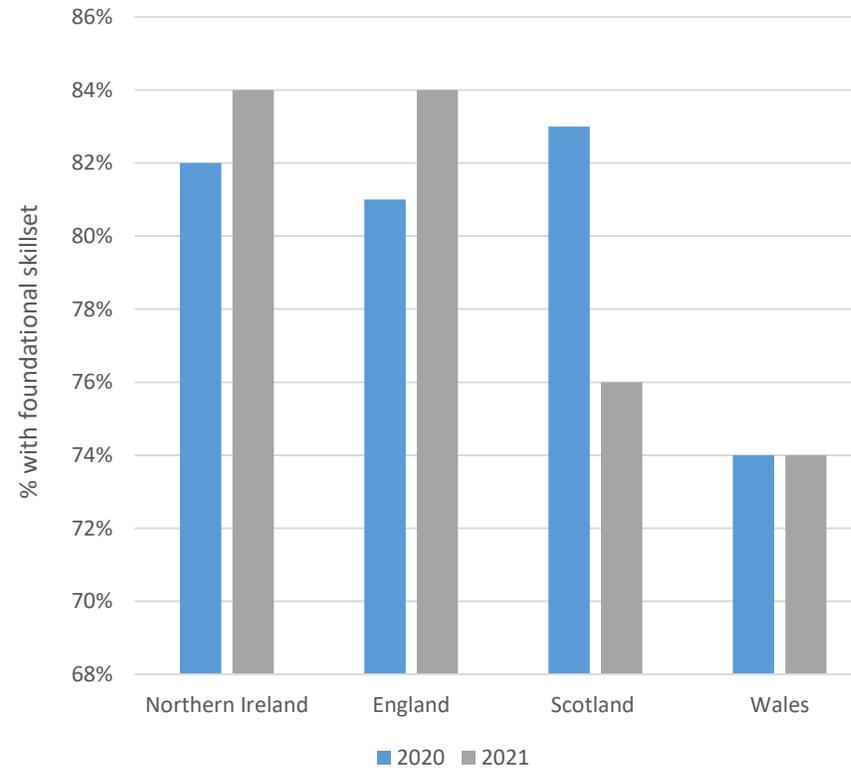


Figure 87. Percentage of the population with a 'foundational digital skillset' by country of the UK, 2020 and 2021 (Lloyds Bank, 2021).



As of 2021, research from Lloyds Bank (2021) found that almost 1 in 10 people from Wales were unable to complete at least one of the basic digital tasks set out in their Essential Digital Skills Framework. This was the second highest percentage in the UK after Northern Ireland.

Similarly, only 73 per cent of Welsh respondents were able to demonstrate a 'foundational digital skillset' by completing all 7 of the basic tasks. This was the lowest proportion of all UK countries, falling 8 percentage points below the UK average of 81 percent.

The increasing prevalence of the internet has made digital access and ability essential in the day to day lives of UK citizens. As such, the digital skillset of the population will continue to drive key trends in Wales in the future.

According to a 2015 report from the Centre for Economics and Business Research (CEBR) acquiring basic digital skills can bring several benefits to an individual:

- **Earnings:** people in work who gain basic digital skills can increase their earnings by between 3 and 10 per cent.
- **Employment:** those with basic digital skills have a greater chance of finding work, and are more likely to look for work when economically inactive.
- **Communication:** those with basic digital skills will communicate with friends and family 14 per cent more frequently than those without.
- **Time:** people with digital skills save time accessing government services, online banking and other similar services, when compared to those who access these services in person.

References & Resources



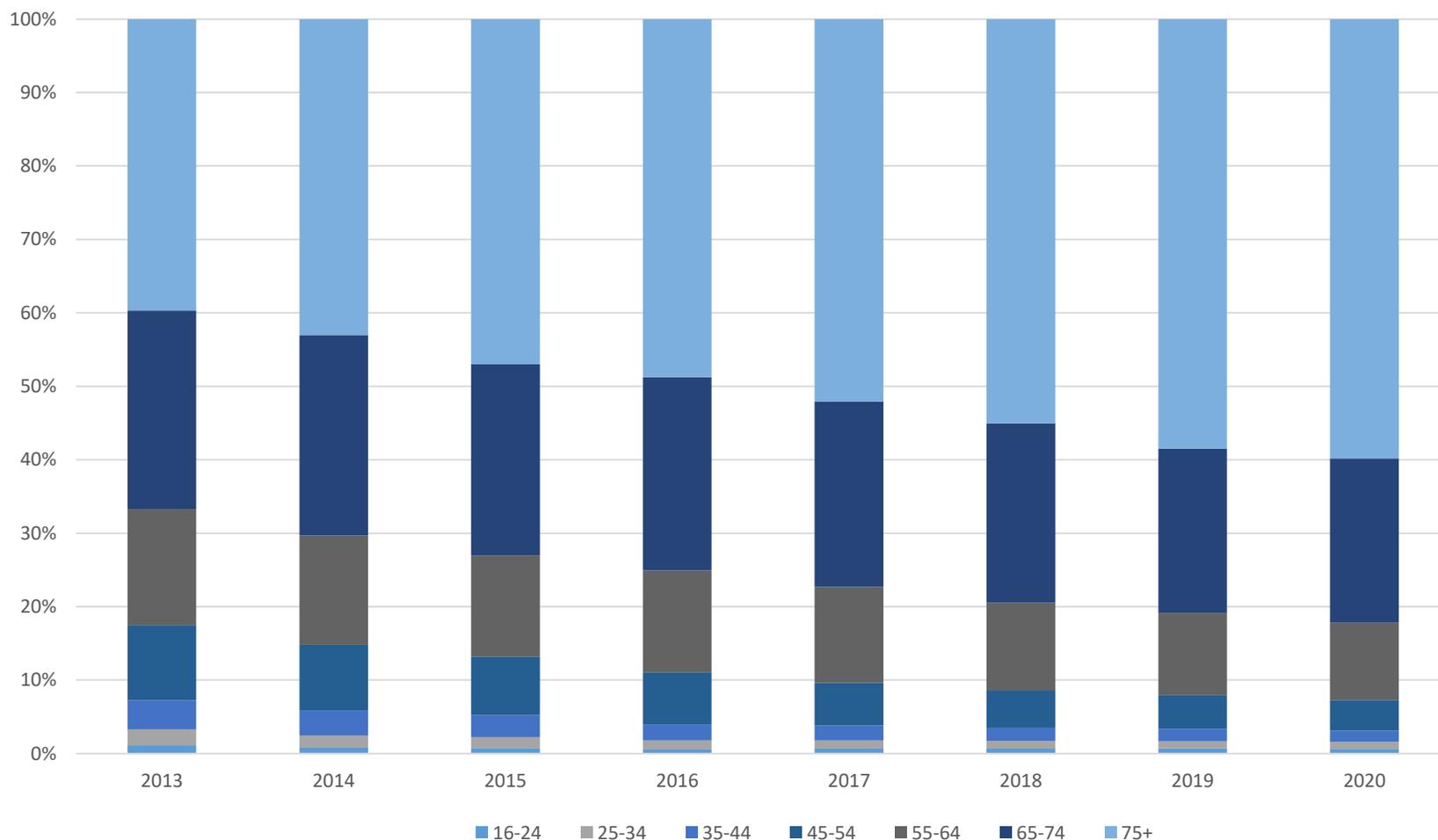
Essential Digital Skills Report 2021 (Lloyds Bank, 2021)



Economic Impact of Digital Skills (CEBR, 2015)

At a UK level, there is an increase in the percentage of people aged 75 years and over that report being internet non-users

Figure 88. Age composition of internet non-users, UK 2011 to 2018 (ONS, 2021).



While National Survey results indicate that the proportion of internet users among those aged 75 and over in Wales is increasing, trends since 2013 show that this age group accounts for an increasing percentage of the UK's internet non-users overall. In 2013, 40 per cent of internet non-users in the UK were aged 75 or over. By 2020, this proportion had increased to 60 per cent.

The way in which older adults access the internet also differs from other age groups. In 2018 for example, 77 per cent of adults in Great Britain reported accessing internet 'on the go', i.e. away from home or work, using a device such as a smartphone or tablet. This, however, declines with age, with only 69 per cent of those aged 55 to 64 and 39 per cent of those over the age of 65 reporting 'on the go' internet use.

It is unclear how this pattern will continue to develop in the future as the population ages. Those in older age groups in the future will be part of a generation who grew up more digitally engaged, although it is yet to be seen whether engagement will decline with age.

Health problems and the impacts of ageing on cognitive ability have the potential to reduce digital engagement, while technological advancements may render obsolete previously learned digital skills. There is also, however, the potential for future technology to enable more individuals of an older age to become digitally engaged. This has been recently evidenced with developments such as voice activated digital services that remove the need for specific skills.

References & Resources



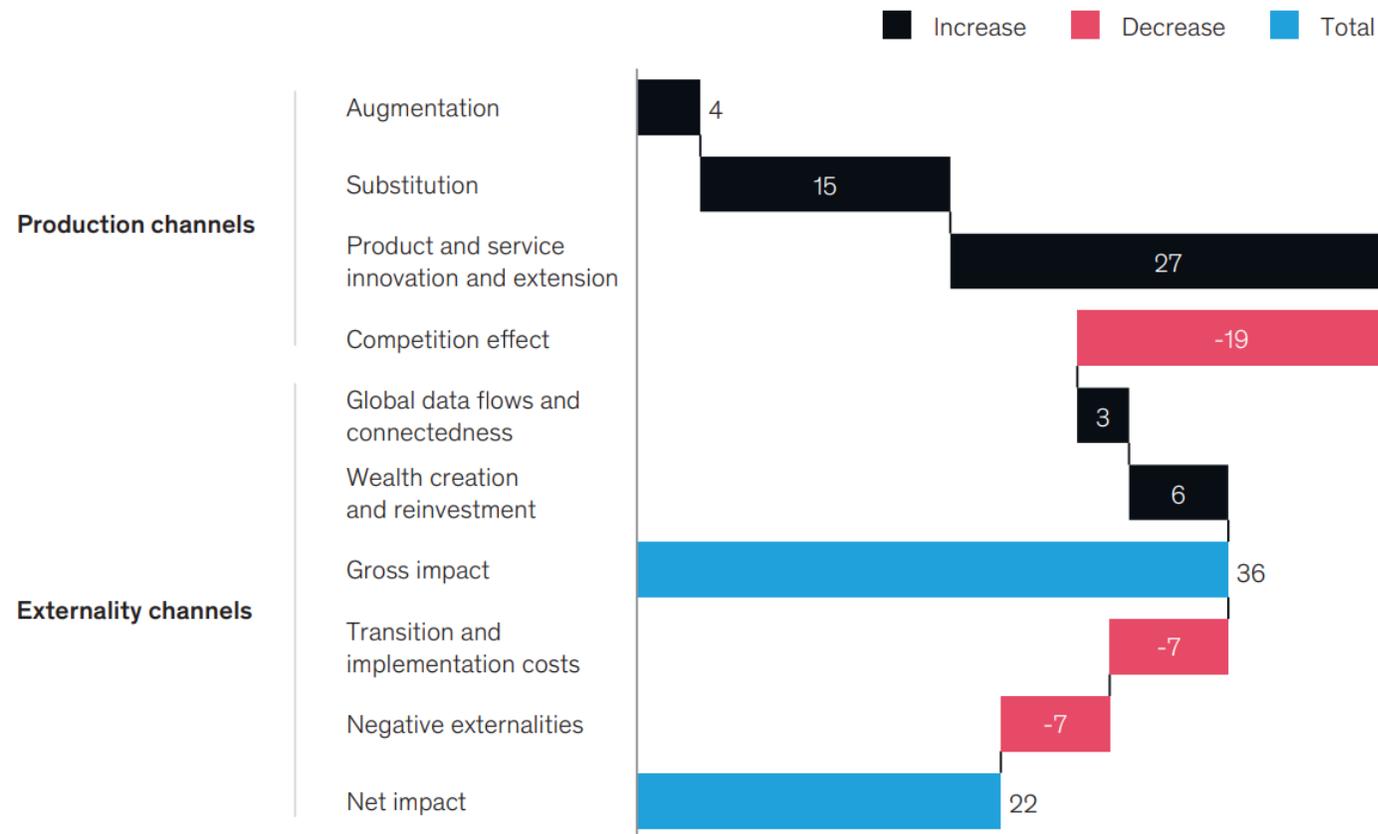
Exploring the UK's Digital Divide (ONS, 2019a)



Internet Users Dataset (ONS, 2021)

Infrastructure driving the growth of artificial intelligence (AI) in the UK is continuing to develop and has the potential to deliver both economic and societal benefits

Figure 89. Breakdown of the estimated economic impact of AI in % GDP between 2019 and 2030 (McKinsey, 2019).



Note: Numbers are simulated figures from McKinsey Global Institute analysis intended to provide directional perspectives rather than forecast.

Technologies using artificial intelligence (AI) have already become a part of our everyday lives.

As defined by IBM, AI “leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind”.

This technology is currently employed in a number of different ways, many of which include systems and processes that the public interact with, and rely upon, on a regular basis. Select examples include: translation and speech recognition, traffic flow management, financial trading algorithms, and personalised online recommendations.

Figure 89, taken from a McKinsey report on AI in the UK, shows the potential benefits AI could create for the UK economy by 2030. This analysis places the UK within the top quartile of countries globally for AI readiness based on research activities, start-up investment, automation potential, digital absorption, innovation foundation, human capital and ICT connectedness.

Capturing the benefits of AI adoption may take time as a result of the lags and transition costs associated with the deployment of relevant technologies and securing of necessary technological talent. Uncertainties remain around the future trajectories of AI adaption, adoption and realisation of associated benefits, each dependant on how prepared a particular sector is as well as willingness to change.

References & Resources



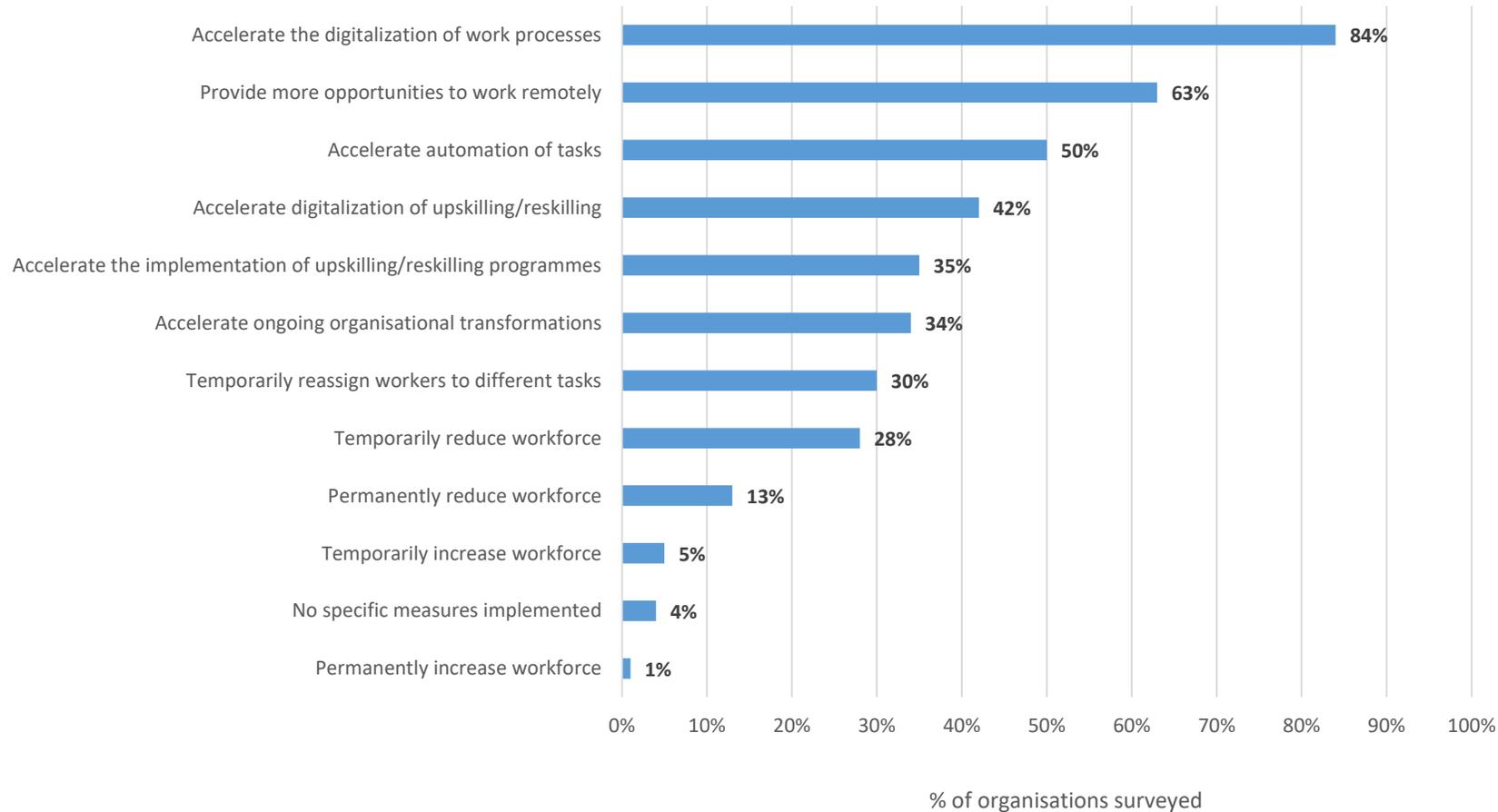
[Artificial Intelligence in the United Kingdom \(McKinsey, 2019\)](#)



[What is Artificial Intelligence? \(IBM, 2020\)](#)

Globally, businesses are increasingly adapting to digitalisation and adopting new technologies

Figure 90. Planned business adaptation in response to COVID-19 (World Economic Forum, 2020).



