Appendix B

Baseline Data, Key Sustainability Issues and Opportunities

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1 Introduction

This appendix provides the baseline social, economic, cultural and environmental data for Wales that is being used to help undertake the following aspects of the ISA:

- Identify the current baseline social, economic, cultural and environmental situation within Wales, against which the likely effect of the NTDP will be predicted.
- Identify key trends issues and opportunities for the ISA and NTDP to consider.
- Develop the ISA Framework to use for the appraisal of the NTDP.
- Ultimately assist the development of a monitoring framework to monitor the significant effects of the NTDP.

The appendix has been structured around each of the seven well-being goals. Within those goals, the baseline data has been sub-divided into a series of ISA topics. Each section is structured as follows:

1. Wellbeing Goal and identification of relevant ISA topics within it.
2. Overview of Baseline Conditions for each topic. This comprises:
    a. The relevance of that topic to the NTDP;
    b. The baseline conditions and trends structured around the baseline data sets;
    c. Any data gaps that are in the process of being filled; and
3. Key Issues derived from the above that are relevant to the NTDP and opportunities for it to address them.

Note on the baseline data sets

In the ISA the baseline data sets used are specific facts and statistics that are gathered by different organisations including, for example, the Welsh Government; the UK Government; or statutory bodies such as Natural Resources Wales (NRW), amongst others. These have been carefully selected to help give an appropriate overview of the baseline conditions and trends over time at a national scale and where necessary more detail on regional variations within Wales.

It is intended that the baseline data sets can be used as factual yardsticks to support the appraisal of the effects of the NTDP against each of the relevant ISA Framework Objectives.

Ultimately, once the ISA is complete and the NTDP is adopted, indicators will be produced to help monitor the predicted significant effects of the NTDP as it is used.

There are hundreds of potential baseline data sets that could be used, many providing only subtly different information. As such, the selection of indictors for this ISA will be focussed, streamlined and reflective of the national scale and influence that the NTDP is expected to have.

2 Well-Being Goal: A Prosperous Wales

This section provides baseline data relating to the following well-being goal:

"An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work".

The data relates primarily to:

- The Economy, Employment and Income in Wales; and
- Education in Wales.

2.1 The Economy, Employment and Income in Wales

2.1.1 Relevance to the NTDP

A strong national economy is vitally important for securing people's wealth, jobs and incomes. This has a large contribution to the quality of life and the economic, social, cultural and environmental well-being of people and communities in Wales. Investment in transport networks can influence the functioning of labour markets, business productivity and competitiveness. These impacts interact over time and can lead to improvements in economic output and the geographical distribution of economic activity. They can also impact on the environment, quality of life and the overall attractiveness of towns and cities.

Figure B-1 highlights how direct impacts from investment could create market efficiencies leading to investment and relocation decisions which in-turn can lead to changes in productivity and economic growth[1]. The mechanisms for delivering economic impacts include:

- Benefits to non-users. In the case of public transport investments, these include reduced negative externalities from car travel (i.e. reduced congestion and CO_2 emissions) and option values (i.e. the value that is placed on maintaining a public asset or service even if there is little or no likelihood of the individual actually ever using it).
- Productivity effects. Productivity impacts generated through efficiencies resulting from improved connectivity, which effectively brings businesses, suppliers and

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[1] Greener Transport Solutions (2021) Transport and the economy. Available at: https://greenertransportsolutions.com/guidance-tool/ [Accessed: 30.11.21]

workers closer together. These benefits are additional to user and non-user benefits at the national level.

- Induced investment impacts. Changes in the level or location of private sector investment as a result of a transport investment. These benefits are context specific and may be partially displaced from other areas.
- Employment impacts. Labour market impacts resulting from connectivity improvements, which may allow people to move to more productive jobs or enter the labour market as a result of reduced and cheaper commuting journeys.
- Regeneration impacts. Local economic impacts resulting from improved local image and attraction of land use development. In some cases, transport can act as a catalyst of local economic growth. These benefits may not be completely additional at a national level and may arise as a result of displacement of economic activity from elsewhere.

In addition to the potential long-term impacts on productivity, the construction of large infrastructure projects provides an injection of resources into local economies during construction which may create new employment opportunities. Whilst this expenditure may simply be redirected from other government activities, the local impacts could be both significant in the short term and catalytic over the longer term.

Figure B-1: Transport investment and economic growth
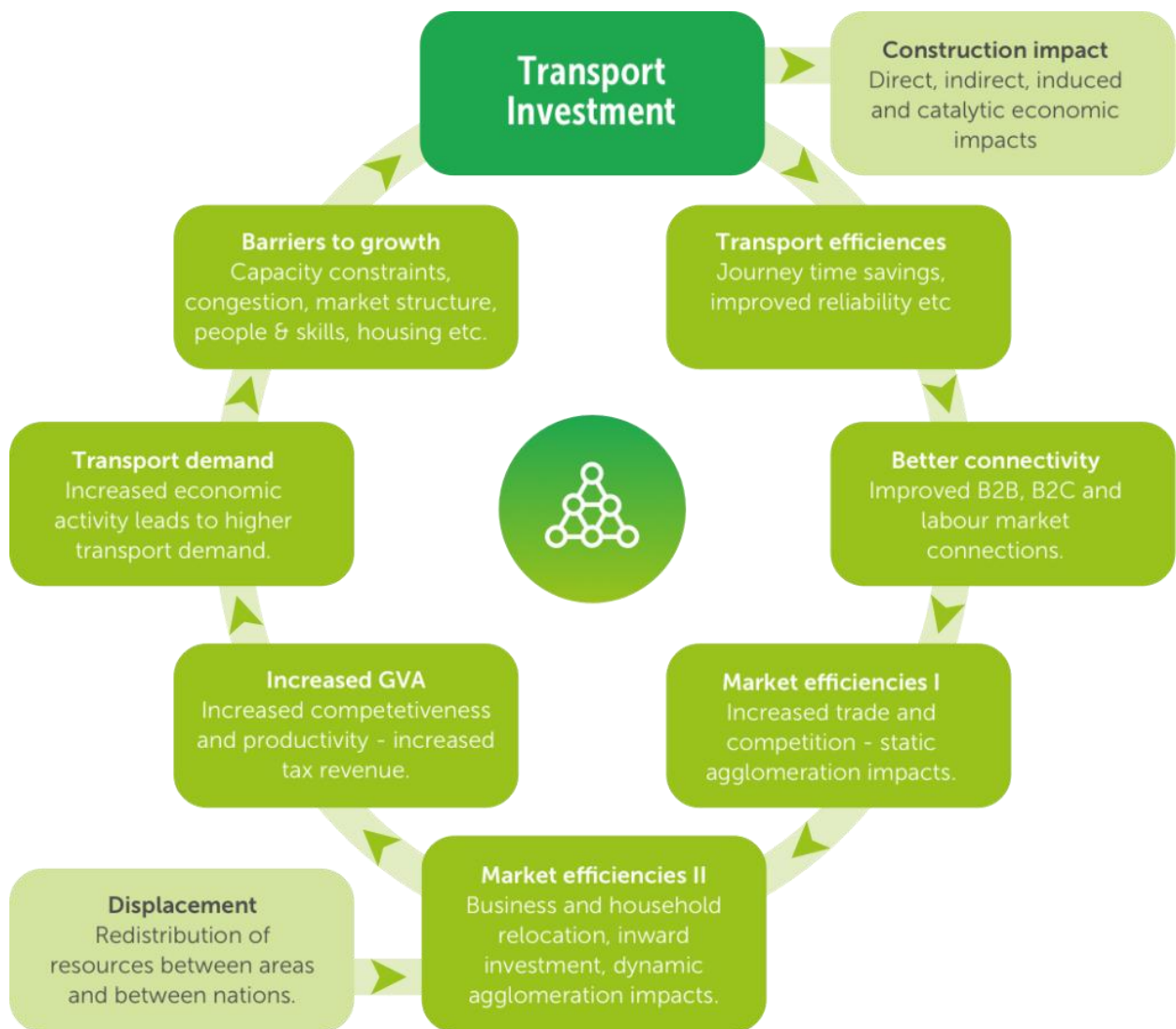
Source: Greener Transport Solutions: Transport and the economy

The NTDP has a key role in supporting the national economy, through helping to guide development relating its supporting infrastructure.

The Welsh Government Strategy for Tourism[2] seeks to promote improved transport links by air, sea, road and rail. This could be supported by the NTDP.