The evolution of technology is likely to continue to be key driver in the global post-pandemic response.

According to the results of the Future of Jobs Survey conducted by the World Economic Forum, planned adaptations to the post-pandemic workplace will predominantly focus on the accelerated digitalisation of work processes and the provision of more opportunities to work remotely.

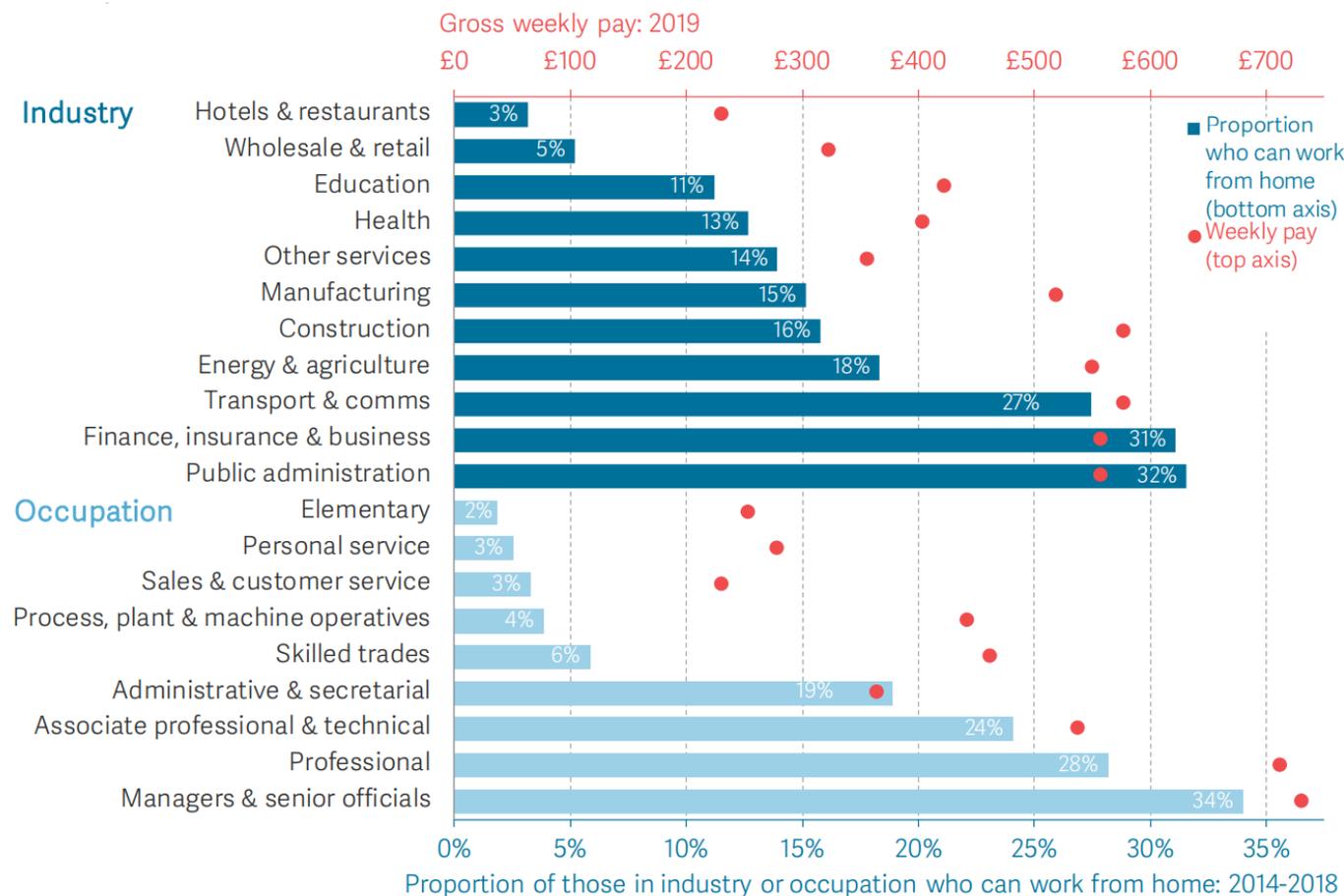
The survey also predicts that the types of technology adopted globally will change as new technologies become more easily accessible. By 2025, the adoption of encryption and cyber security technologies is projected to increase by 29 per cent, while the adoption of cloud computing is estimated to rise by 17 per cent.

Not all new technologies are becoming more popular however, with the adoption of new materials (such as nanotubes), and quantum computing dropping by 12 and 5 per cent respectively.



Technology is changing the way we work with increasing potential to work remotely, although the extent of this trend varies between job type

Figure 91. Proportion of employees who can work from home if needed (2014-18) and gross weekly pay, by industry and occupation (2019), UK (Resolution Foundation, 2020).



Evidence indicates that the trend toward more flexible ways of working will continue, with technology playing a considerable role in enabling this to happen.

The ability to work either from home or closer to home is heavily dependent on industry and occupation. During the 2014-18 period those in low-paid work, as well as those in customer facing, plant, or skilled trade roles were less likely to be offered the opportunity to work remotely.

This is also true for certain industries, with only 3 per cent of hospitality employees and 5 per cent of retail employees working from home during this period. Those most likely to be able to work remotely were employed within either finance, insurance & business (31 per cent) or public administration roles (32 per cent).

Job quality is therefore likely to become a major contributing factor in enabling flexible and remote working to become the norm in the future.

It is worth noting that this data takes account of the trend towards home working that was occurring pre-pandemic. While the longer-term impacts of increasing homeworking are unclear, it is likely that the ability to, and attitudes towards, working from home will change significantly following the COVID-19 crisis.

Further data will be required to assess whether any further acceleration of this trend as a result of the pandemic will continue.

References & Resources



Doing What it Takes (Resolution Foundation, 2020)

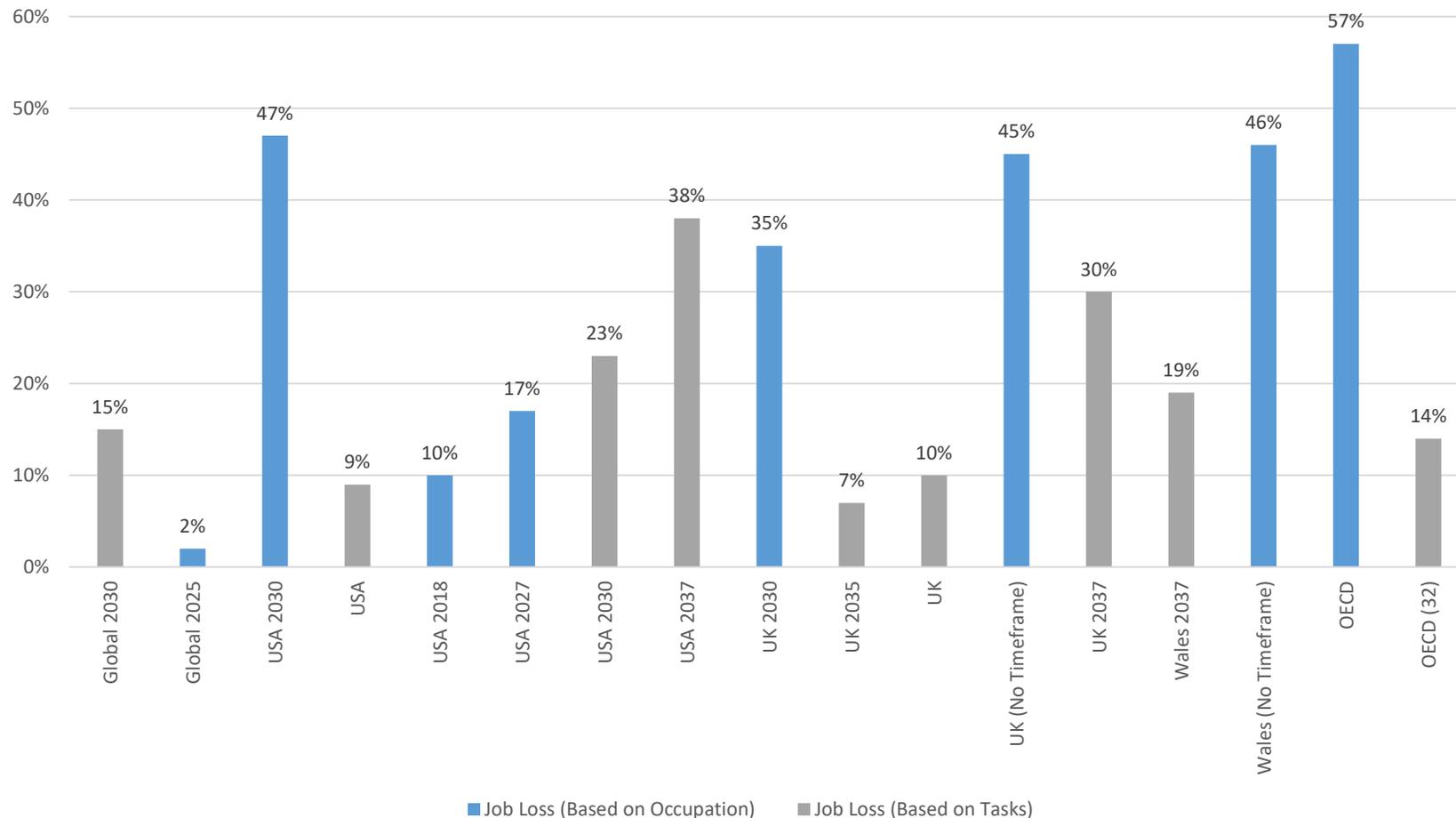


The Future of Jobs Report (World Economic Forum, 2020)

The trend towards greater automation of work is likely to continue, with the increased substitution of labour with technology resulting in new opportunities, products and services

Figure 92. Analysis of various studies examining the impact of automation on jobs

(Welsh Government, 2019).



Evidence on the automation of work varies depending on the methodology used and whether whole occupations or individual tasks are being assessed. As per the conclusions of the Brown Review, the trend towards further automation of work is likely to continue with the increasing use of technology in substituting labour as well as the recombination of technology with existing workplaces practices in order to generate new opportunities, products and services of the future.

According to a 2019 analysis produced by the Institute for Public Policy Research (IPPR) on the proportion of jobs in the nations and regions of the UK with high potential for automation, Wales stood at 6.5 per cent, slightly above the UK average of 6.2 per cent.

Taking account of the post pandemic response by businesses, it is likely Wales will experience further waves of automation as more processes and tasks are able to be delivered using technology.

The wider implications of further automation of work are likely to be seen in terms of the impact on the overall availability of work in Wales (i.e. fewer jobs), job quality and the broader impact on the industries and sectors which contribute to the overall prosperity of Wales.

References & Resources



Delivering Economic Transformation (Welsh Government, 2019)



Shaping the Future (IPPR Scotland, 2020)

Lower-skilled or routine jobs are at greater risk of future automation than high-skilled occupations

Figure 93. Probability of automation by major job category, UK, 2017 (ONS, 2019b).



In an analysis of 20 million jobs across England, the Office for National Statistics found that roles involving routine and repetitive tasks were at greatest risk of automation, while those involving varied and complex tasks were less likely to be automated.

Roles classified as 'low-skill' were therefore deemed to be at greatest risk, with elementary occupations including waiters and waitresses, shelf fillers and elementary having the highest probability of automation in the future. Roles deemed to be 'high-skill' were found to be at lowest risk of automation, particularly those of professional occupations or managers, directors and senior officials.

The three occupations at the lowest risk of automation were medical practitioners, higher education teaching professionals, and senior professionals of educational establishments.

References & Resources



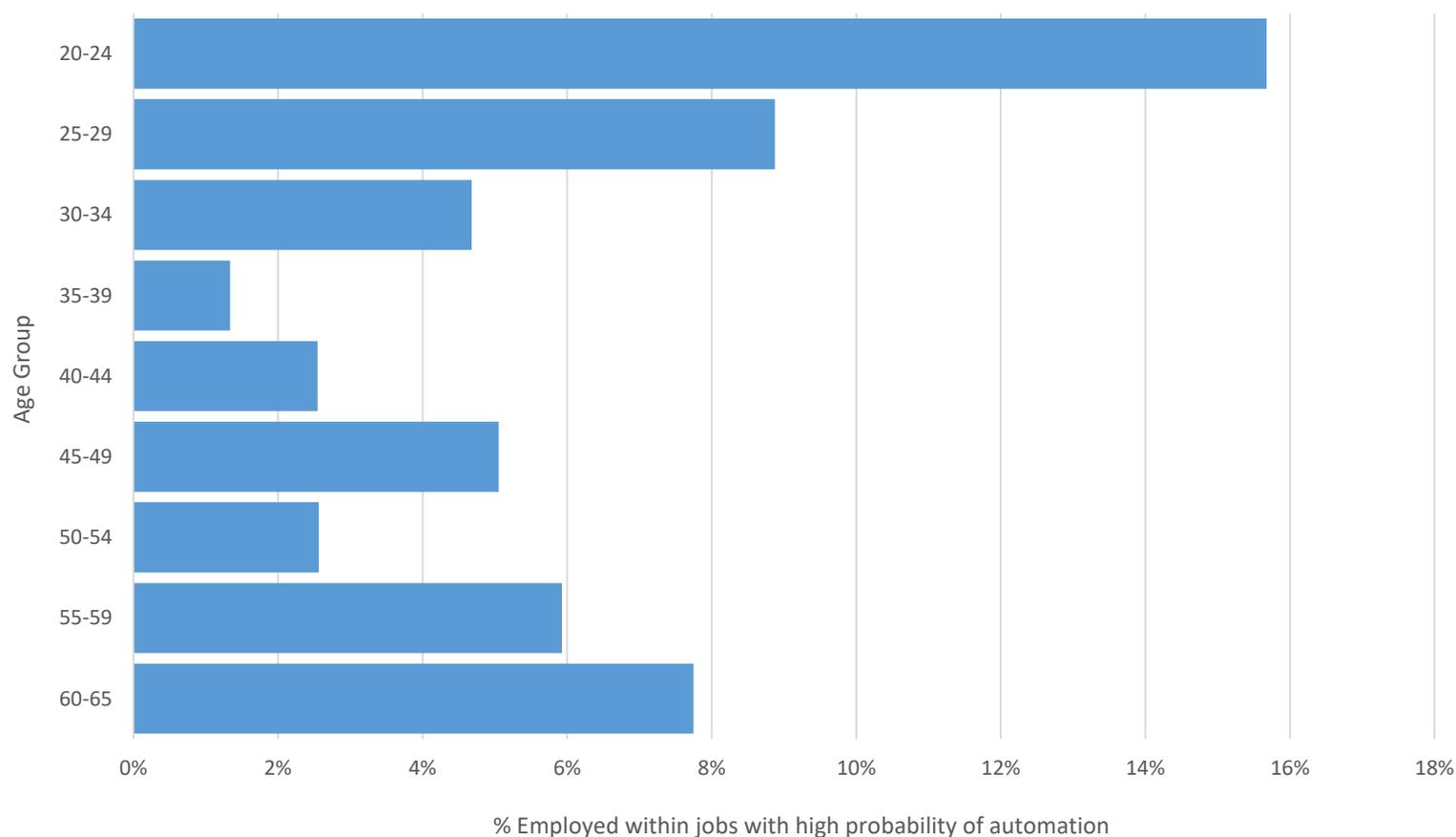
Occupations at highest risk of automation (ONS, 2019b)



Probability of Automation in England: 2011 and 2017 (ONS, 2019c)

Younger people and women are more likely to be employed within jobs that have a high probability of being automated in the future

Figure 94. Proportion of people at high risk of automation by age, 2017, England (ONS, 2019b).



Those in employment aged 20 to 24 were found to be at greatest risk of job automation, with 15.7 per cent employed within roles deemed to be 'high risk'. This risk decreases with age until its lowest point at 35 to 39 years (1.3 per cent), at which point risk begins to rise again up to the 60-65 age group (7.7 per cent).

The analysis from the Office for National Statistics also shows that in 2017, 70.2 per cent of the roles at high risk of automation were held by women.

Workers tend to obtain skills as they progress further in their careers. When young workers enter the labour market, they may be entering part-time roles and be employed in industries like sales, retail, and other roles where some degree of automation is likely. Many young workers may move through a range of roles before settling into a career. They also have more time and opportunity to retrain or change career paths.

The research suggests that the risk of automation from the age of 35 years can be explained with the change in working patterns, particularly for women. From the age of 30 years, more women work part-time, and this increases until women reach the age of 50 years. People who work part-time are more likely to work in roles at higher risk of automation (although ultimately occupation determines the probability of automation rather than working pattern).