2.1.2 Baseline conditions and trends

The economy of Wales is closely aligned with that of the rest of the UK. However, for a long time, economic output has been lower in Wales compared with other areas. In

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[2] Welsh Government (2019) Tourism Strategy (Partnership for Growth). Available at: https://gov.wales/tourism-strategy-partnership-growth [Accessed: 30.11.21]

2019, the GVA (a key measure of economic output)[3] was £67.1 billion, or £21,295 per head[4]. This was 72.6% of the average for the total of all UK regions, down by 0.7% compared to 2018. Wales had the second lowest level of GVA per head in the UK (measured against the other UK regions). GVA per head in Wales has increased 2.1% compared to 2018, however the economic future of the whole of the UK is currently uncertain in light of the exit of the UK from the European Union and the continuing effect of the COVID pandemic.

The highest levels of output in 2019 were from Cardiff, Flintshire, Newport, Wrexham, Swansea and Monmouthshire reflecting the larger proportion of industry, population and services in those areas. GVA per head is significantly lower across much of the rest of Wales, reflecting its more rural nature. Blaenau Gwent recorded the lowest GVA per head in 2019 (£12,739). The fastest growth over the last decade has been in the South West region[5]

In 2019 GVA per hour worked in Wales was approximately 16% below the UK average – making it the second lowest region in the UK, just over 2%% above Northern Ireland. Within Wales, Powys had the lowest GVA per hours worked at 43% below the UK average, with Flintshire and Wrexham having the highest at 6% below the average[6]. This reflects a lower-than-average level of productivity in Wales[7].

The second half of the 20th century saw a significant decline in the traditional manufacturing and extractive industries in Wales with a move towards service sector employment. The modern Welsh economy is now dominated by the service sector

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[3] Gross value added (GVA) is a measure of the value of goods and services produced in an area, industry or sector of an economy. GVA is linked as a measure to gross domestic product (GDP).

[4] Welsh Government (2021) Regional gross domestic product and gross value added: 1998 to 2019. Available at: https://gov.wales/regional-gross-domestic-product-and-gross-value-added-1998-2019 [Accessed: 18.11.21]

[5] Welsh Government (2021) Stats Wales: Gross Value Added by Welsh economic region. Available at: https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Regional-Accounts/Gross-Value-Added-GDP/gvaperhead-by-area-year [Accessed: 24.11.21]

[6] ONS (2021) Subregional productivity: labour productivity indices by local authority district. Available at:
https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/datasets/subregionalproductivitylabourproductivityindicesbylocalauthoritydistrict [Accessed 30/11/2021]

[7] Office of National Statistics (2021) Subregional productivity in the UK: July 2021. Available at:
https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/labourproductivity/articles/regionalandsubregionalproductivityintheuk/july2021 [Accessed: 02.12.21]

including public health, education, defence and administration, accounting for over 70% of the total Wales GVA. Figure B-2 shows the split of GVA per industry.

Figure B-2: Gross Value Added in Wales by industry (%)
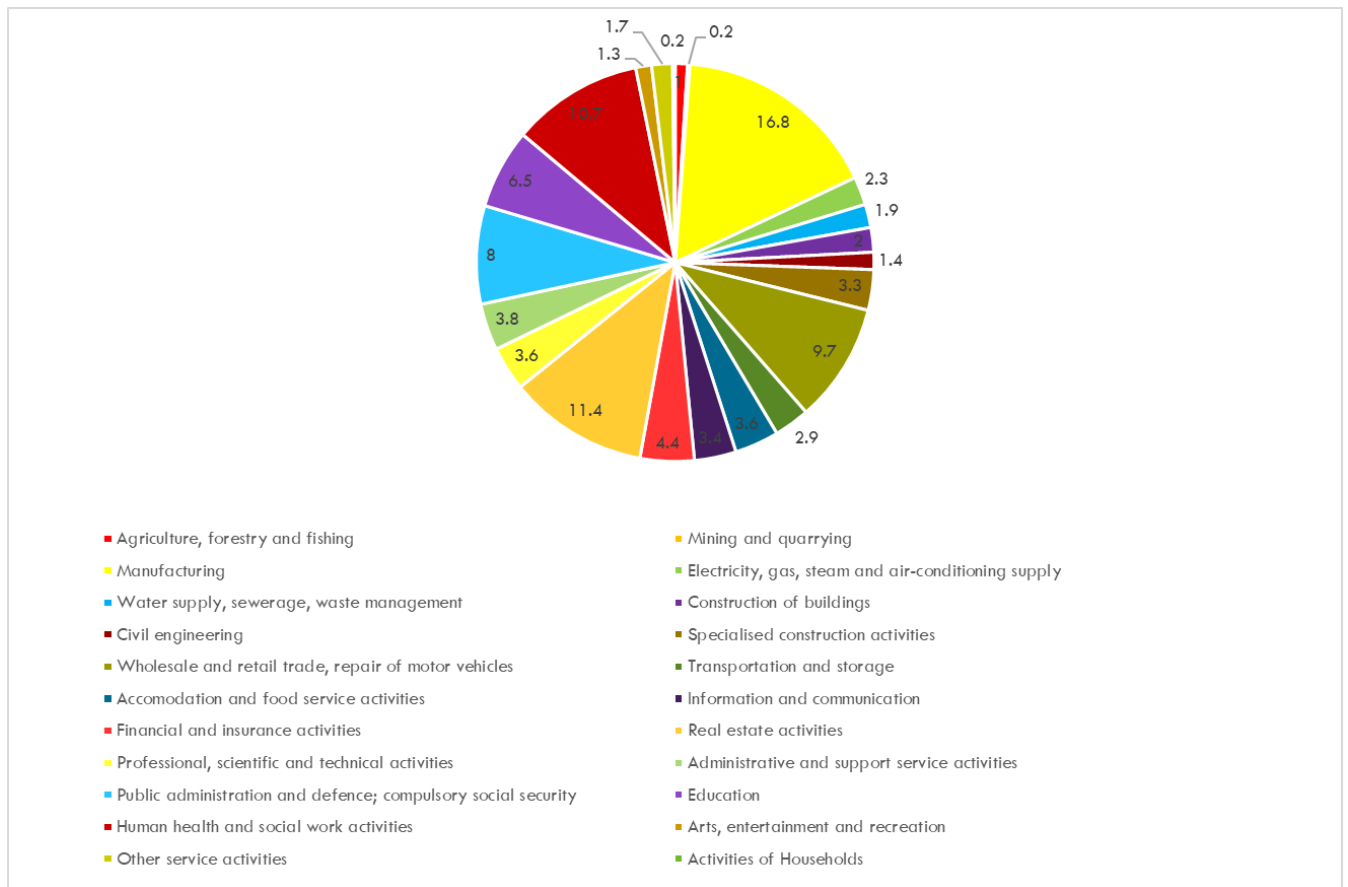
Source: Stats Wales (2020)

After the service industry, the next largest group is the 'Production' industry. Whilst heavy industry has been in decline, Wales still has a diverse manufacturing sector. This includes:

- Metal ore refining at plants in, for example, Port Talbot, Llanwern, Newport, Trostre, Shotton, Ammanford, Pontarddulais, Tafarnaubach and Caerphilly;
- Oil refining at Milford Haven;
- Automotive component production; and
- Growth in the electronics industry.

Rural economy

Wales is largely rural in nature, so agriculture and forestry represent a large area of economic land-use. This is dominated by beef, sheep and dairy farming on relatively small farms, compared to the rest of the UK. Economic output from these industries is, however, relatively small.

Tourism

The National Heritage Fund sets out the following from 'The Impact of heritage tourism for the UK economy'[8], which is the second follow-up to Investing in Success[9], Heritage Fund's original report on heritage tourism, published in partnership with VisitBritain. The three reports analyse the impact of the heritage-based visitor economy and highlight the importance of continued investment from leisure, culture and heritage budgets in supporting UK tourism.

- Wales' heritage makes a £1bn GVA contribution to UK tourism economy (Cultural, historic and natural heritage attractions refer to museums, theatres, historic houses, historic parks or natural landscapes such as wetlands and national parks).
- Heritage tourism supports over 24,000 jobs in Wales.
- Wales' cultural and heritage attractions receive more than 10m visitors per year.
- Heritage tourism more important as economic driver in Wales than the UK as a whole.

With its rich natural and cultural assets, tourism is also a significant and growing part of the national economy. Cardiff, in particular, is a primary tourist destination due to its large number of high-quality attractions. This brings income and employment opportunities for a range of associated businesses such as hotels, food and retail outlets. In 2018, there was £6.3 billion of visitor spending, generating £3 billion in GVA. This is a contribution of around 6% GVA to the Welsh economy[10].