References & Resources



Occupations at highest risk of automation (ONS, 2019b)



Probability of Automation in England: 2011 and 2017 (ONS, 2019c)

Technology evolution is changing the makeup of skills required by employers

Figure 95. Percentage share of digital occupations within the total number of job adverts (Burning Glass Technologies, 2019).

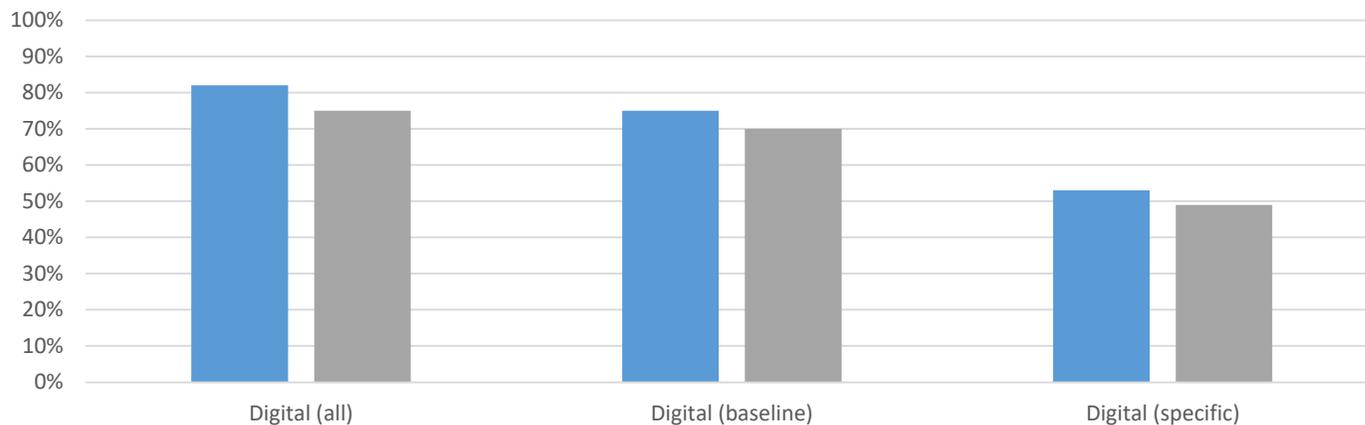
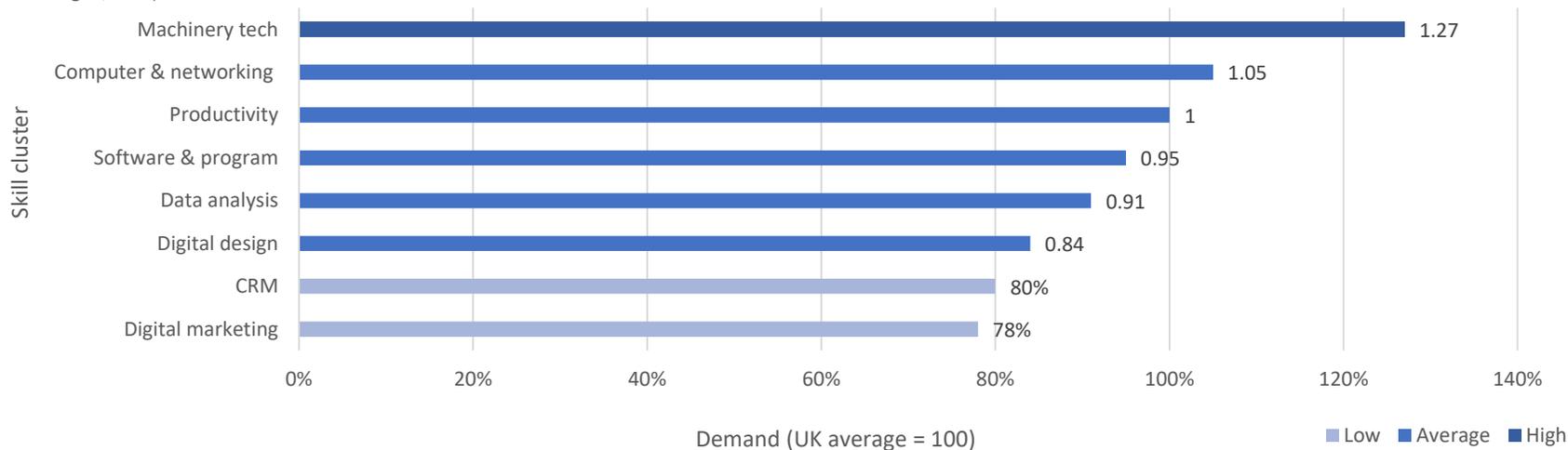


Figure 96. Digital demand concentration by skill cluster, Wales (UK avg = 100) (Burning Glass Technologies, 2019).



Digital skills are now being required by employers in occupations across all skill levels. Even amongst low-skill jobs, 77 per cent of job postings in the UK are in occupations that require digital skills, increasing to 85 per cent for middle-skill jobs and 83 per cent of high-skill jobs.

While digital requirements in Wales are lower than the UK average across the board, **Figure 95** shows that baseline digital skills are still a stated requirement in at least 70 per cent of job adverts.

Skills relating to machinery tech are in greatest demand within Wales, while the demand for computer and networking skills is 5 per cent higher than the UK average. Both digital marketing and customer relationship management skills are in low demand however, lower than the UK average by 22 and 20 per cent respectively.

In addition to location, demand for digital skills also varies considerably by industry. Job adverts within the information and communication sector, for example, have the greatest demand for specific digital skills (79 per cent), while this demand drops to 16 per cent for roles within the health and social work sector.

Demand for digital skills is also likely to change over time. For example, many of the fastest-growing skills and software packages in areas such as data analysis and digital marketing have only emerged or matured within the last few years.

Analysis from the World Economic Forum indicates that technology-related skills will account for the most valued skills by 2025. However, areas that cannot be replicated through the use of technology such as emotional intelligence, persuasion and negotiation, will retain their value and remain in demand for the foreseeable future.

References & Resources



[Demand for Digital Skills \(Burning Glass Technologies, 2019\)](#)



[Future of Jobs Report \(World Economic Forum, 2020\)](#)

Rapidly evolving technologies are bringing greater security risks and ethical concerns as governments and societies learn to balancing the risks and benefits of technological change

Figure 97. Percentage of organisations that have identified cyber attacks/breaches in the last 12 months, UK (DDCMS, 2021).

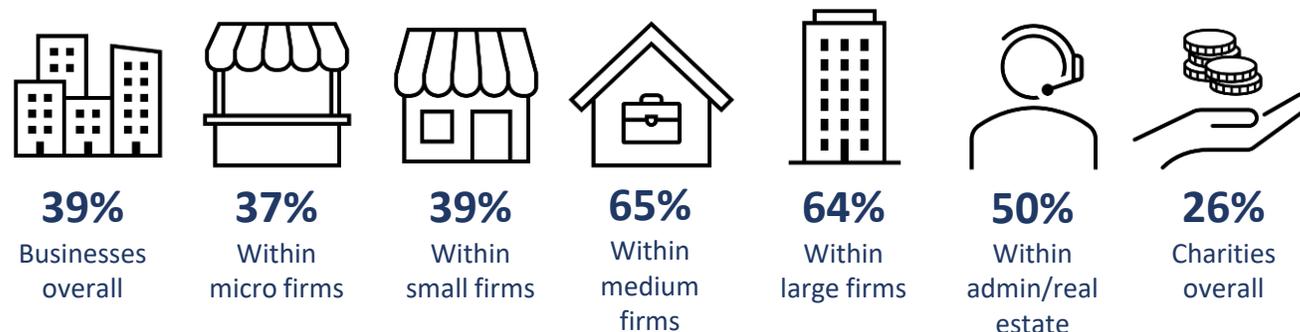
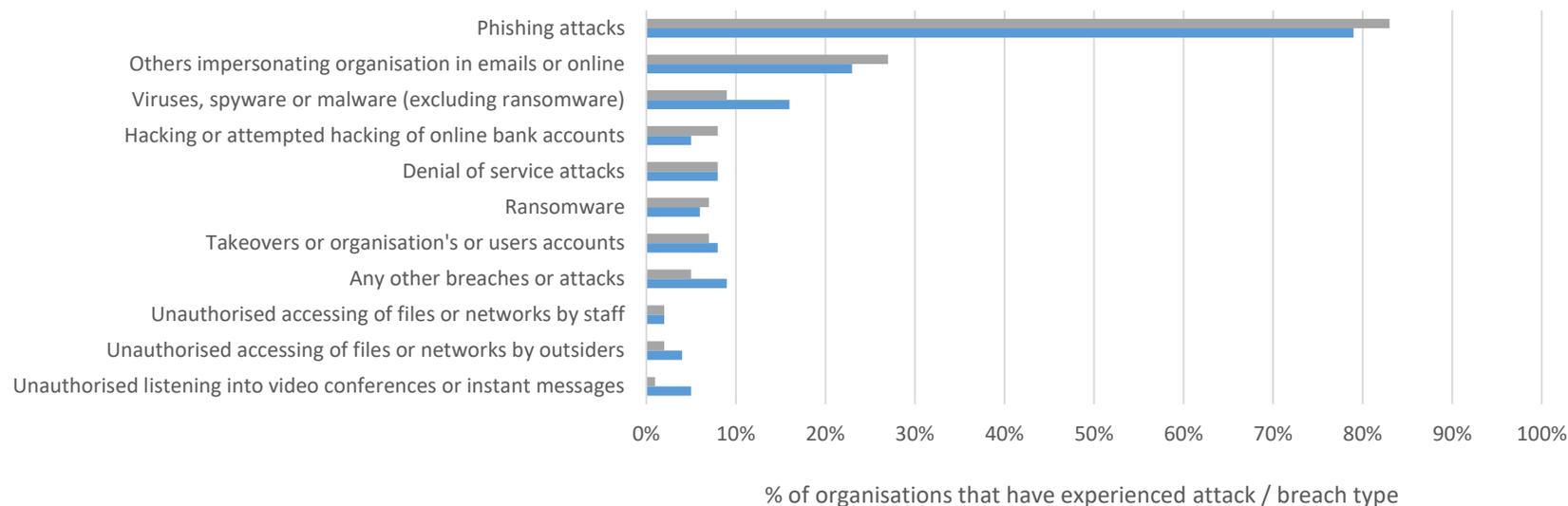


Figure 98. Breakdown of incident type among organisations that have experienced a cyber attack or breach in the last year (DDCMS, 2021).



With demand for the storage and processing of massive amounts of data increasing in line with the recent shift toward digital and online services, cybersecurity threats have become a real and growing concern.

Businesses are increasingly adopting digital solutions for the storage sensitive financial and personal information, with 82 per cent of UK businesses now using online banking and 58 per cent holding personal information about customers electronically. Around 2 in 5 businesses have experienced data breaches or attacks within the last 12 months, putting this data at risk and highlighting the importance of cybersecurity.

Security will therefore need to be viewed as a core component alongside technology adoption in order to prevent breaches and threats occurring in the future. The pace of technology evolution will pose particular policy questions in terms of how new and existing technologies are regulated and the circumstances which define their use.

AI is one example of where potential bias has been identified in application of machine learning. The most controversial of which being the use of AI in facial recognition technology.

Ethics and regulation are therefore likely to continue to be significant conversation areas for governments and societies to deal with in balancing the benefits and risks of technology change.



Overview

The pandemic has had major economic effects over the last two years, but the longer term implications are generally uncertain. Therefore, this section focuses mainly on short to medium-term trends.

Over the period since the mid 1990s, the historic gap in employment rates between Wales and the rest of the UK has narrowed, and over the recent past the labour market in Wales has performed as well or better than a number of other UK countries and regions. At the same time, there is no sign that the average “quality” of jobs in Wales has declined, although there is clearly scope for improvement in this regard.

Qualification levels in Wales have improved, though not as much as in some other parts of the UK.

Over the long term, improvements in wages and living standards are dependent upon increases in productivity. As with other parts of the UK, productivity growth in Wales has been weak since around the time of the financial crisis.

The UK as a whole compares poorly with other countries in terms of its level of labour productivity, and, in turn, Welsh performance is weaker than most other parts of the UK.

The gap in productivity between Wales and the UK as whole widened over the years leading up to the financial crisis, but has been broadly unchanged since. However, average (median) pay in Wales has in broad terms kept pace with the UK since around the time of devolution.

Living standards in Wales, as reflected in median incomes, are around 5% below those in the UK as whole. This gap is much smaller than the gap in GDP per head, mainly reflecting large transfers under the UK's fiscal system.

Changes in Welsh median incomes track the UK as whole quite closely over the medium term. As with the UK as a whole, the improvement in Welsh living standards has been sluggish in recent years, largely in response to the weak underpinning productivity growth.

Income inequality across the UK widened sharply during the 1980s, but has been broadly unchanged since (with some fluctuation).

However, there was a modest increase in inequality across the UK over the period immediately before the pandemic, and some indications that one of the lasting effects of the pandemic will be to further increase

inequality, as the disruption to education has impacted differentially. Children and young people from lower income backgrounds have been particularly affected and this may have lasting consequences.

While income inequality has been broadly unchanged over the medium to longer term, relative poverty in Wales has, if anything, declined, though this decline occurred in the period prior to 2010. Future prospects for relative poverty depend to a large extent on UK Government policy decision on taxes and benefits.

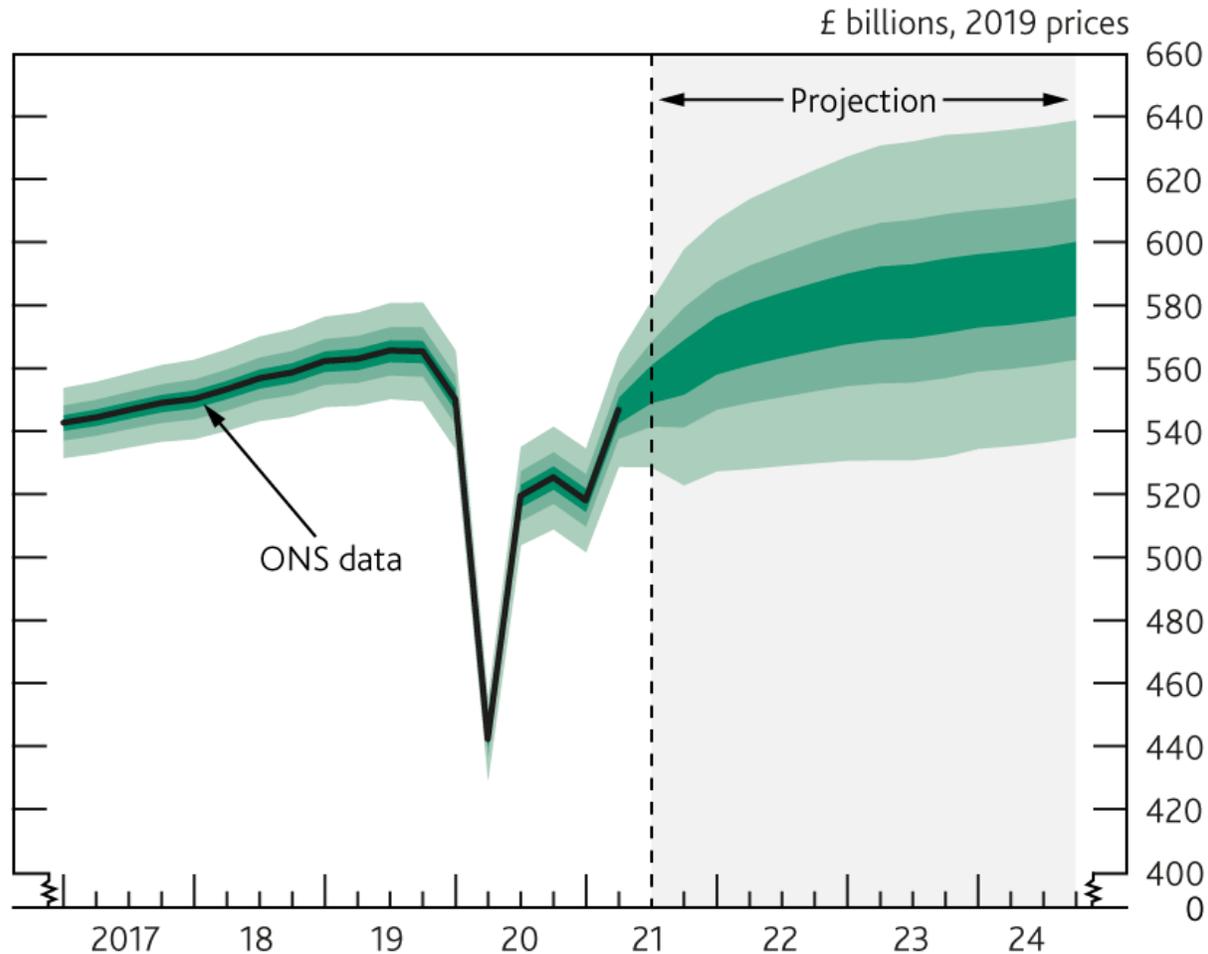
Differences in living standards between different areas of Wales have narrowed over the period since the late 1990s, though this trend may have partially reversed since around 2013.