Between January and December 2019 there were 10.7 million overnight domestic Great Britain trips to Wales which was an increase of 6.8% on the previous year which generated an expenditure of £2,003 million [11]. These figures compare to a 3.6% increase in overnight domestic trips and a 2.9% increase in expenditure for Great Britain. For both Great Britain and Wales, the total expenditure increased but the number of nights spent decreased or remained the same, indicating that visitors spend more. The volume of international trips and expenditure also increased in Wales by 3.6% and 18.8%, respectively. In contrast, the number of tourism day visits taken in Wales decreased by 8.8% in the same period, compared to a decrease of

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[8] Heritage Fund. Available at: https://www.heritagefund.org.uk/news/new-figures-reveal-impact-wales-heritage-uk-tourism-economy [Accessed: 30.11.21]
[9] Heritage Fund (2010) Investing in Success. Available at: https://www.heritagefund.org.uk/sites/default/files/media/about_us/hlf_tourism_impact_single.pdf [Accessed: 30.11.21]
[10] Welsh Government (2020) Welcome to Wales: Priorities for the Visitor Economy 2020-2025, Summary of Evidence Base https://gov.wales/sites/default/files/publications/2020-01/welcome-to-wales-priorities-for-the-visitor-economy-2020-to-2025-summary.pdf [Accessed: 30.11.21]
[11] Welsh Government (2020) Wales tourism performance: 2019. Available at: https://gov.wales/wales-tourism-performance-2019 [Accessed: 30.11.21]

2.9% of trips taken in Great Britain. These statistics predate the COVID-19 pandemic, and therefore may not be representative of the current situation.

Third sector

The third sector, as defined by the Wales Council for Voluntary Action (WCVA), is a very diverse range of organisations, including voluntary organisations and social enterprises, which share a set of values and characteristics. In 2019, approximately 124,800 people in Wales were employed in the charity/voluntary sector in Wales, accounting for just over 10% of all employment in Wales[12]

The value of the third sector has been estimated by WCVA by adding the value of volunteer time (provided by organisations) – an estimated 61 million hours is given in a year and this has a monetary value of £757 million. In 2019 the sector had an estimated value of £3.8 billion[13].

Micro-businesses

In 2019, there were an estimated 267,045 enterprises, the highest estimate since the start of the series in 2003. There was a steady annual increase from 2009-2019 and this trend is likely to continue[14].The overall increase was largely attributed to growth in the micro size-band enterprises - 0-9 employees, which grew by 29% between 2009 and 2019. This could be a result of the recent labour market conditions, which may have encouraged people to set up businesses, as they are made redundant (for example). Regionally, micro enterprises in 2019 accounted for 34.9% of employment, however in mid-Wales they represented 52% of employment. The production sector had the smallest proportion of total employment in micro businesses in Wales at 5.6 per cent.

Innovation

The Welsh Government also monitors the levels of innovation in the economy. It identified that between 2016-2018, 32% of Welsh businesses were innovation active, comparable to levels in Scotland and Northern Ireland, but just behind England (38%)[15].

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[12] WCVA (2021) The Third Sector Data Hub. Available at: https://wcva.cymru/the-voluntary-sector-in-wales/ [Accessed: 30.11.21]

[13] Welsh Government (2019) Third Sector Scheme Wales: Annual Report 2017-18. Available at: https://gov.wales/sites/default/files/publications/2019-03/third-sector-annual-report-2017-18_0.pdf [Accessed: 30.11.21]

[14] Welsh Government (2019) Size Analysis of Active Businesses in Wales. Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-12/size-analysis-active-businesses-2019-503.pdf [Accessed: 30.11.21]

[15] Welsh Government (2020) Businesses that are innovation active. Available at: https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/Businesses/Innovation/businessesthatareinnovationactive-by-year [Accessed: 30.11.21]

Economic Activity

The 2010, the Welsh Government publication, Economic Renewal: a new direction[16], identified two important factors responsible for Wales weaker economic position compared to the rest of the UK. These are a low employment rate and low average wages (reflecting low average productivity). In November 2021, the employment rate in Wales was 73.8% compared to 75.4% in the UK[17]. This shows some improvement on the employment rates since November 2020, which were 72.1% and 75.3% for Wales and the UK respectively. Following the COVID-19 pandemic, it is uncertain how this trend will continue.

In September 2019, the number of people economically inactive had decreased in Wales over the past decade by 4% from 23.7% to 19.7% (between September 2009 – September 2019). The national trend decrease in Wales has been above the UK average over this period with the UK decreasing by only 2.6%, however the percentage of economic inactivity in Wales remains above the UK average of 17.4 in 2019. As of November 2021, the economic inactivity rate was 24.4%, compared to 20.9% for the UK. The future direction of this trend is likely to be affected by the outcome of the COVID-19 pandemic.

According to the Welsh Index of Multiple Deprivation (WIMD)[18] 2019 employment domain[19] (see Figure B-3), the highest levels of employment deprivation were in the South Wales valleys and in some North Wales coastal towns. In terms of local authorities, Blaenau Gwent Merthyr Tydfil recorded the highest proportion of LSOAs in the most 10% in Wales for the employment domain. Monmouthshire had no LSOAs in the most deprived 10% for employment.

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[16] Welsh Government (2010) Economic Renewal: a new direction. Available at: https://www.bridgend.gov.uk/media/2061/sd121.pdf [Accessed: 30.11.21]
[17] Welsh Government (2021) Labour market overview: November 2021. Available at: https://gov.wales/labour-market-overview-november-2021 [Accessed: 30.11.21]
[18] The WIMD ranks each of the 1909 Lower Super Output Areas (LSOAs) in Wales in terms of the level of deprivation that LSOA exhibits for a given domain. Those ranked in the bottom 191 LSOAs are, therefore, in the 10% most deprived nationally.
[19] Welsh Government (2019) Welsh Index of Multiple Deprivation (WIMD) 2019 Results report. Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-02/welsh-index-multiple-deprivation-2019-results-report.pdf [Accessed: 30.11.21]

Figure B-3: WIMD 2019 Map for Wales, Employment Domain

Welsh Index of Multiple Deprivation 2019
Employment Domain

by Lower Level Super Output Areas

Rank	Most Deprived	
1 - 191		10% most deprived
192 - 382		10-20% most deprived
383 - 573		20-30% most deprived
574 - 955		30-50% most deprived
956 - 1909		50% least deprived
	Least Deprived	

Local Authority Boundary ———

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November 2019
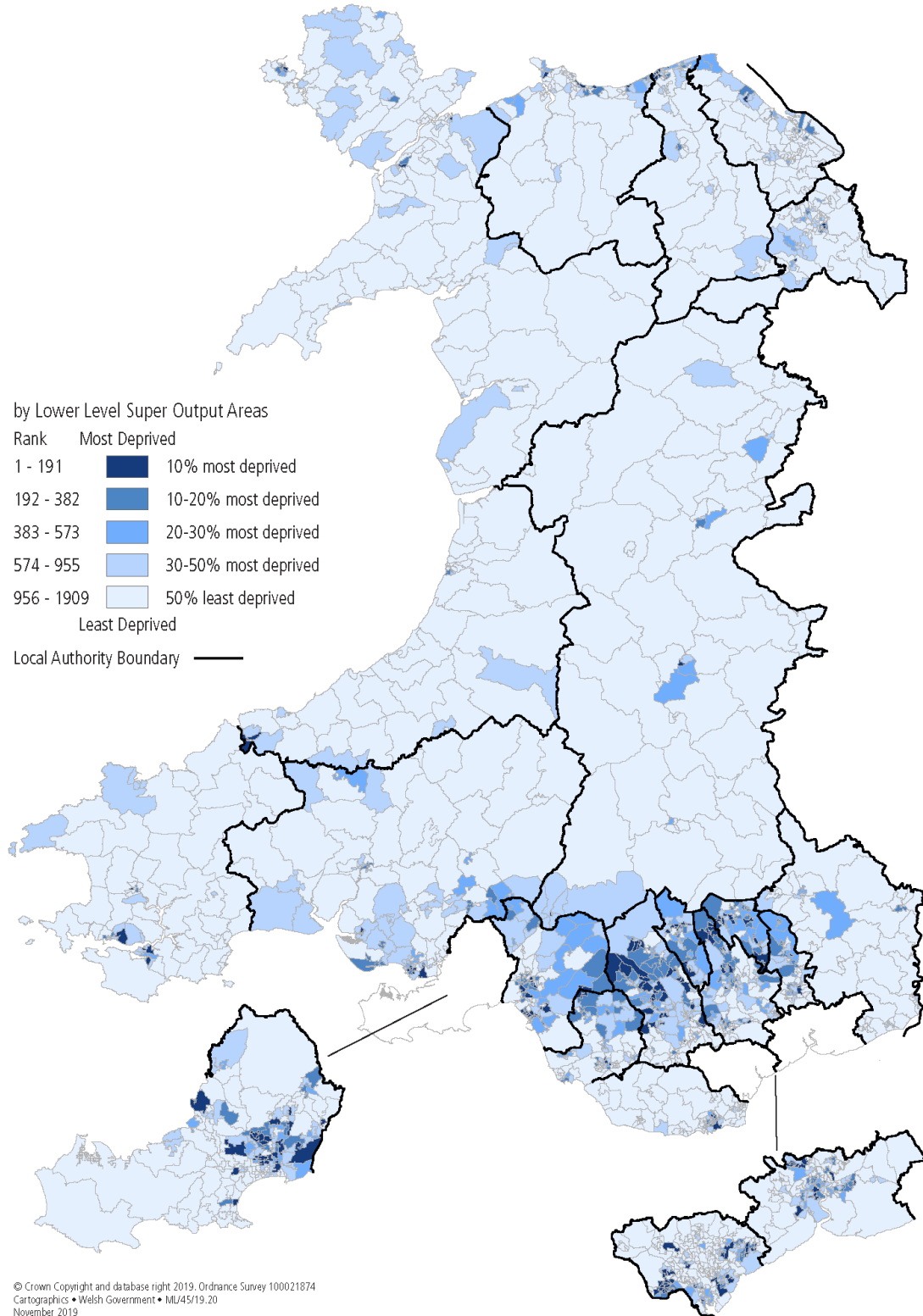
Source: WIMD 2019

Earnings

The average (median) gross weekly earning for full-time adults working in in Wales is £562.80, compared to a UK average of £610.70[20]. Median gross earnings in Wales increased by 3.9% between 2020 and 2021, compared to 4.3% across the UK.

The highest average earnings are in the North Wales economic region, followed closely by the South East economic region. The Mid Wales region had the lowest average earnings in Wales[21].

In Wales, 70.7% of people in employment were either on permanent contracts (or have a temporary contract and are not seeking permanent employment) and were earning more than two thirds of the UK median wage for August to October 2018[22].

The WIMD 2019 income domain focuses on the proportion of people with income below a defined level and has a weight of 22% in the overall index. In the WIMD 2019 income domain, there were pockets of high deprivation in the South Wales valleys, and in some North Wales coastal towns. The local authorities with the highest proportion of LSOAs in the most deprived 10% in Wales, for the income domain, was Newport, Merthyr Tydfil and Cardiff (at around 20%).

Job Satisfaction

Findings from the Work in Wales Skills and Employment Survey, 2006-2017[23] found that, in terms of overall work satisfaction, workers in Wales exhibited the highest levels of low job satisfaction (9% compared to 7% in Britain) and very high job satisfaction (21% compared to 18% in Britain). In 2019-20, respondents (to the National Survey of Wales[24]) were asked how satisfied they were with their present job. On a scale of 0-10, the average satisfaction score was 7.4. There appears to be a strong correlation between satisfaction with present job and satisfaction with

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[20] Welsh Government (2021) Annual survey of hours and earnings: 2021. Available at: https://gov.wales/annual-survey-hours-and-earnings-2021 [Accessed: 25.11.21]
[21] Welsh Government (2021) Average earnings data by Welsh local areas. Available at: https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Earnings/medianweeklyearnings-by-welshlocalareas-year [Accessed: 30.11.21]
[22] Welsh Government (2021) Percentage of people in employment who are on permanent contracts (or on temporary contracts and not seeking permanent employment) and who earn more than two thirds of the UK median wage. Available at: https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Earnings/peopleinemploymentwhoareonpermanentcontractsearnmorethantwothirdsukmedianwage-by-quarter [Accessed: 30.11.21]
[23] Welsh Government (2019) Skills and Employment Survey: Work in Wales, 2006 to 2017. Available at: https://gov.wales/skills-and-employment-survey-work-wales-2006-2017 [Accessed: 30.11.21]
[24] Welsh Government (2021) National Survey for Wales: results viewer. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed: 30.11.21]

commuting time. 66% of people who were highly satisfied with their present job were also highly satisfied their commuting time.

Distance travelled to work

Table B-1 shows the majority of Welsh residents travel less than 10km to work according to the 2011 Census. The majority of residents living within all Welsh regions travel a maximum distance of less than 10km to work at a proportion ranging between 37.9 to 58%. Of the residents who work from home Mid and West Wales work have significantly higher numbers than the Welsh and other regional levels. The age of this dataset should be taken into account as distances may have changed significantly in the past 9 years.

Table B-1: Distance travelled to work by Welsh Regions

Distance travelled to work	Mid and West Wales	North Wales	South Wales Central	South Wales East	South Wales West	Wales
Less than 10km	37.9%	48.6%	58.0%	51.2%	55.9%	50.5%
10km to less than 30km	23.0%	23.5%	20.4%	25.8%	21.1%	22.8%
30km and over	11.7%	9.6%	6.1%	7.6%	8.1%	8.5%
Work mainly at or from home	18.2%	10.8%	7.8%	8.1%	7.7%	10.4%
Other	9.3%	7.6%	7.7%	7.3%	7.2%	7.8%

Source: 2011 Census

As of the 2019-2020 National Survey of Wales, 12% of people travelled less than 1 mile to work[25]. The majority of respondents (44%) travelled more than 3 miles and less than 15 miles, with 20% and 24% of respondents travelled in between 1 and 3 miles and more than 15 miles respectively.

Journey to work by mode

The method of travel to work 2011 Census data (QS701EW) for Welsh residents are illustrated in Table B-2. The results show a similar split between each mode type compared across each country by Welsh regions. The results for Wales overall the majority of residents travel by car (car or van driver, car passenger or motorcyclist) 45% and lower for active travel (walking or cycling) 7%, whilst the proportion of residents travelling via public transport (bus or rail) lower at 4%. The proportion of residents not in employment in Wales overall at 39%.

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[25] Welsh Government (2021) National Survey for Wales: results viewer. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed: 30.11.21]

Table B-2: Method travelled to work by Welsh Regions

Distance travelled to work	Mid and West Wales	North Wales	South Wales Central	South Wales East	South Wales West	Wales
Car	44%	48%	42%	47%	46%	45%
Public Transport	2%	4%	7%	5%	4%	4%
Active	8%	7%	9%	6%	6%	7%
Other method of travel to work	1%	0%	0%	0%	0%	0%
Not in employment	38%	37%	39%	40%	42%	39%
Working from home	7%	3%	2%	2%	2%	3%

Source: 2011 Census

Broadband

Ofcom[26] reported in 2020 that Superfast Broadband is available to 94% of premises in Wales, up 1% from the previous year. This translates to 98% of urban properties with access to superfast broadband, but 78% of rural properties, indicating a gulf in access between communities. However, of the 93% of the homes and businesses with access, only 52% of homes/businesses have taken up the services which is the lowest up take in any of the UK nations. Whilst the coverage of internet access is growing, speeds and, in particular, access to superfast broadband can be a particular issue in rural communities, particularly amongst those with low incomes. Between 2013 and 2019, access to the internet in the most deprived households has increased from 67% to 83%[27]. Poorer households across Wales are less likely to have internet access in their home. Over time, it is anticipated that the coverage of high-speed broadband will improve.