The trend towards remote and home working has been accelerated by the pandemic and this is likely to have lasting implications for travel patterns and the location and nature of certain types of activity and employment.

Despite increases in funding by the UK government as a result the pandemic, the longer run fiscal position facing the Welsh Government is challenging, with particular risks resulting from a range of factors, including demographic change.

GDP is projected to grow following a drop during the pandemic, however projections for recovery vary

Figure 99. GDP projection based on market interest rate expectations, other policy measures as announced (Bank of England, 2021).



The November 2021 UK forecast from the Bank of England shows temporary supply disruption weighing on UK output in the near term. Nonetheless, UK GDP continues to recover as the dissipation of COVID-19 effects boosts potential supply and demand growth.

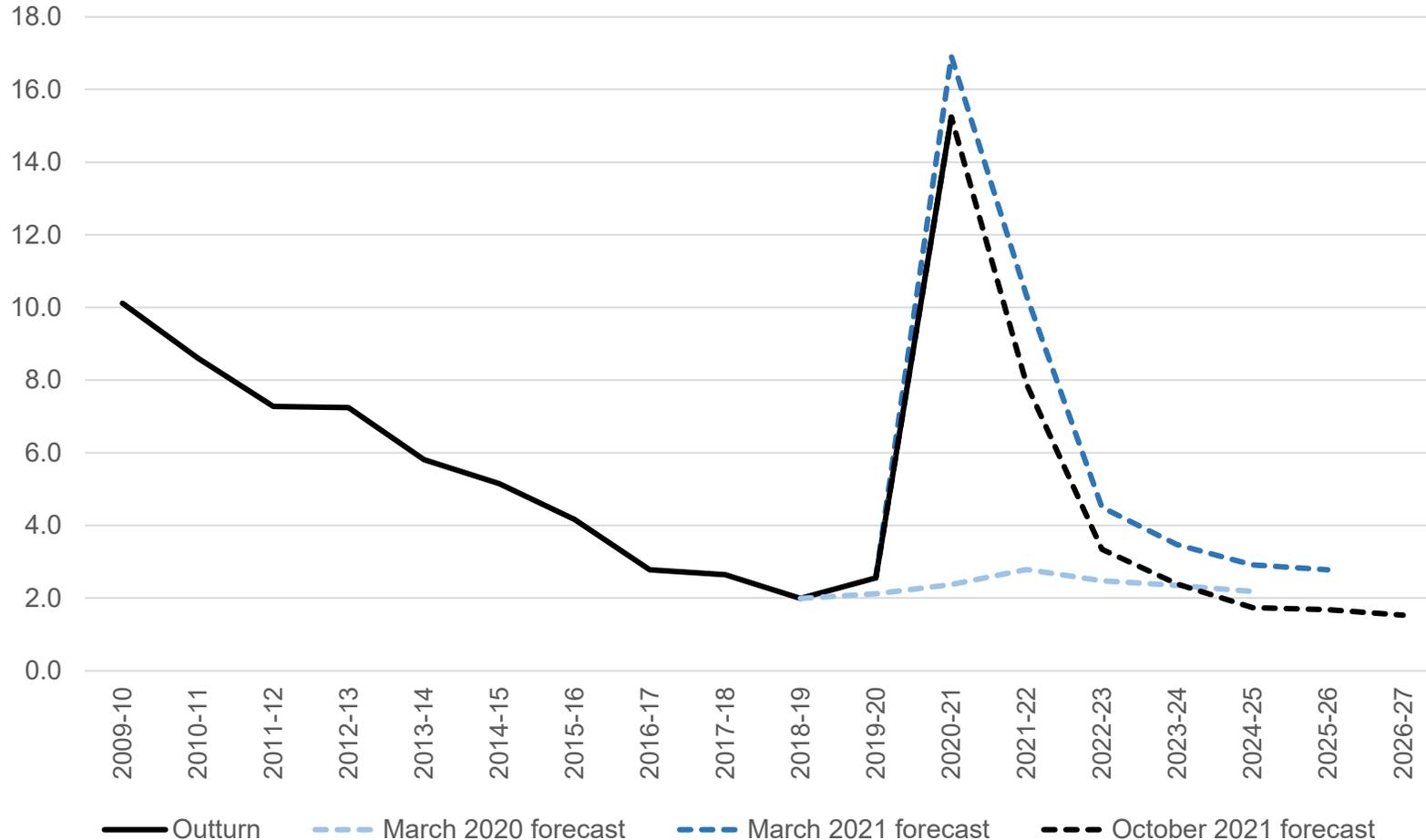
The chart shows the projection for GDP recovery through to 2024, which predicts that GDP will exceed the 2019 Q4 level by 2022 Q1 and continue to rise over the next three years.

The pace of expansion eases with potential supply growth projected to slow to around 1½% a year. This is similar to the relatively subdued rates seen before COVID-19.

The level of potential supply is expected to be around 2% lower at the end of the forecast period than would have been implied by pre-pandemic projections.

UK public sector net borrowing declined as a share of GDP throughout the last decade and is expected to continue to fall in future years

Figure 100: UK public sector net borrowing as a percentage of GDP
(OBR, 2021b).



UK Public sector net borrowing declined considerably as a share of GDP between 2009-10 and 2018-19, following a significant increase during the financial crisis.

The COVID-19 pandemic again led to a sharp increase in net borrowing in 2020-21. At 15 per cent of GDP it was higher than at any time since the Second World War, although lower than forecast in March this year.

The OBR's latest forecast shows a lower borrowing profile than its previous one in March 2021. Net borrowing is expected to fall to 8 per cent of GDP in 2021-22 and 3 per cent in 2022-23. It is expected to be lower than pre-pandemic levels by 2024-25.

References & Resources



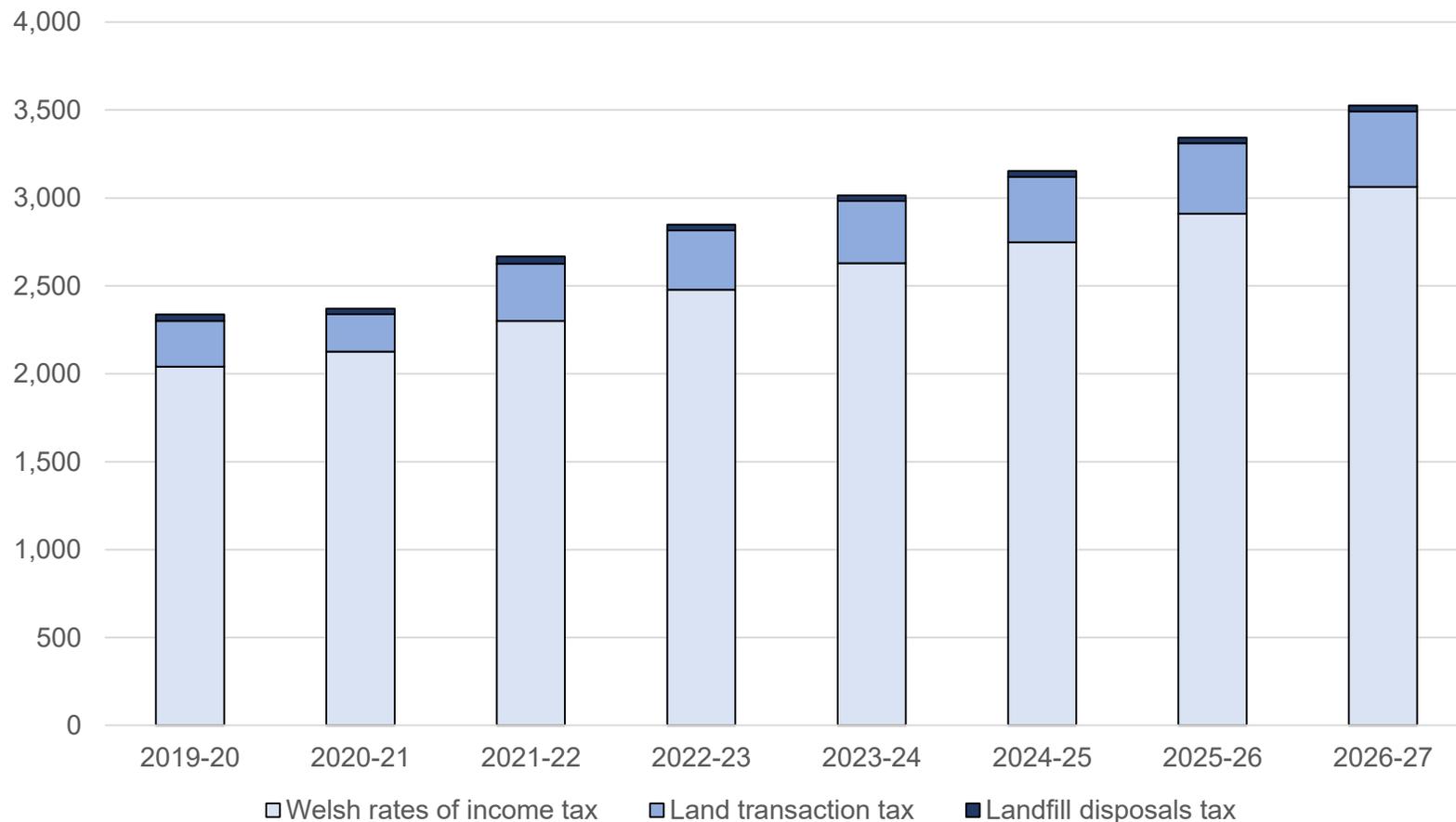
Economic and Fiscal Outlook (OBR, 2021a)



Public Finances Databank - October (OBR, 2021b)

Both devolved tax revenues and the Welsh Government's block resource grant are forecast to grow over the next few years

Figure 101: Devolved Welsh taxes (OBR, 2021d)



The UK Government's Budget and Spending Review was published on 27 October 2021. It sets out UK spending plans until 2024-25, including the Welsh Government's Departmental Expenditure Limits (DEL) or block grant.

The Welsh Government's resource block grant increases by £1.8bn in 2022-23 compared to core funding in the current year. There are then smaller increases of £0.4bn in each of 2023-24 and 2024-25.

The Welsh Government also has COVID-19 related funding of around £2.9bn in the current year. Relative to the total block grant in 2021-22, resource funding will be lower in cash terms in each of the next three years.

The Welsh Government will publish its own draft Budget on 20 December, outlining its spending plans for the next three financial years. The overall budgetary envelope will be made up of the block grant, devolved tax revenues, and borrowing.

Figure 99 shows devolved tax and spending forecasts based on OBR data from October 2021, however revised forecasts for both land transaction tax and landfill disposals tax will be published by the OBR alongside the Welsh Government's draft Budget.

The longer term outlook for the Welsh Government's finances will be considered in the Chief Economist's Report accompanying the draft Budget.

References & Resources



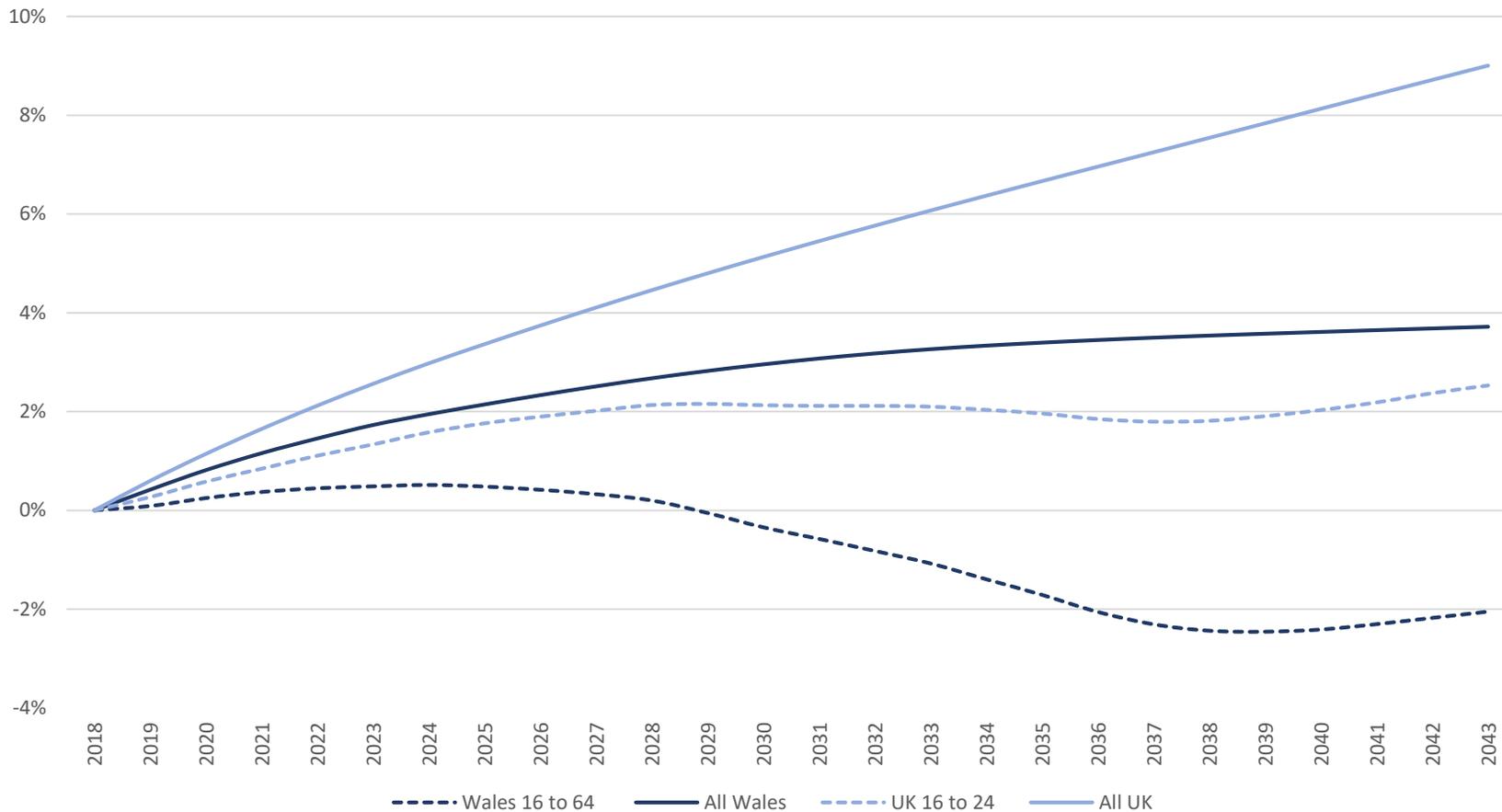
Autumn Budget and Spending Review (HM Treasury, 2021)



Devolved Tax and Spending Forecasts (OBR, 2021d)

A declining working age population may impact upon future levels of tax revenue

Figure 102. Principal Population Projections, 2018 = 100% (ONS, 2019a; 2019b).



In the long term, changes in the demographic structure of Wales will affect future levels of tax revenue.

Up until 2028, the number of economically active people in Wales (equated to those aged 16 to 64 in the graph adjacent) is expected to marginally rise, somewhat strengthening the national tax base. Beyond 2028 however, this cohort is forecast to decrease in size, while the overall population continues to grow.

This scenario would present a risk to the tax base in Wales. In addition to the direct consequences of fewer economically active people supporting an ageing population, there is evidence to suggest that having an older workforce may indirectly slow the productivity growth of an economy.

References & Resources



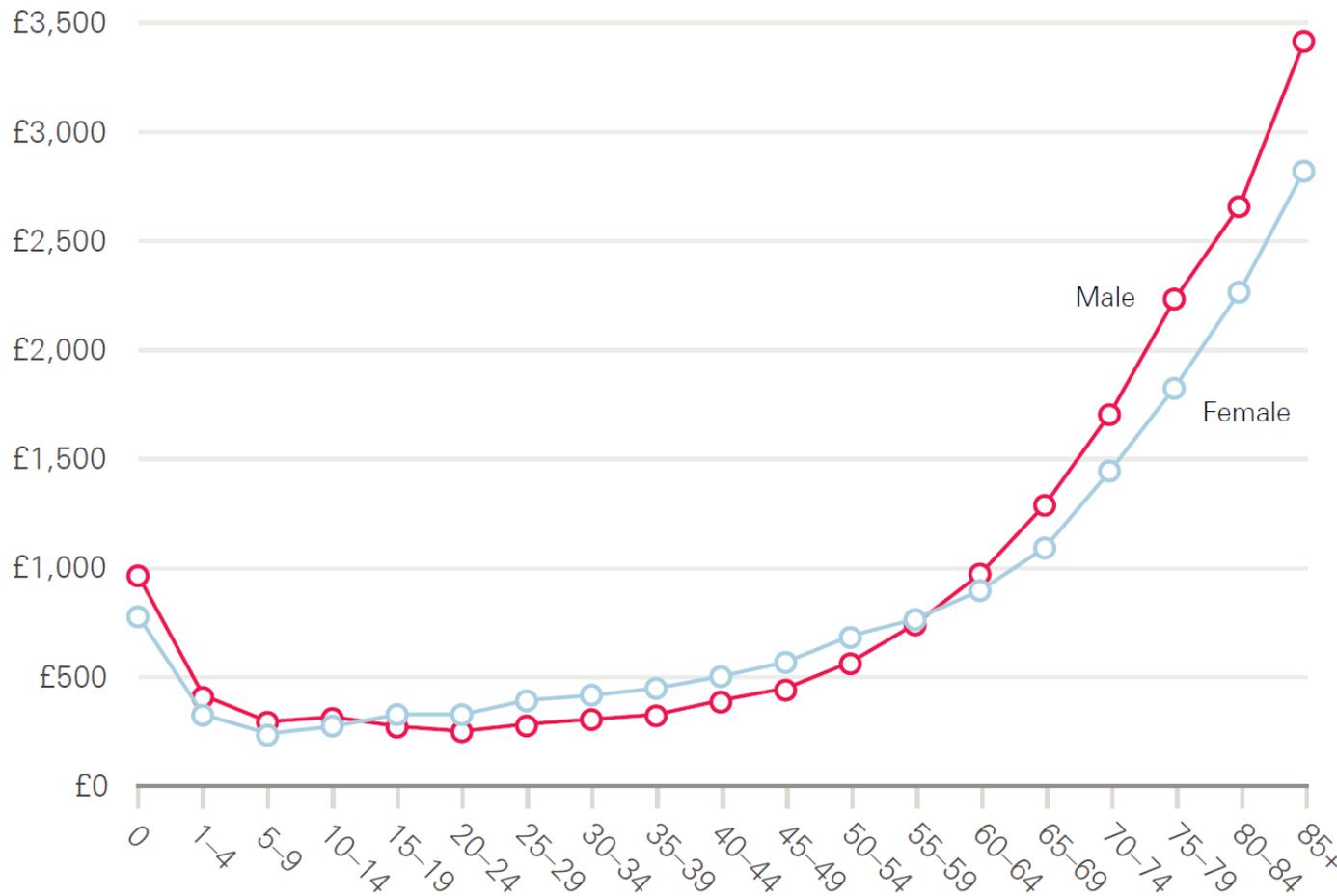
Principal Projection - Wales Population (ONS, 2019a)



Principal Projection - UK Population (ONS, 2019b)

The cost of acute care rises with age, which may result in increased pressure on funding as the population ages

Figure 103. Average annual cost of acute care in Wales (The Health Foundation, 2016).



Both the growing and the ageing of the population will increase pressures on NHS services.

As people grow older, the average cost of their healthcare increases. A smaller economically active population will soon be supporting a larger proportion of people aged 65 and over, with the cost of care rising as average life expectancy extends.

According to Health Foundation projections from 2016, demographic changes alone would increase spending pressures on acute services by 1.3 per cent per year in real terms.

That is before taking into account factors such as the long-term impacts of the COVID-19 pandemic and the increasing prevalence of chronic health conditions, which accounted for 72 per cent of the inpatient spend for those aged 50 and over in 2014-15.

Public Sector Demand and Digital

Overview

Public service demand is projected to continue to increase.

The key driving force behind this increase is population change. With a falling mortality rate amongst those over 65, the population is ageing and the number of pensioners is increasing at a faster rate than the number of people who are working age.

This is set against a public sector finance system that is subject to increasing pressures and which, due to an increasing old age dependency ratio, will face challenges generating the tax revenue required to meet growing demand.

The ageing population will lead to increasing levels of chronic health conditions, multi-morbidities and consequently the numbers of people relying upon long-term support and lengthy hospital stays. Across the UK it is predicted that health expenditure will grow from 7.3 per cent of GDP to 8.3 per cent by 2064/65.

Higher levels of inequality in society also leads to increased demand on public services. This report has demonstrated that several key measures of inequality in Wales have remained the same, or in some cases have even worsened, over the past few decades.

Reactively dealing with the consequences of disadvantage and vulnerability, rather than proactively addressing the inequalities, requires considerable investment from public resources.

The extent to which the pandemic will impact on the ability of public services to meet rising demand is currently unclear. Recent estimates point to a sharp decrease in public service productivity since March 2020 and the strength of recovery will depend on how Wales progresses out of the current crisis.

How people interact with public services is changing. The growth of digital public services is creating another area of increasing demand with investment in this area expected to increase in response to public preferences for digital interaction.

It also provides opportunities to meet service demand with greater flexibility and to improve accessibility for users. Following initial investment, digital delivery may offer improved service efficiency and result in financial savings for governments and local authorities.

There is not, however, one simple answer addressing increased service demand and digital inclusion provides its own challenges. Older people, for example, and those in some of the most disadvantaged groups are

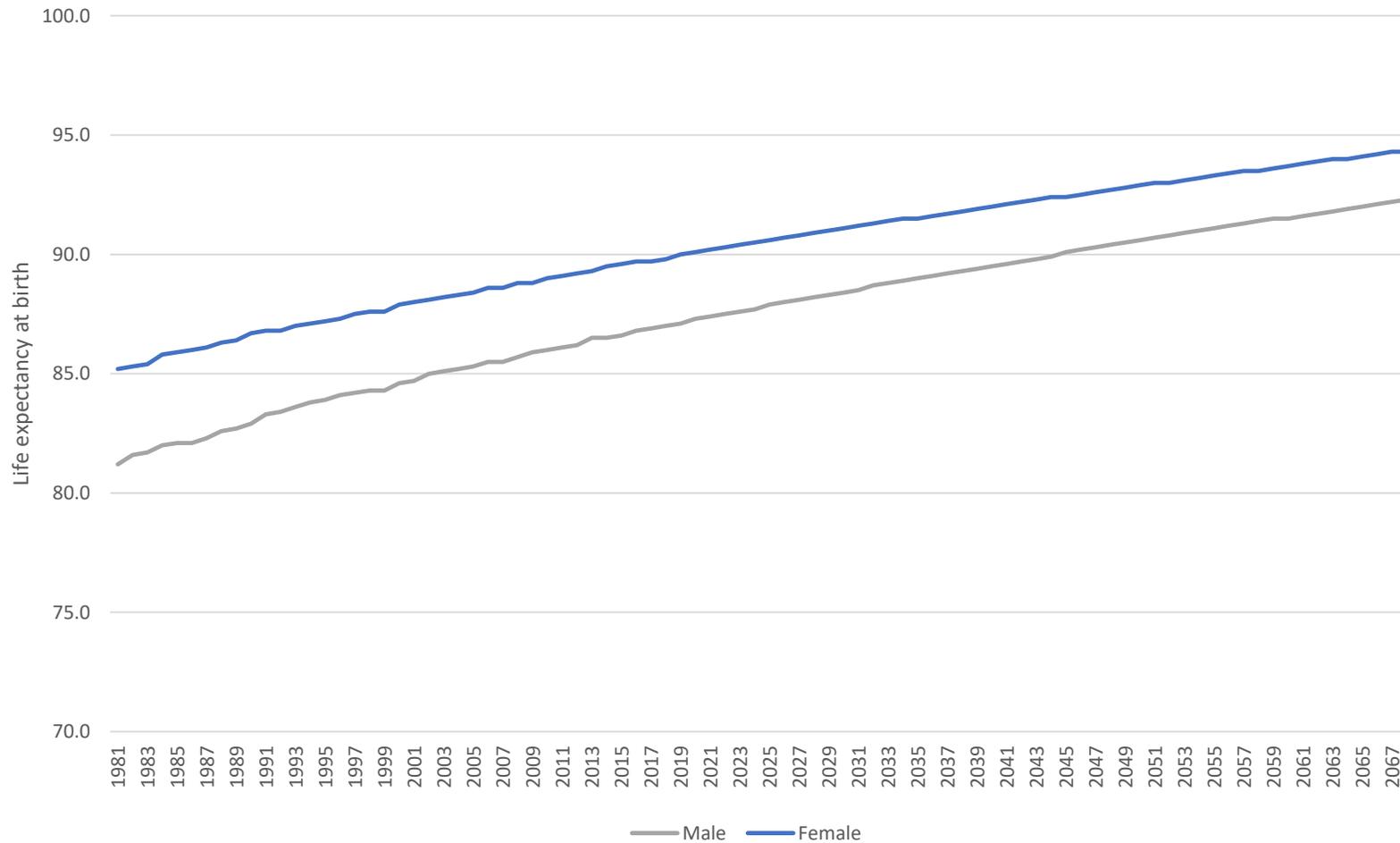
more likely to face barriers that limit digital inclusion.

A growing reliance on digital technologies within society threatens to potentially widen the inequalities caused by digital exclusion. For example, the ability to access certain services, receive information and purchase goods are all restricted to those facing barriers to digital inclusion ([Welsh Government, 2020](#)). Public service providers will need to understand the needs of users who do not, or cannot, use digital tools or online services.

The pandemic has highlighted how digital exclusion disproportionately impacts on certain groups in society, including older people, people from Black, Asian and ethnic minority communities and social housing residents. It has exposed a stark digital divide in Wales and highlighted the significant impact that digital exclusion can have on many people's lives ([Older People's Commissioner for Wales, 2020](#)).

Demand for public services will increase in the future as demographic structures change and the population becomes older

Figure 104. Cohort life expectancy at birth, Wales, 2018-based (ONS, 2019a).



Demand for public services in Wales can be expected to increase in the medium to long term in part due to changing population demographics.

As discussed in previous chapters, an ageing population will increase pressures on public services. Owing to a falling mortality rate, the proportion of people aged 65 and over in the population will increase and with average life expectancies increasing, those people will continue to live for longer.

References & Resources



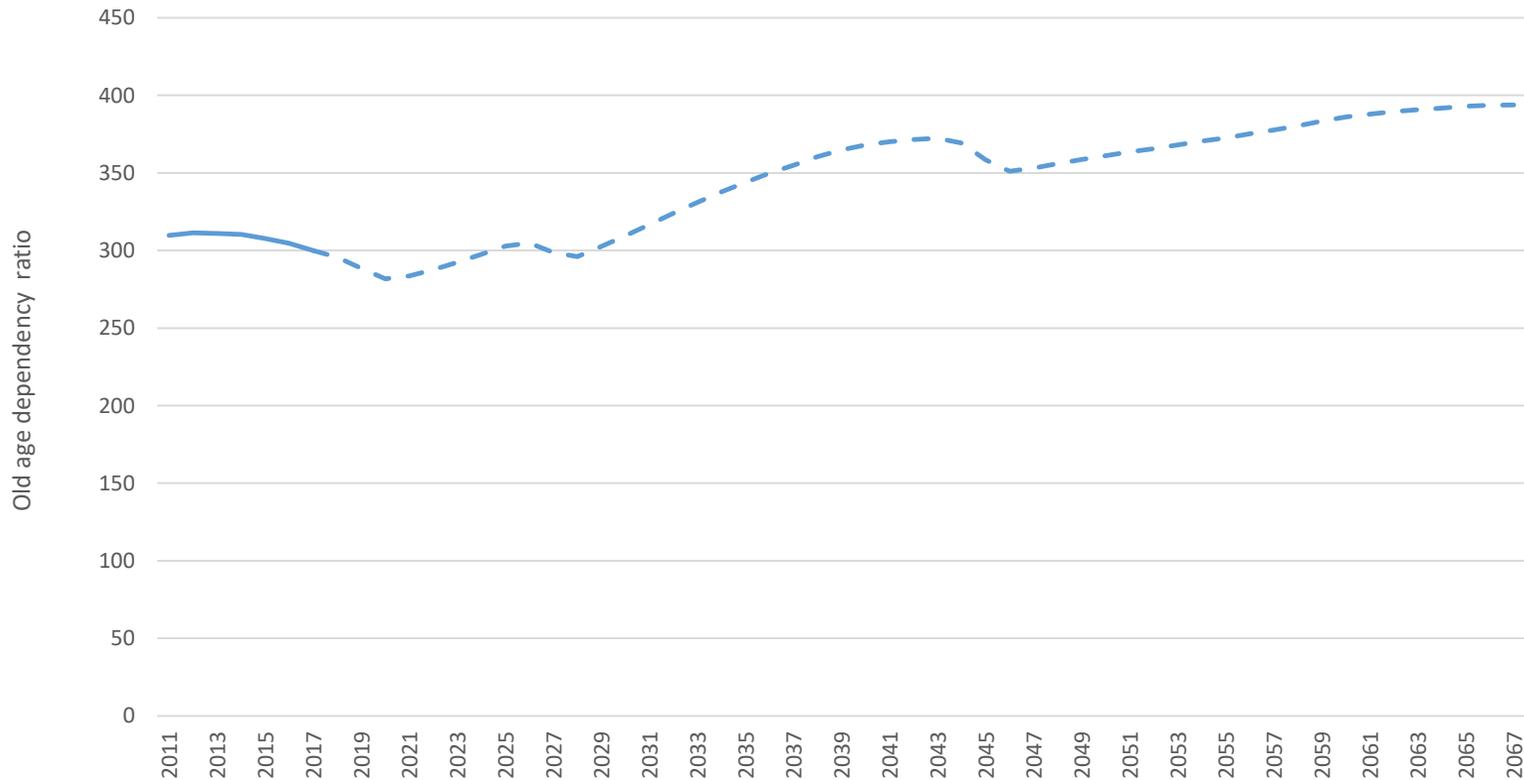
[Future of an Aging Population \(Government Office for Science, 2016\)](#)



[Expectation of Life Principal Projection \(Wales\) \(ONS, 2019a\)](#)

The old age dependency ratio will increase over time as the number of pensioners grows faster than the number of working age people

Figure 105. Historical and principal projection of the Old Age Dependency Ratio, UK, 2011 to 2067 (ONS, 2019b).



Note: Old age dependency ratio = Number of people aged state pension age and over per 1,000 people of working age.

The Old Age Dependency Ratio conveys the number of people aged above the State Pension Age (SPA) for every 1,000 people of working age within a population. While it does not account for those who remain economically active beyond state pension age, the ratio helps to give an approximation of the number of people being supported by the working age population.

Following a period of relative consistency between 1990 and 2010, ONS projections show that the old age dependency ratio in the UK will increase considerably over time until 2067.

This means that the number of economically active people that are able to provide tax revenue is decreasing, while the number of those most likely to require publically funded services is increasing.

In 2011, the UK ratio was 310 people of state pension age for every 1,000 people of working age. Prior to COVID-19 this was expected to steadily climb to 394 people per 1,000 by 2067, however the impact of the pandemic on these figures is yet to be seen.

The old age dependency ratio in Wales has historically been higher than the UK average. Projections from 2012 suggest that there could be up to 400 people of state pension age per 100 in Wales by the mid 2030's.

References & Resources



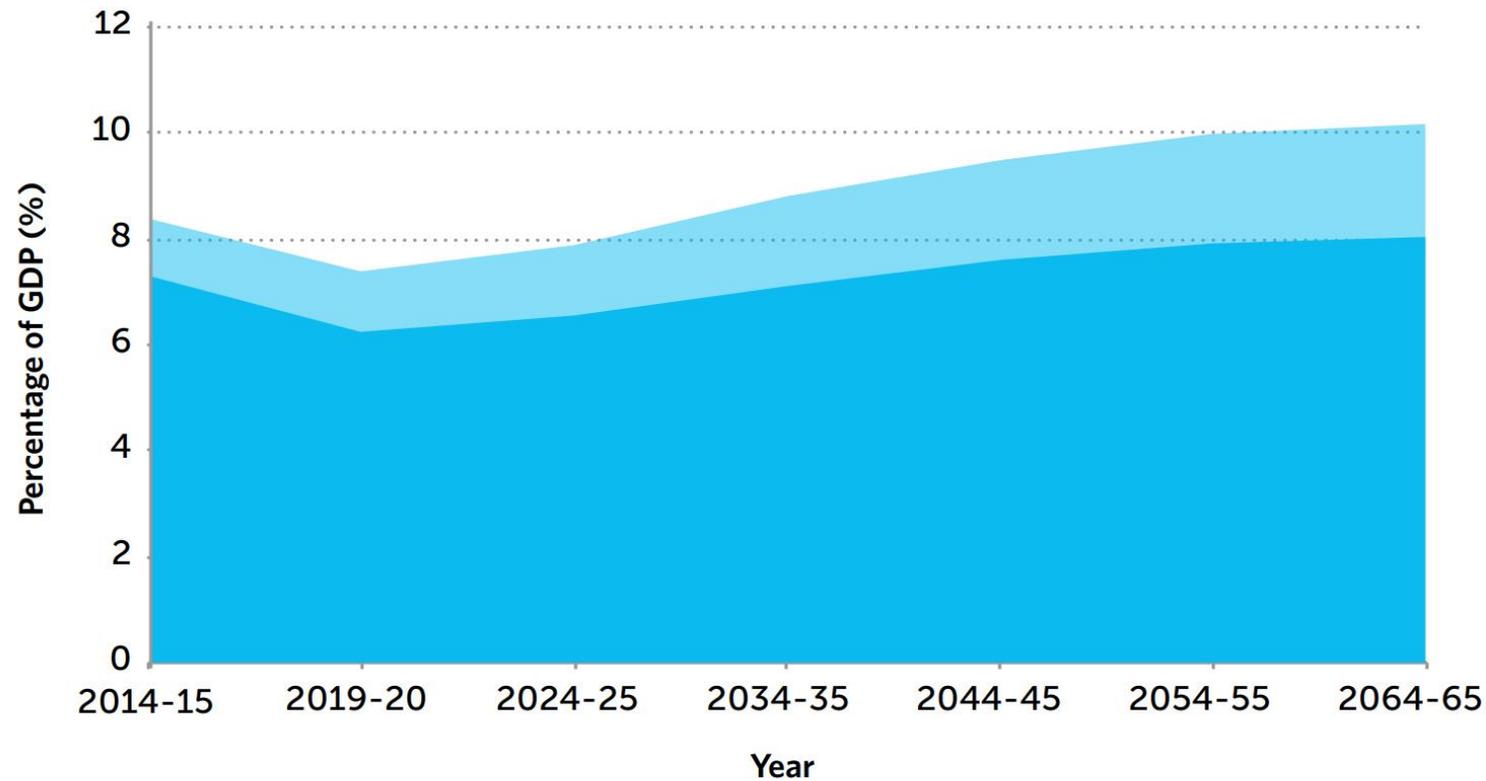
[Future of an Aging Population \(Government Office for Science, 2016\)](#)



[Living Longer and Old Age Dependency \(ONS, 2019b\)](#)

Projections indicate a substantial rise in demand in the health and social care sector

Figure 106. Projected public expenditure on health and long-term care from 2014/15 to 2064/65 as a percentage of UK GDP (Government Office for Science, 2016).