Access to Services

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[26] Ofcom (2020) Connected Nations 2020: Wales Report. Available at: https://www.ofcom.org.uk/__data/assets/pdf_file/0020/209441/connected-nations-2020-wales.pdf [Accessed: 30.11.21]

[27] Welsh Government (2019) National Survey for Wales, 2018-19 Internet use and digital skills. Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-09/internet-use-and-digital-skills-national-survey-wales-april-2018-march-2019-207.pdf [Accessed: 30.11.21]

The WIMD 2019[28]sets out deprivation in relation to access to services. The access to services domain measures travel times to a range of services as a proxy for wider physical access to services. For WIMD 2019, the domain also considers access to digital services, through an indicator on the availability of superfast broadband. The domain measures include access to the following services:

- Food shop
- General Practitioner (GP) Surgery
- Post Office
- % Unavailability of broadband at 30Mb/s
- Primary School
- Public Library
- Sports Facility
- Secondary School
- Petrol Station
- Pharmacy

Figure B-4 presents the overall scores across Wales. In the WIMD 2019 access to services domain, high deprivation was widespread across rural areas of Wales. There were also some deprived pockets near large urban areas. The local authorities with the highest proportion of small areas in the most deprived 10% in Wales for access to services were Powys (50.6%) and Ceredigion (50.0%). The Local Authorities in Cardiff, Neath Port Talbot, Bridgend, Rhondda Cynon Taf, Blaenau Gwent and Torfaen had no areas in the most deprived 10%. For the access to services domain, the most deprived small area in Wales was Cynwyl Gaeo, Carmarthenshire, the same as for WIMD 2014. Six of the 10 most deprived areas in WIMD 2019 were also in the 10 most deprived areas in WIMD 2014. The overall patterns of access to services deprivation in WIMD 2019 are similar to those for WIMD 2014. However, there have been notable changes to relative ranks at the least deprived end. This reflects the significant improvements in the travel time calculations, as well as possible changes to service locations, public transport and road networks since 2014, and the inclusion of the new access to digital services indicator.

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[28] Welsh Government (2019) Welsh Index of Multiple Deprivation (WIMD) 2019 Results report. Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-02/welsh-index-multiple-deprivation-2019-results-report.pdf [Accessed: 30.11.21]

Figure B-4: Access to services for LSOAs in Wales

Welsh Index of Multiple Deprivation 2019
Access to Services Domain

by Lower Level Super Output Areas

Rank		Most Deprived
1 - 191		10% most deprived
192 - 382		10-20% most deprived
383 - 573		20-30% most deprived
574 - 955		30-50% most deprived
956 - 1909		50% least deprived
		Least Deprived

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November 2019
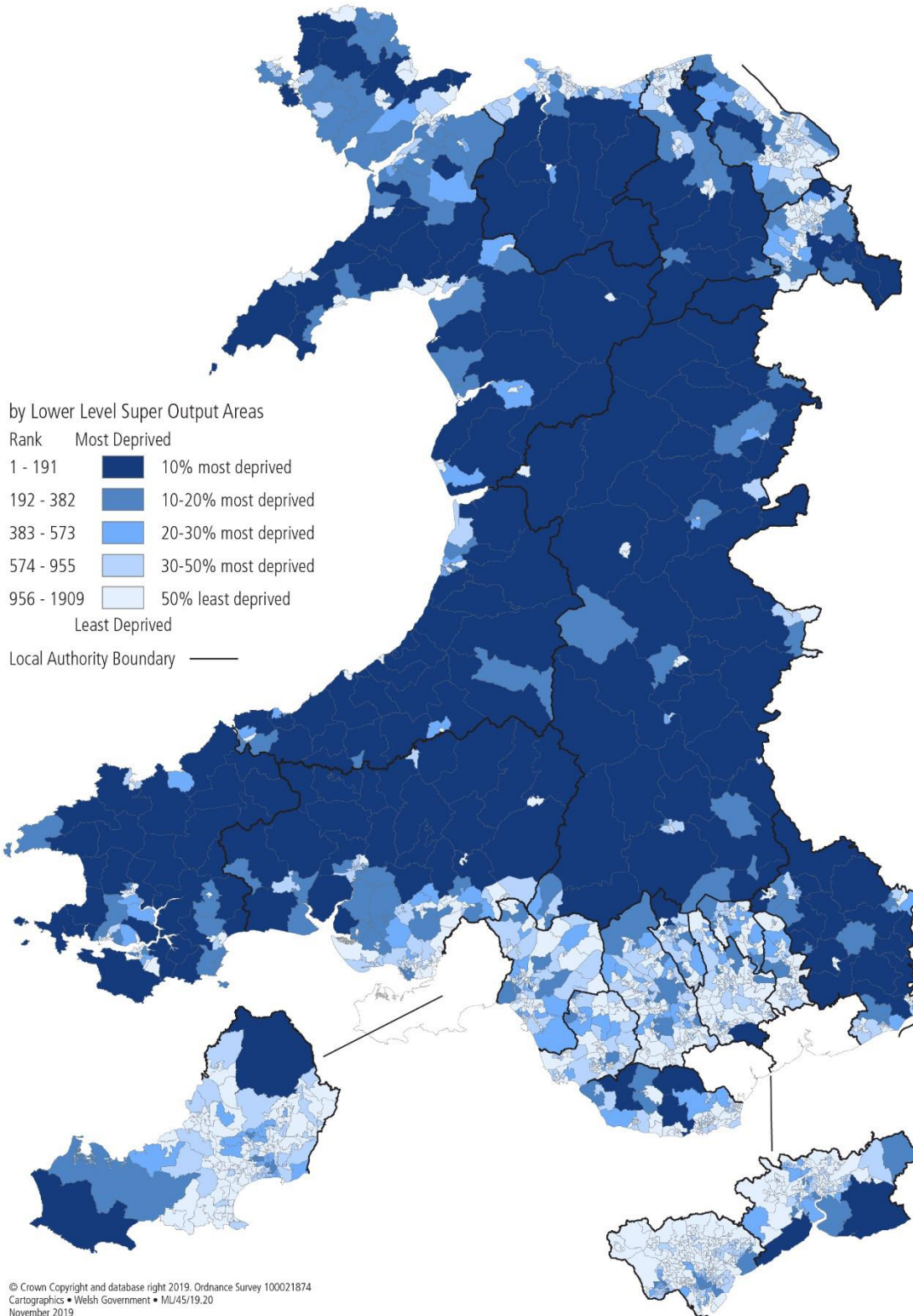
Source: WIMD 2019

2.2 Education in Wales

2.2.1 Relevance to the NTDP

Education is a fundamental factor in developing people's skills, both for future employment and for life in general. Improvements in educational attainment are directly linked to increased incomes, employment and overall economic growth. In particular, education and training to meet the skill sets required to grow the economy are of greatest importance. Chapter 4 of this appendix sets out further specific information in relation to the links between transport and young people, including in relation to accessing educational opportunities.

The NTDP has a key role in ensuring that everyone can access education and training opportunities and, in doing so, support educational development and a healthy economy.

2.2.2 Baseline conditions and trends

Education/ Training

The Welsh Government publishes data on the learning activities and labour market status of young people (aged 16 to 24) in Wales. The data series for 2020 further focuses on the proportion of young people who are not in education, employment or training (NEET) in Wales. In terms of 16-18 year olds, around 79.2% were in education or training (up from 77.1 in 2019). The proportion in employment has decreased to the lowest level since 2013, at 31.4%, down from 36.4% in 2019[29]. In addition, 11.1% of 16-18 year olds were reported as NEETs in 2020, a decrease of 0.6% from the previous year. In 2020, 10.5% of males aged 16 to 18 were considered NEET, compared with 11.7% of females[30].

Since 2004, the proportion of 19-24 year olds in education or training has remained around a similar level whilst the proportion who are NEET increased to higher levels, following the start of the 2008 recession, reflecting contracting employment levels. There has, however, been an increase in employment, and a decrease in the proportion who are NEET in the last 3 successive years. As with many economic

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[29] Welsh Government (2021) Participation of young people in education and the labour market: 2019 and 2020 (provisional). Available at: https://gov.wales/participation-young-people-education-and-labour-market-2019-and-2020-provisional-html [Accessed 30.1.21]

[30] Stats Wales (2020) Estimated 16-24 year olds not in education, training or employment by economic activity and age groups. Available at: 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 [Accessed:30.11.21]

statistics, the immediate future direction of this trend is likely to be influenced by the COVID-19 pandemic.

In terms of 19-24 year olds, 40.4% were in education or training and 61.4% were in full or part-time employment. A higher proportion of females (33.7%) were in full-time education compared with 27.9% of males aged 19 to 24 in 2020. In addition, 15.2% of 19-24 year olds were reported as NEETs which is a decrease of 0.9% on 2019 and is close to the lowest level on record. 13.5% of females aged 19 to 24 were NEET compared to 16.8% of males in 2020[31].

Educational attainment in Wales is slightly below the UK average. The proportion of adults of working age holding Higher Education or equivalent level qualifications (NQF level 4 or above) in 2020 was 41.4%, compared with 27.9% in 2008[31]. Wales is below the UK average level for NQF level 4 (which is 47%[32]). An estimated 80.9% of adults were qualified to NQF level 2 or above, which is an increase of 1.8% from 2019[33]. The trend is rising, with a 10% increase in NQF level 4 attainment in working age adults since 2008, with the greatest rises being amongst women.