Expenditure sector: ● Health ● Long-term care

One key public service likely to see substantial increases in demand is the health and social care sector.

People aged 65+ more likely to experience chronic health conditions and multi-morbidities, both of which increase pressures on health and social care services. The cost and resources required to keep people from older cohorts healthy are therefore greater, owing to factors such as more frequent medical appointments and longer hospital stays.

The chart opposite shows the projected UK public expenditure on health and long-term care as a percentage of UK GDP. These projections estimate that expenditure on health will grow from 7.3 per cent of GDP in 2014-15 to 8.3 per cent in 2064-65 and from 1.1 to 2.2 per cent of GDP on long term care up during the same period.

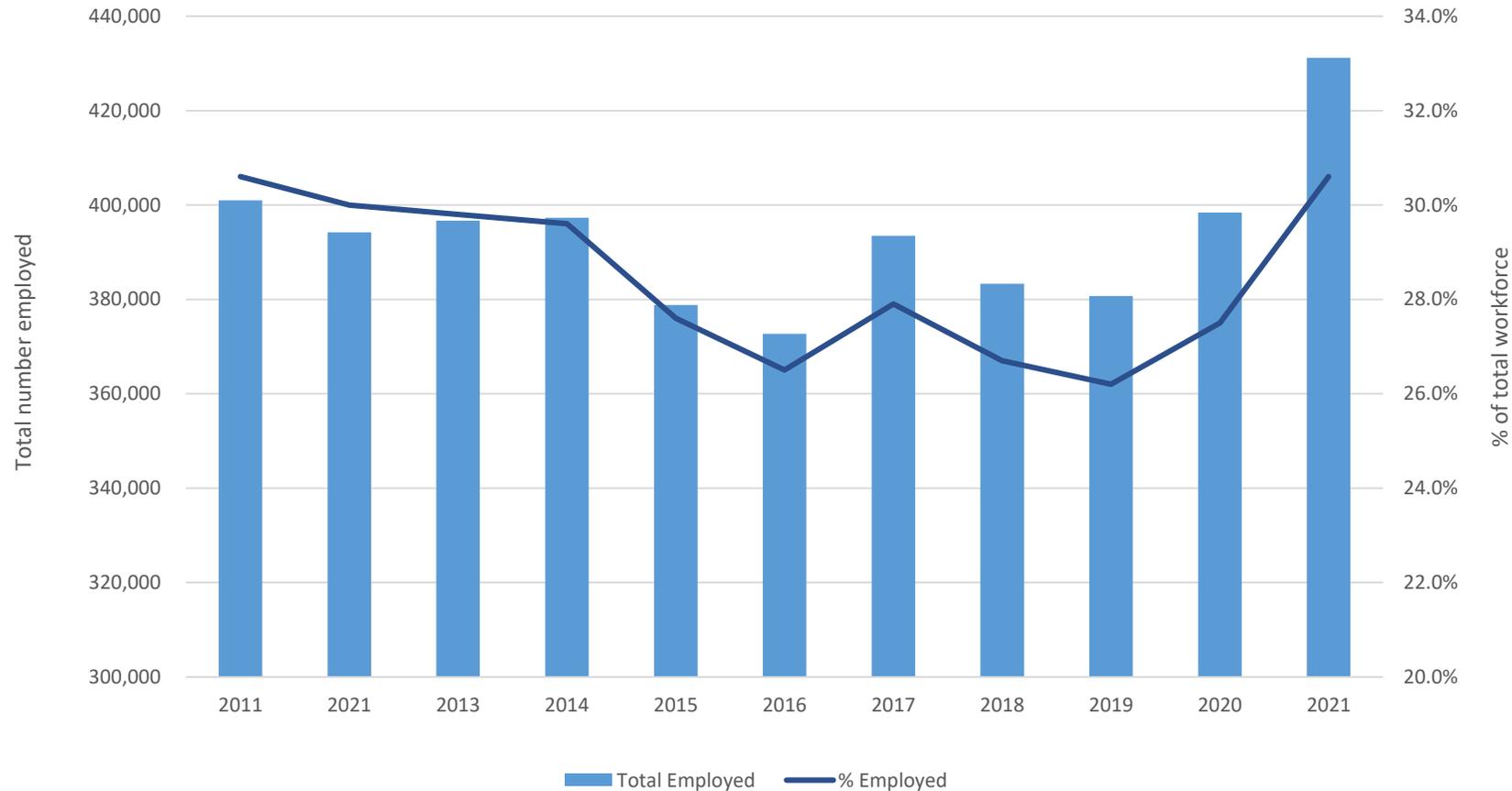
References & Resources



Future of an Aging
Population (Government
Office for Science, 2016)

Public sector employment is showing signs of recovery following a decade of decline

Figure 107. Public sector employment, Wales, 2011 to 2021 (Welsh Government, 2021).



Between 2009 and 2019, the total number of people employed within the public sector in Wales fell by 6 per cent, while public sector employees as a percentage of the overall workforce dropped from 30.8 per cent to 26.2 per cent. This coincided with a period of increased public service demand, putting the workforce under considerable pressure.

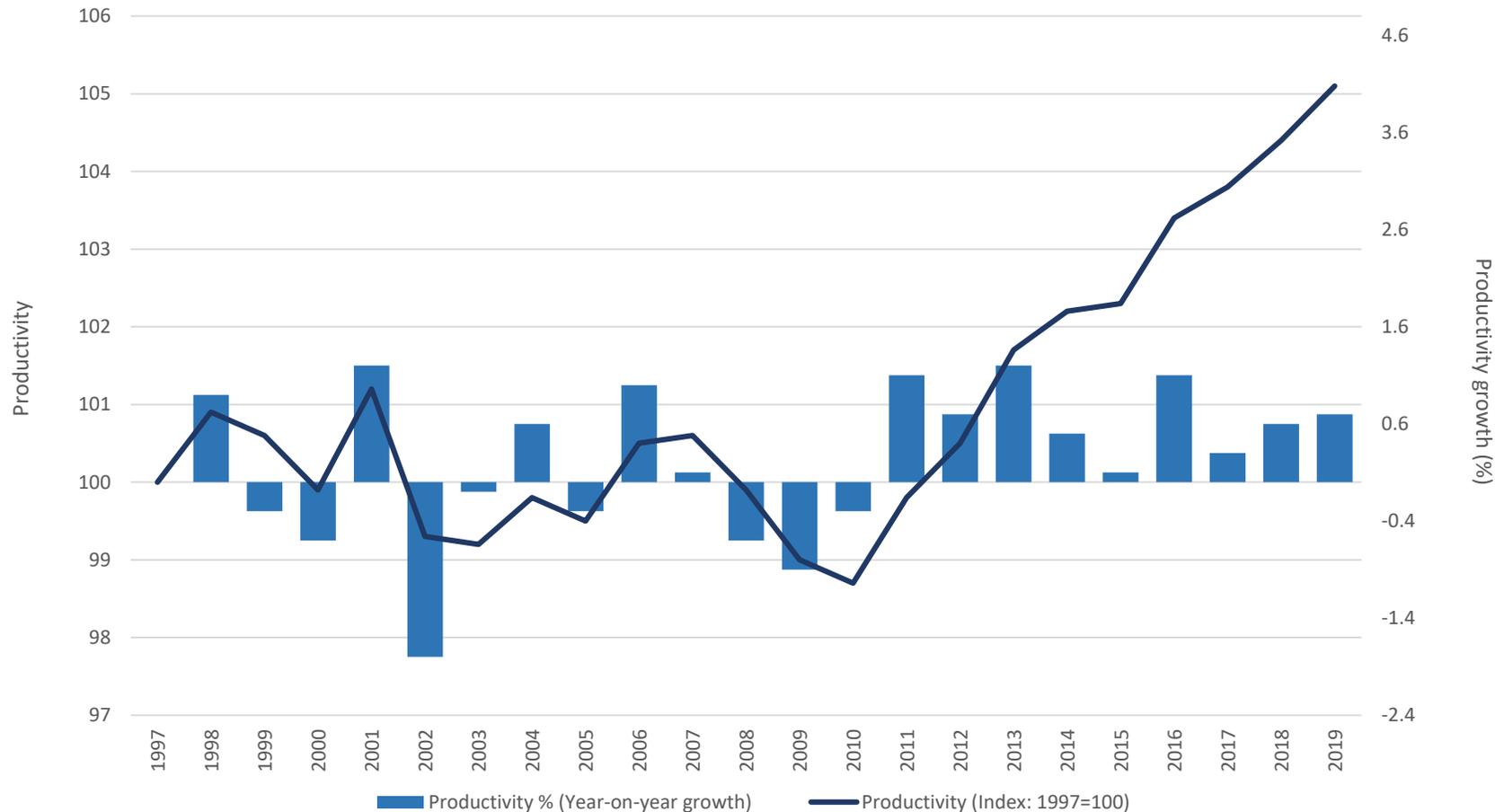
Since 2019 however, the number of people employed within the Welsh public sector has increased to its highest ever point, growing 13.3 per cent in two years. This has seen the percentage of the total workforce in Wales employed within the public sector recover to 30.6 per cent, its highest level since 2011.

Although this may be largely attributed to the number of people recruited in response to the COVID-19 outbreak, it is unclear whether the trend will continue after the pandemic.



Public sector productivity in the UK has been increasing since 2011 and has continued on an upward trend in recent years

Figure 108. Total public service productivity growth rates and index, UK, 1997 to 2019
(ONS, 2021a).



Public service productivity is estimated by comparing growth in the total amount of output with growth in the total amount of inputs used. Productivity increases when more output is being produced for each unit of input compared with the previous year.

After decreasing 1.9 percentage points between 2007 and 2010 following the economic downturn, UK public sector productivity has since surged, climbing 6.4 points by 2019.

When broken down by public service area, healthcare continues to outperform total public service productivity, being the only area to consistently improve since 2004. Following historic trends, both adult social care and public order and safety continue to underperform the UK average, the latter dropping over 9 per cent in the ten years between 2008 and 2018.

References & Resources



[Public Service Productivity \(ONS, 2021a\)](#)

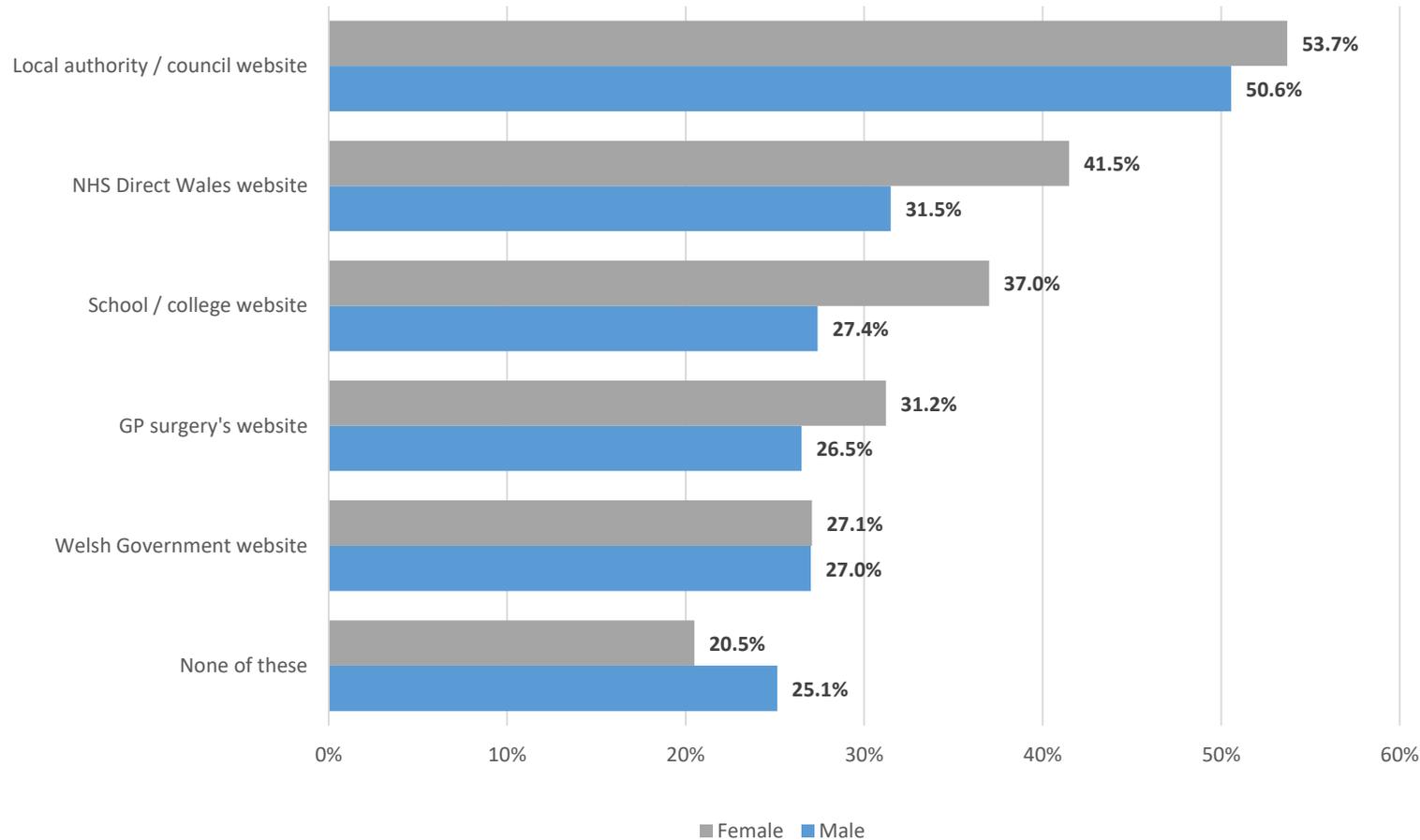


[Public Service Productivity \(Quarterly\) \(ONS, 2021b\)](#)

How people access public sector services is changing due to a move toward digitisation

Figure 109. Public service websites visited in last 12 months, Wales, 2019-20

(Welsh Government, 2021c).



The way in which people access public services is also changing. With internet use and access increasing over the past two decades, there has been growth in digital users of public services.

Results of the National Survey for Wales have evidenced a move toward greater digital adoption and internet use, with 88 per cent of households now able to access the internet at home. Of the adults surveyed aged 16 and over, 95 per cent reported using the internet at least once a day. This is a significant increase from 2013-14 when only 82 per cent of people reported using the internet 'on most days'.

This trend is reflected in the use of public digital facilities. As of 2019-20, 77 per cent of respondents reported using at least one public service website within the last 12 months. Local authority websites proved most popular, having been accessed by over half of the people surveyed (52 per cent), while websites for NHS direct, GP surgeries and schools attracted around one third of respondents each.

References & Resources



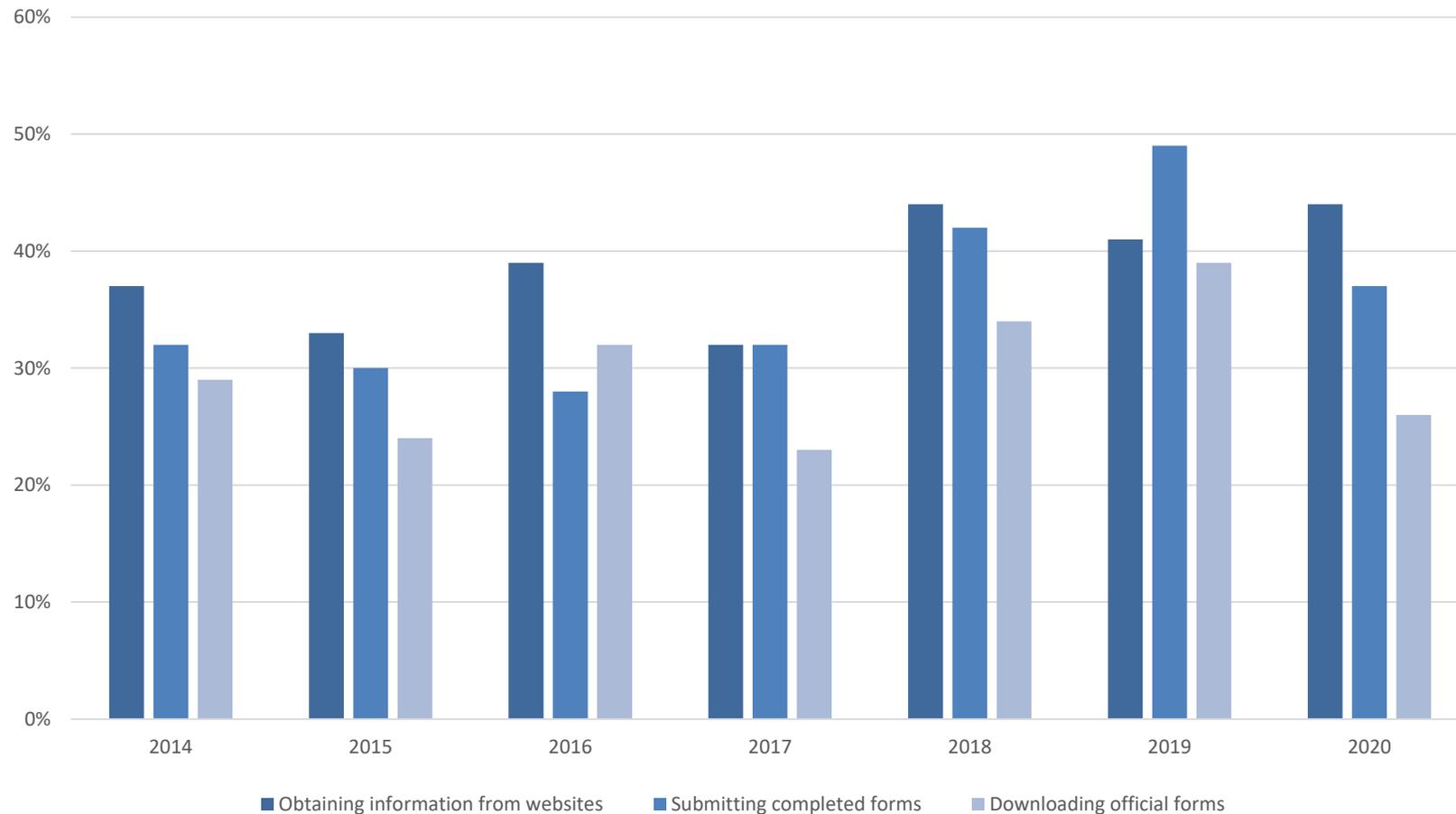
[Internet Skills Report \(Welsh Government, 2021b\)](#)



[National Survey for Wales Results Viewer \(Welsh Government, 2021c\)](#)

People are interacting in increasingly diverse ways with online public services

Figure 110. Reasons for using the internet to interact with public authorities or services, UK, 2014 to 2020 (ONS, 2020).



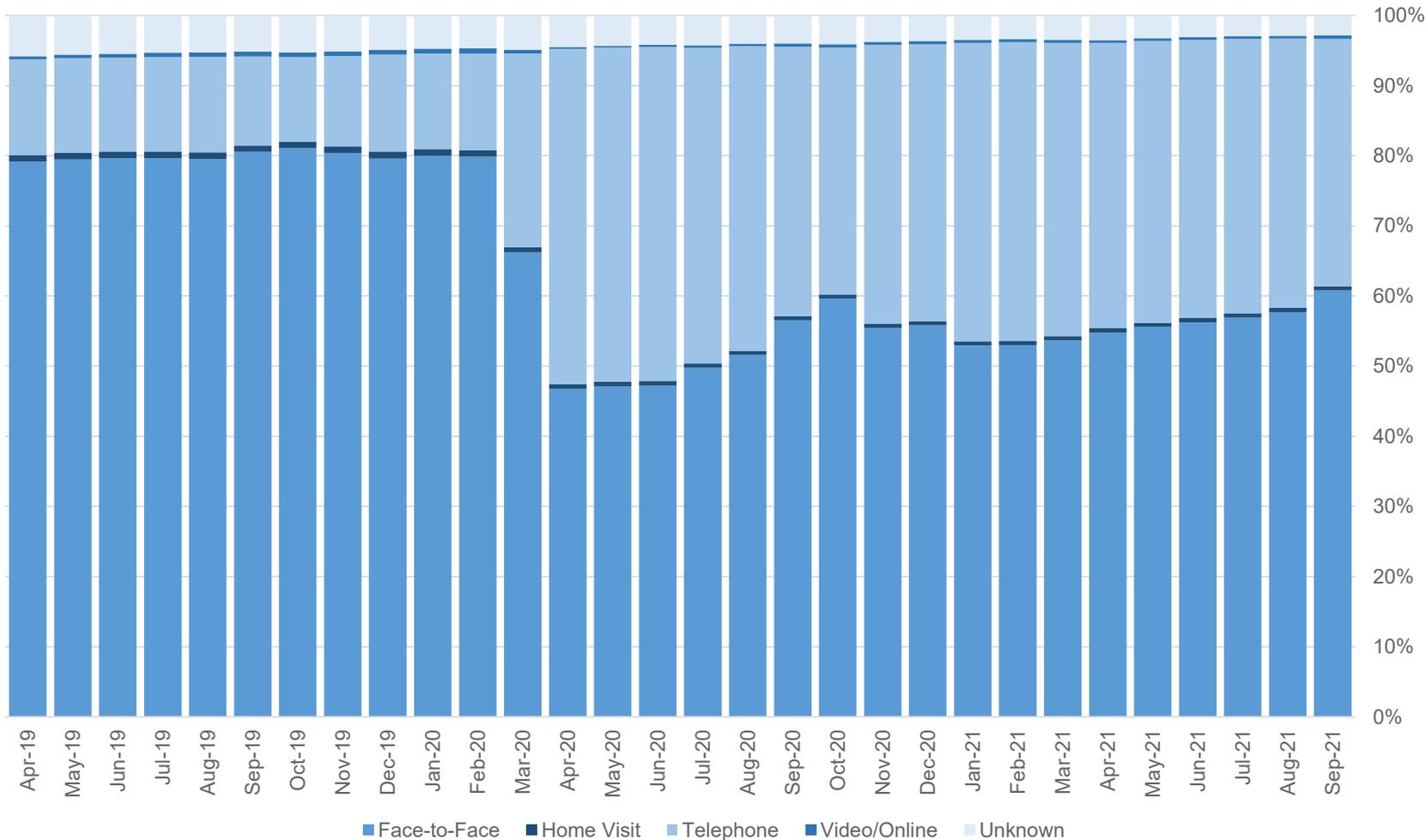
The move toward greater use of online public services is also evident on a UK level. According to ONS data, the percentage of people using the internet to interact with public authorities or online services at least once within a 12 month period has seen a general increase since 2014.

Information gathering has historically been the most popular reason for visiting public service websites, growing from 37 per cent in 2014 to 44 per cent in 2020. Both the downloading and submitting of forms online were also becoming more popular between 2017 and 2019, having reached 39 per cent and 49 per cent at their respective peaks, however both have since dropped again in popularity.

People aged 35-54 were found to be most likely to access public service websites, while those aged 65 and over were least likely. This is potentially indicative of a barrier to older people interacting with online services, which will need to be addressed as the trend toward digitisation continues.

Technology is changing the way we interact with and meet demand for health and social care services

Figure 111. Percentage of GP appointments by setting, England, April 2019 to September 2021 (NHS, 2021).



The ability of the health and social care sector to quickly and effectively adapt to new technology was highlighted during the pandemic. Remote GP consultations, for example, were adopted across the country, with evidence to support the efficacy of their uptake.

Figures available for England (which are broadly representative of the rest of the UK) show that GP appointments carried out via telephone or video/online rose from 15 per cent in February 2020 to 48 per cent in April. While this figure has dropped marginally since COVID-19 restrictions have eased, remote methods have consistently accounted for around 40 per cent of all GP appointments in the twelve months between September 2020 and September 2021.

There is also evidence to suggest that there have been reductions in the time taken between booking date and appointment date. Since March 2020, the percentage of appointments seen within 1 day of booking has remained higher than at any time in the 12 months prior to the pandemic. Similar improvements have also been seen for same-day bookings and bookings within 2-7 days.

While it is beyond the scope of this report to discuss the possible benefits or limitations of digital healthcare and consultations and it is not yet clear whether this trend will continue after the pandemic, the data does demonstrate the digital potential of the health and social care system.

References & Resources



Digital and Remote Care in Covid (Nuffield Trust, 2021)



Digital Appointments in General Practice (NHS, 2021)

References and Resources



People and Population - Reports

Bevan Foundation. (2018). *Demographic trends in Wales. Merthyr Tydfil: Bevan Foundation.*
<https://www.bevanfoundation.org/wp-content/uploads/2018/11/Demographic-trends-FINAL.pdf>

CPEC. (2019). *Projections of older people with dementia and costs of dementia care in the United Kingdom, 2019-2040.* London: London School of Economics and Political Science.
https://www.alzheimers.org.uk/sites/default/files/2019-11/cpec_report_november_2019.pdf

Government Office for Science. (2016). *Future of an ageing population.* London: Government Office for Science.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/816458/future-of-an-ageing-population.pdf

ONS. (2019a). *Past and projected period and cohort life tables, 2018-based, UK: 1981 to 2068.* Online: Office for National Statistics.
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/pastandprojecteddatafromtheperiodandcohortlifetables/1981to2068#how-long-can-you-expect-to-live>

ONS. (2019c). *National population projections, migration assumptions: 2018-based.* Online: Office for National Statistics.
<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/methodologies/nationalpopulationprojectionsmigrationassumptions2018based#appendix-b-wales-charts>

ONS. (2020). *Migration statistics quarterly report: August 2020.* Online: Office for National Statistics.
<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/migrationstatisticsquarterlyreport/august2020>

ONS. (2021c). *Health state life expectancies by national deprivation deciles, Wales: 2017 to 2019.* Online: Office for National Statistics.
<https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthinequalities/bulletins/healthstatelifeexpectanciesbynationaldeprivationdecileswales/2017to2019>

United Nations. (2019a). *World population prospects 2019.* New York: United Nations.
https://reliefweb.int/sites/reliefweb.int/files/resources/WPP2019_Highlights.pdf

United Nations. (2020). *World population ageing 2019.* New York: United Nations.
<https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Report.pdf>

Welsh Government. (2017). *Technical report: Projection and trajectory for the number of Welsh speakers aged three and over, 2011 to 2050.* Cardiff: Welsh Government.
<https://gov.wales/sites/default/files/publications/2018-12/welsh-speaker-estimates-2011-to-2050-technical-report.pdf>

Welsh Government. (2020b). *Local authority population projections for Wales: 2018-based (revised).* Cardiff: Welsh Government.
<https://gov.wales/sites/default/files/statistics-and-research/2020-08/subnational-population-projections-2018-based-280.pdf>

Welsh Government. (2020d) *Subnational household projections (local authority): 2018 to 2043.* Welsh Government:
<https://gov.wales/subnational-household-projections-2018-based>

Welsh Government. (2020e). *Estimates of additional housing need in Wales (2019-based).* Cardiff: Welsh Government.
https://gov.wales/sites/default/files/statistics-and-research/2020-08/estimates-of-additional-housing-need-in-wales-2019-based_0.pdf

People and Population - Datasets

ONS. (2019b). *National population projections table of contents.* Office for National Statistics:
<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/2014basednationalpopulationprojectionstableofcontents>

ONS. (2021a). *Life expectancy estimates, all ages, UK.* Office for National Statistics:
<https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/datasets/lifeexpectancyestimatesallagesuk>

ONS. (2021b). *Health state life expectancy, all ages, UK.* Office for National Statistics:
<https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/datasets/healthstatelifeexpectancyallagesuk>

United Nations. (2019b). *Standard projections (Estimates and projection variants).* Department of Economic and Social Affairs:
<https://population.un.org/wpp/Download/Standard/Population/>

Welsh Government. (2020a). *Population projections by year and age.* StatsWales:
<https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Projections/National/2018-based/populationprojections-by-year-age>

Welsh Government. (2020c). *General health and illness by WIMD deprivation quintile.* StatsWales:
<https://statswales.gov.wales/Catalogue/National-Survey-for-Wales/Population-Health/Adult-general-health-and-illness/genhealthillness-by-wimddeprivation>

Welsh Government. (2020f). *Average annual estimates of housing need (2019-based) by region, variant and year (5 year period).* StatsWales:
<https://statswales.gov.wales/Catalogue/Housing/Housing-Need/2019-based/averageannualestimatesofhousingneed2019based-by-region-variant-year>

Welsh Government. (2021a). *Population projections by local authority and year.* StatsWales:
<https://statswales.gov.wales/Catalogue/Population-and-Migration/Population/Projections/Local-Authority/2018-based/populationprojections-by-localauthority-year>

Welsh Government. (2021b). *Household projections by household type and year.* StatsWales:
<https://statswales.gov.wales/Catalogue/Housing/Households/Projections/National/2018-based/householdprojections-by-householdtype-year>

Welsh Government. (2021c). *Household projections by variant and year.* StatsWales:
<https://statswales.gov.wales/Catalogue/Housing/Households/Projections/National/2018-based/householdprojections-by-variant-year>

Welsh Government. (2021d). *Annual population survey – Ability to speak Welsh by age, sex and year.* StatsWales:
<https://statswales.gov.wales/Catalogue/Welsh-Language/Annual-Population-Survey-Welsh-Language/speak-welsh-by-age-sex>

Inequalities - Reports

ONS. (2021c). *What are the regional differences in income and productivity?* Office for National Statistics:

<https://www.ons.gov.uk/visualisations/dvc1370/index.html>

United Nations. (2020a). *Shaping the trends of our time.* United Nations:

<https://www.un.org/development/desa/publications/wp-content/uploads/sites/10/2020/10/20-124-UNEN-75Report-Full-EN-REVISED.pdf>

United Nations. (2020b). *Charting pathways out of multidimensional poverty.* United Nations Development Programme.

http://hdr.undp.org/sites/default/files/2020_mpi_report_en.pdf

Welsh Government. (2019). *Child poverty progress report 2019.*

<https://gov.wales/sites/default/files/publications/2020-01/child-poverty-strategy-2019-progress-report.pdf>

Welsh Government. (2020a). *Examination results in schools in Wales, 2019/20.* Welsh Government:

<https://gov.wales/sites/default/files/statistics-and-research/2020-12/examination-results-september-2019-august-2020-670.pdf>

Welsh Government. (2020b). *GCSE entries and results pupils in Year 11 by FSM.* StatsWales:

<https://statswales.gov.wales/Catalogue/Education-and-Skills/Schools-and-Teachers/Examinations-and-Assessments/Key-Stage-4/gcseentriesandresultspupilsyear11by-fsm>

Welsh Government. (2020c). *Chief Economist's report 2020.* Cardiff: Welsh Government:

<https://gov.wales/sites/default/files/publications/2020-12/chief-economists-report-2020.pdf>

Welsh Government. (2021g). *Labour market overview: October 2021.* Welsh Government:

<https://gov.wales/labour-market-overview-october-2021>

References and Resources

Inequalities - Datasets

ONS. (2021a). *Regional gross disposable household income: local authorities by ITL1 region.* Office for National Statistics:
<https://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/dataset/regionalgrossdisposablehouseholdincomelocalauthoritiesbyitl1region>

ONS. (2021b). *Labour productivity time series.* Office for National Statistics:
<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/datasets/labourproductivity>

ONS. (2021d). *LFS: Employment rate: Wales: Aged 16-64: All: %: SA.* Office for National Statistics:
<https://www.ons.gov.uk/visualisations/dvc1370/index.html>

UK Government. (2021). *Explore education statistics.* Gov.UK:
<https://explore-education-statistics.service.gov.uk/data-tables/fast-track/e71dd1d5-86d3-4c1d-a87c-52311ddfb19d>

United Nations. (2020c). *Multidimensional poverty index.* United Nations:
http://hdr.undp.org/sites/default/files/2020_mpi_statistical_data_table_1_and_2_en.pdf

United Nations. (2021). *World income inequality database.* United Nations University:
<https://www.wider.unu.edu/database/world-income-inequality-database-wiid>

Welsh Government. (2020b). *GCSE entries and results pupils in Year 11 by FSM.* StatsWales:
<https://statswales.gov.wales/Catalogue/Education-and-Skills/Schools-and-Teachers/Examinations-and-Assessments/Key-Stage-4/gcseentriesandresultspupilsyear11byfsm>

Welsh Government. (2021a). *Percentage of all individuals, children, working-age adults and pensioners living in relative income poverty for the UK, UK countries and regions of England between 1994-95 to 1996-97 and 2017-18 to 2019-20.* StatsWales:
<https://statswales.gov.wales/Catalogue/Community-Safety-and-Social-Inclusion/Poverty/householdbelowaverageincome-by-year>

Welsh Government. (2021b). *People in relative income poverty by whether there is disability within the family.* StatsWales:
<https://statswales.gov.wales/Catalogue/Community-Safety-and-Social-Inclusion/Poverty/peopleinrelativeincomepoverty-by-whetherthereisdisabilitywithinthefamily>

Welsh Government. (2021c). *People in relative income poverty by ethnic group of the head of household.* StatsWales:
<https://statswales.gov.wales/Catalogue/Community-Safety-and-Social-Inclusion/Poverty/peopleinrelativeincomepoverty-by-ethnicgroupoftheheadofhousehold>