In terms of regional distribution, adults in Mid Wales had the highest level of qualifications, whereas adults in North Wales had the highest number of adults with no form of qualifications[34]. The results for 2020 are presented in Table B-3. More specifically, qualification levels were highest in Vale of Glamorgan, Cardiff and Monmouthshire, and lowest in Blaenau Gwent, Merthyr Tydfil and Caerphilly.

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[31] Welsh Government (2021) Levels of highest qualifications held by working age adults by age group and gender. Available at: https://statswales.gov.wales/Catalogue/Education-and-Skills/Post-16-Education-and-Training/Lifelong-Learning/Qualification-Levels/highestqualificationlevelsofworkingageadults-by-gender-year-qualification [Accessed: 30.11.21]
[32] National Statistics (2021) Education and training statistics for the UK. Available at: https://explore-education-statistics.service.gov.uk/find-statistics/education-and-training-statistics-for-the-uk/2021 [Accessed: 30.11.21]
[33] Welsh Government (2021) Levels of highest qualification held by working age adults: 2020. Available at: https://gov.wales/levels-highest-qualification-held-working-age-adults-2020-html [Accessed: 30.11.21]
[34] Stats Wales (2021) Highest qualification levels of working age adults by regions of Wales and qualification. Available at: https://statswales.gov.wales/Catalogue/Education-and-Skills/Post-16-Education-and-Training/Lifelong-Learning/Qualification-Levels/highestqualificationlevelsofworkingageadults-by-regionsofwales-qualification [Accessed 30.11.21]

Table B-3: Percentage of adults with qualifications at the different levels of the NQF

Area	No qualifications	Qualified to below level 2	Qualified to NQF level 2 or above	Qualified to NQF level 3 or above	Qualified to NQF level 4 or above
Wales	7.3%	11.8%	80.9%	62.3%	41.4%
North Wales	7.8%	12.6%	79.6%	59.5%	37.3%
Mid Wales	4.5%	10.5%	85.0%	68.9%	47.0%
South West Wales	7.0%	11.6%	81.3%	62.1%	39.5%
South East Wales	7.5%	11.7%	80.8%	62.9%	43.2%

Source: Stats Wales

The distribution of LSOAs and their relative deprivation in the education domain illustrates regional variation in educational attainment and access to education. This is shown in Figure B-5 below. The South Wales valleys are the most educationally deprived area of Wales. This area includes the local authorities of Merthyr Tydfil, Torfaen, Blaenau Gwent and Rhondda Cynon Taff. There are also parts of the urban areas of Cardiff, Newport and Swansea that are suffering from education deprivation. Parts of Monmouthshire, Powys, Vale of Glamorgan and the North-East corner of Wales exhibit relatively low levels of education deprivation.

Figure B-5: Education Deprivation for LSOAs in Wales

Welsh Index of Multiple Deprivation 2019
Education Domain

by Lower Level Super Output Areas

Rank	Most Deprived	
1 - 191		10% most deprived
192 - 382		10-20% most deprived
383 - 573		20-30% most deprived
574 - 955		30-50% most deprived
956 - 1909		50% least deprived
	Least Deprived	

Local Authority Boundary ———

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Cartographics • Welsh Government • WG45/19.20
November 2019
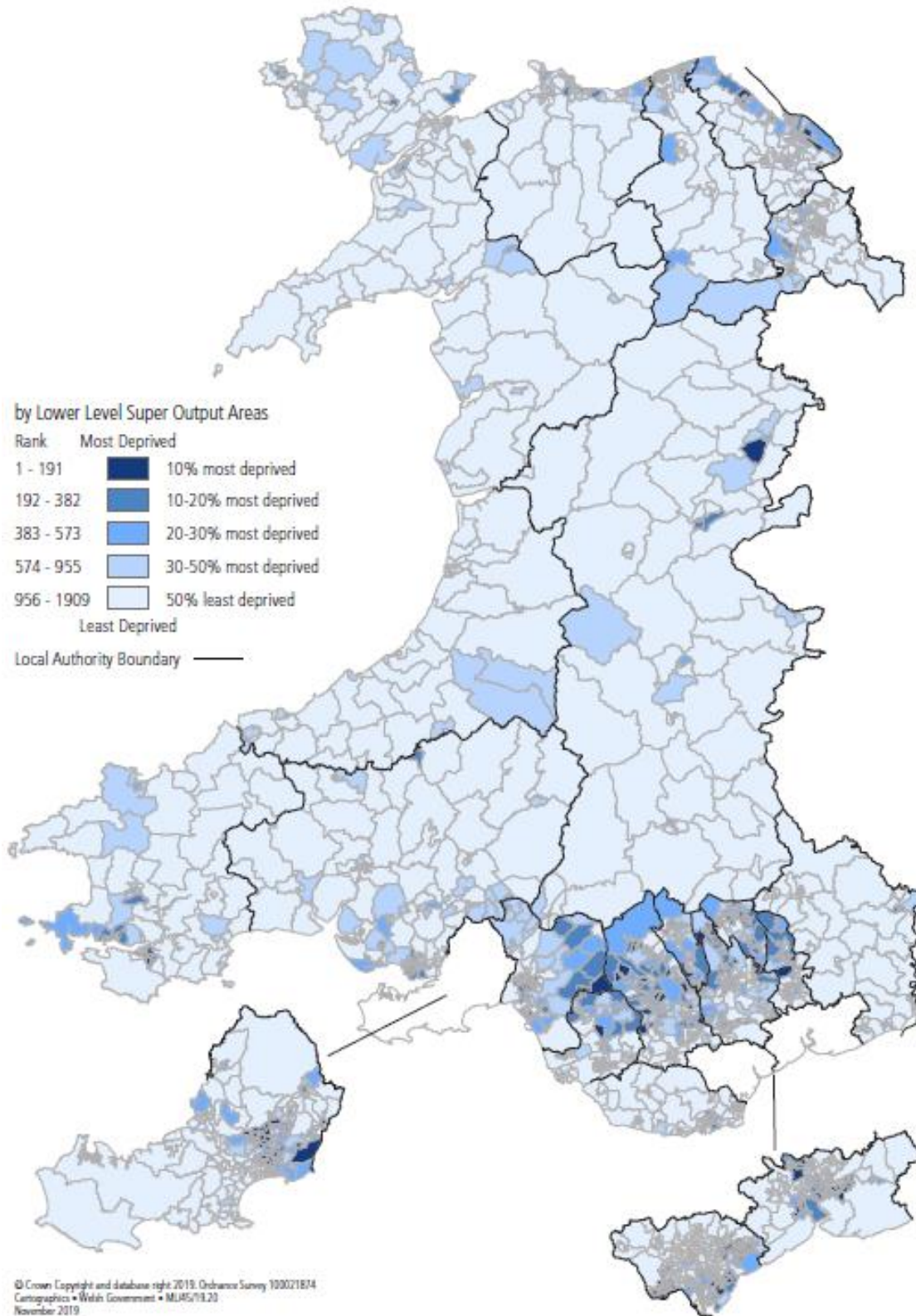
Source: WIMD 2019

Travel to School

National Survey results[35] indicate that car was the most common mode of transport used to get to a primary school (55%), followed by walking with an adult (32%). At secondary school the most popular modes of transport were catching a school bus and walking. 44 per cent of children actively travelled to primary school, and 34 per cent to secondary school in 2018-19. There has been little change in these percentages since 2014-15.

Figures B-6 and B-7 illustrate the mode of travel to/from school by urban/rural classification.