Welsh Government. (2021d). *Working age adults in relative income poverty by economic status of household.* StatsWales:
<https://statswales.gov.wales/Catalogue/Community-Safety-and-Social-Inclusion/Poverty/workingageadultsinrelativeincomepoverty-by-economicstatusofhousehold>

Welsh Government. (2021e). *Children in relative income poverty by economic status of household.* StatsWales:
<https://statswales.gov.wales/Catalogue/Community-Safety-and-Social-Inclusion/Poverty/childreninrelativeincomepoverty-by-economicstatusofhousehold>

Welsh Government. (2021f). *ILO unemployment rates by Welsh local areas and year.* StatsWales:
<https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Unemployment/ILO-Unemployment/ilounemploymentrates-by-welshlocalareas-year>

Welsh Government. (2021h). *Workplace employment by Welsh local areas and year.* StatsWales:
<https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Jobs/Whole-Workforce/workplaceemployment-by-welshlocalareas-year>

Welsh Government. (2021i). *Highest qualification levels of working age adults by UK country, region and qualification.* StatsWales:
<https://statswales.gov.wales/Catalogue/Education-and-Skills/Post-16-Education-and-Training/Lifelong-Learning/Qualification-Levels/highestqualificationlevelsofworkingageadults-by-ukcountry-region-qualification>

Welsh Government. (2021j). *Estimated 16-24 year olds not in education, training or employment by economic activity and age groups.* StatsWales:
<https://statswales.gov.wales/Catalogue/Education-and-Skills/Post-16-Education-and-Training/Lifelong-Learning/Participation-of-Adults-and-Young-People/estimated1624neet-by-economicactivity-agegroup>

Planetary Health & Limits – Reports

Air Quality Expert Group. (2019). *Non-exhaust emissions from road traffic.* Department for Environment, Food & Rural Affairs.
https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1907101151_20190709_Non_Exhaust_Emissions_typeset_Final.pdf

Cadw. (2020). *Historic environment and climate change in Wales.*
[https://cadw.gov.wales/sites/default/files/2020-02/Adaptation%20Plan%20-%20FINAL%20WEB%20-%20English%20\(1\).pdf](https://cadw.gov.wales/sites/default/files/2020-02/Adaptation%20Plan%20-%20FINAL%20WEB%20-%20English%20(1).pdf)

CGIAR. (2020). *Big facts on climate change, agriculture and food security.* Big Facts:
<https://ccafs.cgiar.org/bigfacts/#>

Challinor, A. J., Watson, J., Lobell, D. B., Howden, S. M., Smith, D. R., & Chhetri, N. (2014). *A meta-analysis of crop yield under climate change and adaptation.* Nature Climate Change.
https://www.researchgate.net/publication/262687950_A_meta-analysis_of_crop_yield_under_climate_change_and_adaptation

Climate Change Committee. (2021a). *Independent assessment of UK climate risk.* Climate Change Committee.
<https://www.theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf>

Climate Change Committee. (2021b). *2021 Progress report to parliament.* Climate Change Committee.
<https://www.theccc.org.uk/publication/2021-progress-report-to-parliament/>

Convention on Biological Diversity. (2020). *Global Biodiversity Outlook 5.* Montreal.
<https://www.cbd.int/gbo/gbo5/publication/gbo-5-en.pdf>

DEFRA. (2021a). *Concentrations of nitrogen dioxide.* Department for Environment, Food & Rural Affairs.
<https://www.gov.uk/government/statistics/air-quality-statistics/nitrogen-dioxide>

FAO. (2012). *World agriculture towards 2030/2050: The 2012 revision.* Agricultural Development Economics Division.
<https://www.fao.org/3/ap106e/ap106e.pdf>

Hanlon, H. M., Bernie, D., Carigi, G., & Lowe, J. A. (2021). *Future changes to high impact weather in the UK.* Climate Change, 166(50).
<https://link.springer.com/content/pdf/10.1007/s10584-021-03100-5.pdf>

JNCC. (2020). *Nitrogen futures.* Peterborough.
<https://data.jncc.gov.uk/data/04f4896c-7391-47c3-ba02-8278925a99c5/JNCC-Report-665-FINAL-WEB.pdf>

Johnson, C. N. (2021). *Past and future decline and extinction of species.* The Royal Society.
<https://royalsociety.org/topics-policy/projects/biodiversity/decline-and-extinction/>

Lindley, S.; O'Neill, J.; Kandeh, J.; Laweson, N.; Christian, R.; O'Neill, M. (2011). *Climate change, justice and vulnerability.* Joseph Rowntree Foundation.
<https://www.jrf.org.uk/report/climate-change-justice-and-vulnerability>

Met Office. (2020). *Major update to key global temperature data set.* Met Office:
<https://www.metoffice.gov.uk/research/news/2020/major-update-to-key-global-temperature-data-set>

NRW. (2016). *State of natural resources report (SoNaRR): Assessment of the sustainable management of natural resources.* Natural Resources Wales.
<https://cdn.cyfoethnaturiol.cymru/media/679405/chapter-4-resilience-final-for-publication.pdf>

NRW. (2020). *SoNaRR 2020: Bridges to the future.* Natural Resources Wales.
<https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-bridges-to-the-future/?lang=en>

Oxfam. (2015). *Carbon emissions and income inequality.* Oxfam Library.
<https://oxfamilibrary.openrepository.com/bitstream/handle/10546/582545/tb-carbon-emissions-inequality-methodology-021215-en.pdf?sequence=2>

Planetary Health & Limits – Reports (cont.)

IPCC. (2019). Chapter 5: food security. In *Climate change and land*. 437-550.
https://www.ipcc.ch/site/assets/uploads/sites/4/2021/02/08_Chapter-5_3.pdf

Scheelbeck, P. F., Moss, C., Kastner, T., Alae-Carw, C., Jarmul, S., Green, R., Dangour, A. D. (2020). *UK's fruit and vegetable supply increasingly dependent on imports from climate vulnerable producing countries*. *Nat Food*, 705-712.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7116398/>

Sediri, S., Trommetter, M., Frascaria-Lacoste, N., Fernandez- Manjarrez, J. (2020). *Transformability as a Wicked Problem: A Cautionary Tale?*. *Sustainability*, 12(15).
<https://www.mdpi.com/2071-1050/12/15/5895/htm>

SEI. (2015). *Ecological and carbon footprints of Wales: Update to 2011*. Llywodraeth Cymru.
<https://gov.wales/sites/default/files/publications/2019-04/ecological-and-carbon-footprint-of-wales-report.pdf>

State of Nature Partnership. (2019). *State of nature: A summary for Wales*. RSPB.
https://www.rspb.org.uk/globalassets/images/campaigning-and-positions/let-nature-sing/birdsong-takeover/pdf/sonr/rspb_state-of-nature_summary_wales.pdf

United Nations. (2018). *Inclusive wealth report 2018*. Nairobi: United Nations.
<https://www.unep.org/resources/inclusive-wealth-report-2018>

United Nations. (2020a). *Shaping the trends of our time*. United Nations.
<https://www.un.org/development/desa/publications/wp-content/uploads/sites/10/2020/10/20-124-UNEN-75Report-Full-EN-REVISED.pdf>

United Nations. (2020b). *Emissions gap report 2020*. Nairobi: United Nations.
<https://www.unep.org/emissions-gap-report-2020>

Welsh Government. (2020a). *Energy generation in Wales 2019*. Regen.
<https://gov.wales/sites/default/files/publications/2021-01/energy-generation-in-wales-2019.pdf>

Welsh Government. (2020b). *Energy use in Wales 2018*. Regen.
<https://gov.wales/sites/default/files/publications/2020-06/energy-use-in-wales-2018.pdf>

Welsh Government. (2021). *Net zero Wales: Cabron budget 2 (2021-2025)*.
<https://gov.wales/sites/default/files/publications/2021-10/net-zero-wales-carbon-budget-2-2021-25.pdf>

Wiedmann, T., Lenzen, M., Keyßer, L. T., & Steinberger, J. K. (2020). *Scientists' warning on affluence*. *Nature Communications*, 1-10.
<https://www.nature.com/articles/s41467-020-16941-y.pdf>

WMO. (2021). *State of the global climate*. Geneva: World Meteorological Organization.
https://library.wmo.int/doc_num.php?explnum_id=10618

World Bank. (2010). *World development report 2010: Development and climate change*. Washington DC: World Bank.
<https://openknowledge.worldbank.org/handle/10986/4387>

WWF. (2020). *Living planet report 2020 – Bending the curve of biodiversity loss*. Gland.
<https://f.hubspotusercontent20.net/hubfs/4783129/LPR/PDFs/ENGLISH-FULL.pdf>

Planetary Health & Limits – Datasets

DEFRA. (2021b). *UKEAP: National ammonia monitoring network.* UK Air Information Resource:
<https://uk-air.defra.gov.uk/networks/network-info?view=nh3>

Department for Transport. (2021a). *Statistical dataset - All vehicles.* Gov.UK:
<https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>

Department for Transport. (2021b). *Table catalogue.* Department for Transport:
<https://maps.dft.gov.uk/tsgb-table-catalogue/index.html>

Global Carbon Budget. (2021). *Data supplement to the Global Carbon Budget 2021.* ICOS:
<https://www.icos-cp.eu/science-and-impact/global-carbon-budget/2021>

Met Office. (2021). *Download and view UK Climate Projections data.* Met Office:
<https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/download-data>

NAEI. (2021a). *Devolved administration emission inventories.* National Atmospheric Emissions Inventory:
<https://naei.beis.gov.uk/data/das>

NAEI. (2021b). *Devolved administration emissions by source.* National Atmospheric Emissions Inventory:
<https://naei.beis.gov.uk/data/das?view=by-source>

Our World in Data. (2020). *Agricultural production.* Our World in Data:
<https://ourworldindata.org/agricultural-production>

References and Resources



Technology - Reports

Burning Glass Technologies. (2019). *No longer optional: Employer demand for digital skills.* London: Department for Digital, Culture, Media & Sport.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/807830/No_Longer_Optional_Employer_Demand_for_Digital_Skills.pdf

CEBR. (2015). *Providing basic digital skills to 100% of UK population could contribute over \$14 billion annually to UK economy by 2025.* The Centre for Economics and Business Research:
<https://cebr.com/reports/tinder-foundation-and-go-on-uk-call-for-urgent-digital-skills-funding-to-support-government-2020-fast-broadband-for-all-pledge/>

DDCMS. (2021). *Cyber security breaches survey.* London: Ipsos Mori.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/972399/Cyber_Security_Breaches_Survey_2021_Statistical_Release.pdf

IBM. (2020). *Artificial intelligence (AI).* IBM Cloud Education.
<https://www.ibm.com/cloud/learn/what-is-artificial-intelligence>

IPPR Scotland. (2020). *Shaping the future: A 21st century skills system for Wales.* Edinburgh.
<https://www.ippr.org/files/2020-01/shaping-the-future-wales-feb20.pdf>

Lloyds Bank. (2021). *Essential digital skills report 2021.*
https://www.lloydsbank.com/assets/media/pdfs/banking_with_us/whats-happening/211109-lloyds-essential-digital-skills-report-2021.pdf

McKinsey. (2019). *Artificial intelligence in the United Kingdom: Prospects and challenges.* McKinsey Global Institute.
<https://www.mckinsey.com/featured-insights/artificial-intelligence/artificial-intelligence-in-the-united-kingdom-prospects-and-challenges>

ONS. (2019a). *Exploring the UK's digital divide.* Office for National Statistics.
<https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/articles/exploringtheuksdigitaldivide/2019-03-04>

ONS. (2019b). *Which occupations are at the highest risk of being automated?* Office for National Statistics.
<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/whichoccupationsareathighestriskofbeingautomated/2019-03-25>

ONS. (2019c). *The probability of automation in England: 2011 to 2017.*
<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/theprobabilityofautomationinengland/2011and2017>: Office for National Statistics.

Resolution Foundation. (2020). *Doing what it takes: Protecting firms and families from the impact of coronavirus.* London.
<https://www.resolutionfoundation.org/publications/doing-what-it-takes/>

Welsh Government. (2019). *Wales 4.0 Delivering economic transformation for a better future of work.*
<https://gov.wales/sites/default/files/publications/2019-09/delivering-economic-transformation-for-a-better-future-of-work.pdf>

World Economic Forum. (2020). *The future of jobs report 2020.* Geneva.
https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf

References and Resources

Technology - Datasets

ONS. (2021). *Internet users.* Office for National Statistics:

<https://www.ons.gov.uk/businessindustryandtrade/itandinternetindustry/datasets/internetusers>

Welsh Government. (2021a). *National survey for Wales: results viewer.* Welsh Government:

<https://gov.wales/national-survey-wales-results-viewer>

References and Resources



Public Finances - Reports

Bank of England. (2021). *Monetary policy report: November 2021.* Monetary Policy Committee. <https://www.bankofengland.co.uk/-/media/boe/files/monetary-policy-report/2021/november/monetary-policy-report-november-2021.pdf?la=en&hash=72336FA2809F28D79CA9C1274ED3851261C61CA9>

HM Treasury. (2021). *Autumn budget and spending review 2021: A stronger economy for the British people.* Her Majesty's Treasury. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1029974/Budget_AB2021_Web_Accessible.pdf

OBR. (2021a). *Economic and fiscal outlook: October 2021.* Office for Budget Responsibility. <https://obr.uk/efo/economic-and-fiscal-outlook-october-2021/>

OBR. (2021c). *Overview of the March 2021 Economic and fiscal outlook.* Office for Budget Responsibility: <https://obr.uk/overview-of-the-march-2021-economic-and-fiscal-outlook/>

The Health Foundation. (2016). *The path to sustainability.* <https://www.health.org.uk/publications/reports/the-path-to-sustainability>

Welsh Government. (2021). *Annual budget motion 2021-22.* <https://gov.wales/sites/default/files/publications/2021-03/final-budget-2021-2022-motion.pdf>

Public Finances- Datasets

OBR. (2021b). *Public finances databank - October 2021.* Office for Budget Responsibility: <https://obr.uk/data/>

OBR. (2021d). *March 2021 devolved tax and spending forecasts - charts and tables.* Office for Budget Responsibility: <https://obr.uk/efo/economic-and-fiscal-outlook-march-2021/>

ONS. (2019a). *Principal projection - Wales population in age groups.* Office for National Statistics: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea25principalprojectionwalespopulationinagegroups>

ONS. (2019b). *Principal projection - UK population in age groups.* Office for National Statistics: <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea21principalprojectionukpopulationinagegroups>

References and Resources



Public Sector Demand and Digital - Reports

Government Office for Science. (2016). *Future of an aging population.* London: Government Office for Science.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/816458/future-of-an-ageing-population.pdf

Nuffield Trust. (2021). *The remote care revolution during Covid-19.* Quality Watch.
<https://www.nuffieldtrust.org.uk/files/2020-12/QWAS/digital-and-remote-care-in-covid-19.html#1>

Older People's Commissioner for Wales. (2020). *Leave no-one behind: Action for an age-friendly recovery.*
https://www.olderpeoplewales.com/Libraries/Uploads/Leave_no-one_behind_-_Action_for_an_age-friendly_recovery.sflb.ashx

ONS. (2019b). *Living longer and old-age dependency - what does the future hold?* London: Office for National Statistics.
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/ageing/articles/livinglongerandoldagedependencywhatdoesthefuturehold/2019-06-24>

ONS. (2021a). *Public service productivity: total, UK, 2018.* Office for National Statistics.
<https://www.ons.gov.uk/economy/economicoutputandproductivity/publicservicesproductivity/articles/publicservicesproductivityestimatestotalpublicservices/totaluk2018>

Welsh Government. (2020). *Digital inclusion forward look: towards a digitally confident Wales.*
<https://gov.wales/digital-inclusion-forward-look-towards-digitally-confident-wales.html>

Welsh Government. (2021b). *Internet skills and online public sector services (National Survey for Wales): April 2019 to March 2020.*
<https://gov.wales/internet-skills-and-online-public-sector-services-national-survey-wales-april-2019-march-2020.html>

Public Sector Demand and Digital - Datasets

NHS. (2021). *Appointments in general practice - September 2021.* NHS Digital:
<https://digital.nhs.uk/data-and-information/publications/statistical/appointments-in-general-practice/september-2021#resources>

ONS. (2019a). *Expectation of life, principal projection, Wales.* Office for National Statistics:
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/datasets/expectationoflifeprincipalprojectionwales>

ONS. (2020). *Internet access - households and individuals.* Office for National Statistics:
<https://www.ons.gov.uk/peoplepopulationandcommunity/householdcharacteristics/homeinternetandsocialmediausage/datasets/internetaccesshouseholdsandindividualsreferencetables>

ONS. (2021b). *Public service productivity, quarterly.* Office for National Statistics:
<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/datasets/quarterlypublicserviceproductivityexperimentalstatistics>

Welsh Government. (2021a). *Employment in the public and private sectors by Welsh local authority and status.* Stats Wales:
<https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Persons-Employed/PublicPrivateSectorEmployment-by-WelshLocalAuthority-Status>

Welsh Government. (2021c). *National survey for Wales: Results viewer.* Welsh Government:
<https://gov.wales/national-survey-wales-results-viewer>