Figure B-6: Mode of travel to/from primary school by urban/rural classification (a)
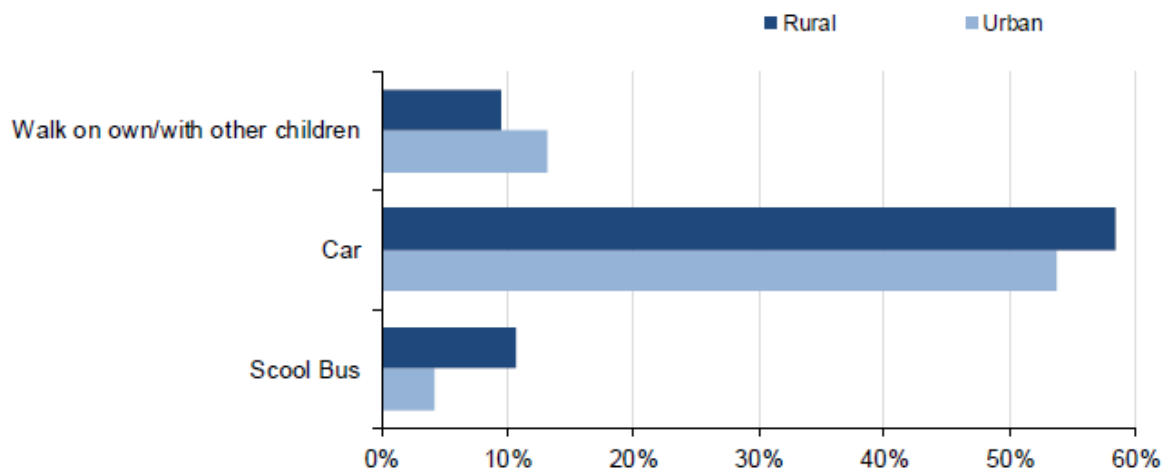
(a) Totals may not sum to 100% as multiple modes of transport can be selected

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[35] Welsh Government (2019) Statistical Bulletin – Walking and Cycling in Wales: Active Travel, 2018-2019 Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-11/active-travel-walking-and-cycling-april-2018-march-2019-073.pdf [Accessed 30.1.21]

Figure B-7: Mode of travel to/from Secondary school by urban/rural classification (a)
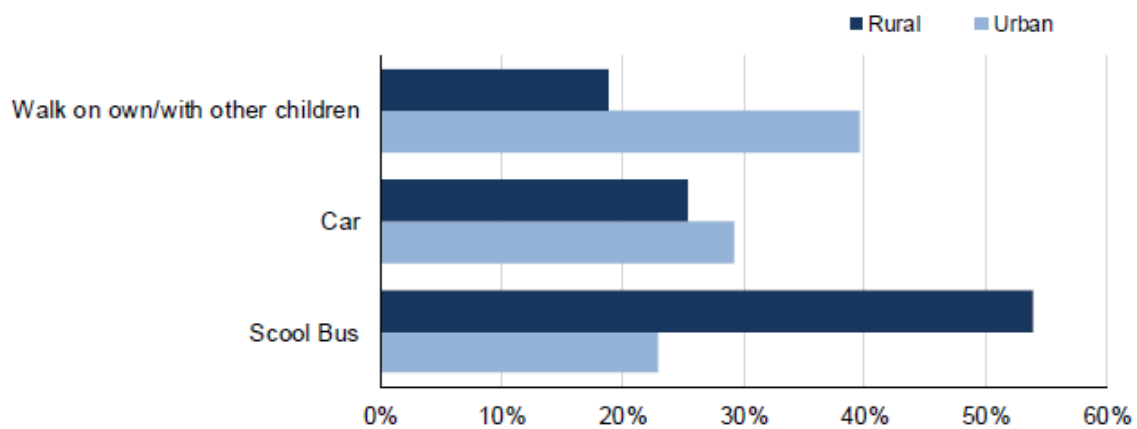
(a) Totals may not sum to 100% as multiple modes of transport can be selected

2.2.3 Data gaps

- Data relating to the barriers to walking to school.
- Data relating to distance travelled to work/education opportunities.
- There are also relevant data gaps to be considered from the data collated from the 2011 Census, as it may not be accurate to the current population and although the 2021 Census has been completed, the figures will not be released until 2022.
- Data relating to the modal split of transport journeys within Wales.
- For all data collected, there may be gendered differences that are not reflected in the sources they were collected from.
- Visitor Economy Data may be considered out of date.

2.3 Key Issues relevant to the NTDP and opportunities to address them

2.3.1 Issues

The economy of Wales is closely aligned with that of the rest of the UK. There has been a move towards service sector employment and a decline in heavy industry; Wales still has a diverse manufacturing sector.

There are clear geographical differences in employment activity in Wales with pockets of higher-than-average deprivation in the South Wales valleys and in some North Wales coastal towns for education and employment, but higher-than-average deprivation for access to services in Central Wales and the Valleys.

Key reasons for relatively poor economic performance include:

- Relatively low skills levels and poor educational attainment levels (although improving), particularly in the more deprived parts of the country.
- The largely rural nature of the country results in relatively small urban areas which would otherwise be more strongly associated with agglomeration effects.
- There is a relatively high proportion of older people who are retirement age.
- There are high levels of congestion which have negative economic impacts including the impact on productivity and freight.
- The UK Climate Risk Independent Assessment (CCRA3) Technical Report and the Evidence for the third UK Climate Change Risk Assessment (CCRA3): Evidence for Wales highlight a number of key risks and opportunities facing Wales with regard to business. These could have effects on a number of factors including health and well-being, employment and the economy. Such matters facing Wales can be summarised as risks to business from flooding, loss of coastal locations, water scarcity, reduced access to capital, reduced productivity from disruption to infrastructure etc., disruption to supply chains and changes in demands for goods and services. These could all be taken into consideration in the NTDP as they will all influence the habits of transport users.
- There are issues with provisioning access to schools and employment, as the highest density areas for these are in the South of Wales. These facilities are much more difficult to access by any means other than private owned car in the North of Wales.

2.3.2 Opportunities

The NTDP has a role to play in achieving balanced and sustainable growth, and the transition to a low resource use (including low carbon) economy, to enable the population to live within environmental limits. This includes the opportunity to promote sustainable freight transport.

The NTDP provides an opportunity for the economy to be guided towards a more sustainable future. This can be through the promotion of sustainable travel infrastructure and improvement of access to employment centres. It can also provide a framework that is more responsive to the needs of the economy and able to support new, emerging sectors and support transition of existing ones through the creation and enhancement of networks. Furthermore, it can also help to guide the creation of an environment that is attractive to inward investment and encourages sustainable access to jobs. Similarly, the NTDP may facilitate improvements in access to education.

The NTDP could seek to help address issues related to poverty and inequality through access to better education, better connectivity between communities and access to jobs and the job market.

Overall, the NTDP could help to achieve the important balance of economic and social improvement that is also sustainable and respects the country's valuable natural and cultural environment.

There is an opportunity for the NTDP to support employment through the promotion and support for active tourism, including the designation of the National Cycle Network as a strategic transport facility to encourage active tourism

There is an opportunity to promote the use of active travel to primary and secondary schools through walk to school schemes. This could be adapted and extended to encourage adults to use active transport methods for travel to work and training.

There is also an opportunity through improved public transport schemes to enable people to access a wider range of employment and education options.

The NTDP presents an opportunity to improve sustainable and public transport methods to tourist locations, to facilitate increases in tourism numbers.

There is an opportunity for the NTDP to reduce congestion through promoting active travel and public transport through re-allocation of road space and integrated sustainable travel modes.

3 Well-Being Goal: A Resilient Wales

This section provides baseline data relating to the following well-being goal:

"A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change)".

The data relates primarily to:

- Air Quality;
- Biodiversity, Flora and Fauna;
- Climate and Flood Risk;
- Geology and Soils;
- Water Environment; and
- Minerals and Waste.

3.1 Air Quality

3.1.1 Relevance to the NTDP

Clean air is important for both human health and the health of the natural environment. Poor air quality is the largest environmental risk to public health in the UK, as long-term exposure to air pollution can cause chronic conditions such as cardiovascular and respiratory diseases as well as lung cancer, leading to reduced life expectancy[36]. It is estimated that the life expectancy of every person in the UK is reduced by an average of 7-8 months due to air pollution[37]. Air pollution can directly affect vegetation (e.g. through exposure to sulphur dioxide or high levels of ozone), or indirectly affect the wider environment through pollutant deposition. Deposition of pollutants can adversely affect the acid and nutrient status of soils and waters, which, in turn, can affect habitat integrity and the fauna and flora they support. The introduction of environmental protection legislation has led to significant changes in the way air quality is managed and controlled, although the planning system also has a large role to play.

Transport is the biggest source of air and noise pollution in the UK. The NTDP can affect air quality and noise pollution through ensuring decisions are based on the

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[36] Public Health England (2018) Health matters: air pollution. Available at: https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution [Accessed: 30.11.21]

[37] Defra (2011) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1. Available at: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1 [Accessed: 30.11.21]

principle of reducing emissions through the transition to implementing the sustainable transport hierarchy.

3.1.2 Baseline conditions and trends

Air pollution is a local, national and international problem caused by the emission of pollutants. In Wales, air quality is generally very good, largely due to its predominantly rural nature and historic decline in heavy industry which has resulted in a reduction in emissions of some pollutants, such as particulate matter (PM) and Nitrogen Dioxide (NO_2). However, there are some parts of the country that experience highly elevated levels of localised pollution, notably due to road traffic. Targets for NO_2, PM, nickel and polycyclic aromatic hydrocarbons are still being breached in certain parts of Wales thereby posing a threat to human health and the natural environment[38].

There are currently 44 designated Air Quality Management Areas (AQMAs) in Wales all of which are found in the south particularly centred around urban centres such as Cardiff, Newport and Swansea and relate to vehicle emissions, however, one area of elevated air pollution from an industrial source also exists associated with Port Talbot, where Tata Steel is located[39]. Nine designated AQMAs have been revoked in Wales, with the last AQMA being revoked in 2021 in the Vale of Glamorgan. Three revocations occurred in Cardiff in 2007 (two AQMAs revoked) and 2013, two in Newport in 2018, two in Rhodnna-Cynon-Taff in 2015 and 2018, and one in Powys County in 2017. Hafod-yr-ynys, a road in Caerphilly, is the most polluted road in the UK outside London. It exceeded hourly NO_2 limits on 60 occasions in 2016 (42 times more than allowed under EU law) and its annual mean NO_2 is almost double the EU limit[40].

Road transport accounts for nearly a third of all NO_2 emissions in the UK and transport is the biggest source of air pollution in the UK. In 2020, for NO_2, there were 10 days with 'moderate' concentrations, 2 days of 'high' and no days of 'very high'. Bridgend Park Street and Hafod-yr-ynys monitoring sites exceeded their annual

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[38] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]
[39] Welsh Government (2021) Air Quality in Wales: Air Quality Management Areas. Available at: https://airquality.gov.wales/laqm/air-quality-management-areas [Accessed: 30.11.21]
[40] National Assembly for Wales (2019) Air Quality: Research Briefing. Available at:https://research.senedd.wales/media/2gmjaank/19-036-web-eng.pdf [Accessed: 30.11.21]

mean objective of 40μg m-3 for NO_2[41]. Levels of Nitrogen Oxides (NO_x) emissions have seen a significant decrease across the UK between 1990 and 2019[42] (see Figure B-8). The major contributor to NO_x emissions in the UK is road transport, which is the sector that has also recorded the biggest decrease in emissions since 1990.

Figure B-8: UK annual emissions of nitrogen oxides by 2019 major emissions sources: 1990, 2005, 2018 and 2019

Source: Ricardo Energy & Environment
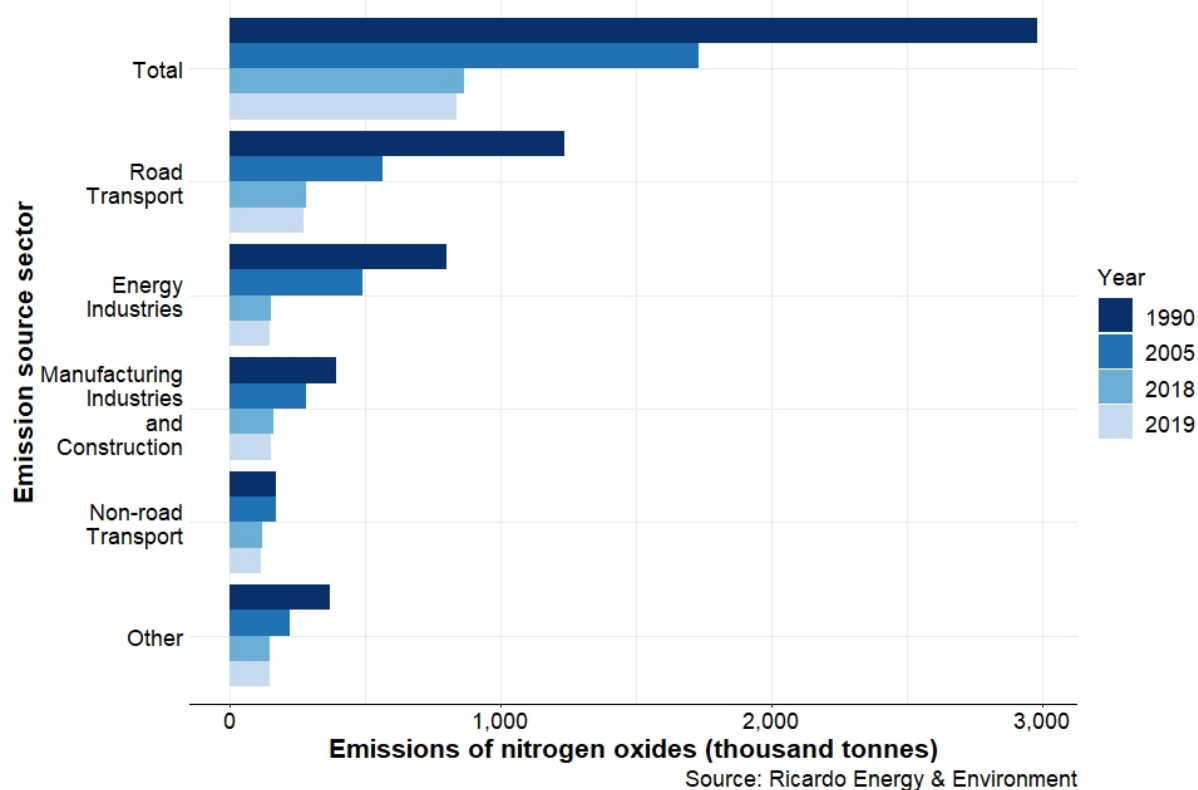
Ammonia also remains an issue, both as a local air pollutant and as a contributor to the formation of secondary particulate matter, including the formation of ultra-fine particulates ($PM_{2.5}$), which can have a more serious impact on human health than the larger PM_{10}s. Indeed, 88% of sensitive Welsh habitats are subject to nitrogen deposition in excess of critical load limits, including 61% of ancient semi-natural woodland in Wales experiencing ammonia concentrations above the Critical Level for lichen- and moss-rich ecosystems. Similar exceedances occur in bogs,

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[41] Welsh Government (2020) Air Quality in Wales 2020. Available at: https://airquality.gov.wales/sites/default/files/documents/2021-10/AQ-Wales-2020_English_Final.pdf [Accessed: 30.11.21]
[42] DEFRA (2021) Emission of air pollutants in the UK – Nitrogen oxides (NOx). Available at: https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-nitrogen-oxides-nox [Accessed: 01.12.21]

heathlands and acid grasslands[43]. This can lead to direct toxicity in the ecosystems and changes in species assemblages. Ammonia can arise, principally from the freight sector, as a result of ammonia slippage from Selective Catalytic Reduction, designed to reduce releases of nitrous oxides.

Wales has some of the worst air quality in the UK, which is surprising given its low population density and relatively small cities. A report in 2018 found that Cardiff and Port Talbot both have higher PM_{10} levels than either Birmingham or Manchester. There are also five sites on motorway trunk roads (where NO_2 concentrations are above the limit level) that have had speed limits introduced in June 2018 in order to improve the air quality[44].

Figure B-9 shows the trends in ambient air pollution from 1990 to 2020[45]. Whilst there were no instances in 2020 of EU PM_{10} air quality limits being reached; NO_2 limits were exceeded at two sites. NO_2 and is the catalyst for the designation of all (except one) Air Quality Management Areas (AQMAs) in Wales. Road transport accounts for nearly a third of all NO_2 emissions in the UK.

While ozone is not emitted directly from *vehicles*, the compound is formed in the atmosphere through reactions involving *vehicle emissions, including* hydrocarbons *and nitrous oxides*, and sunlight. The rate at which the reactions proceed is related to both temperature and intensity of the sunlight.

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[43] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]
[44] Welsh Government (2019) Tackling roadside nitrogen dioxide concentration in Wales. Available at: https://gov.wales/sites/default/files/publications/2019-10/interim-data-on-no2-concentrations-for-the-motorway-and-trunk-road.pdf [Accessed: 01.12.21]
[45] Welsh Government (2020) Air Quality in Wales 2020. Available at: https://airquality.gov.wales/sites/default/files/documents/2021-10/AQ-Wales-2020_English_Final.pdf [Accessed: 30.11.21]

Figure B-9: Ambient Air Pollutant Trends in Wales 1990-2020
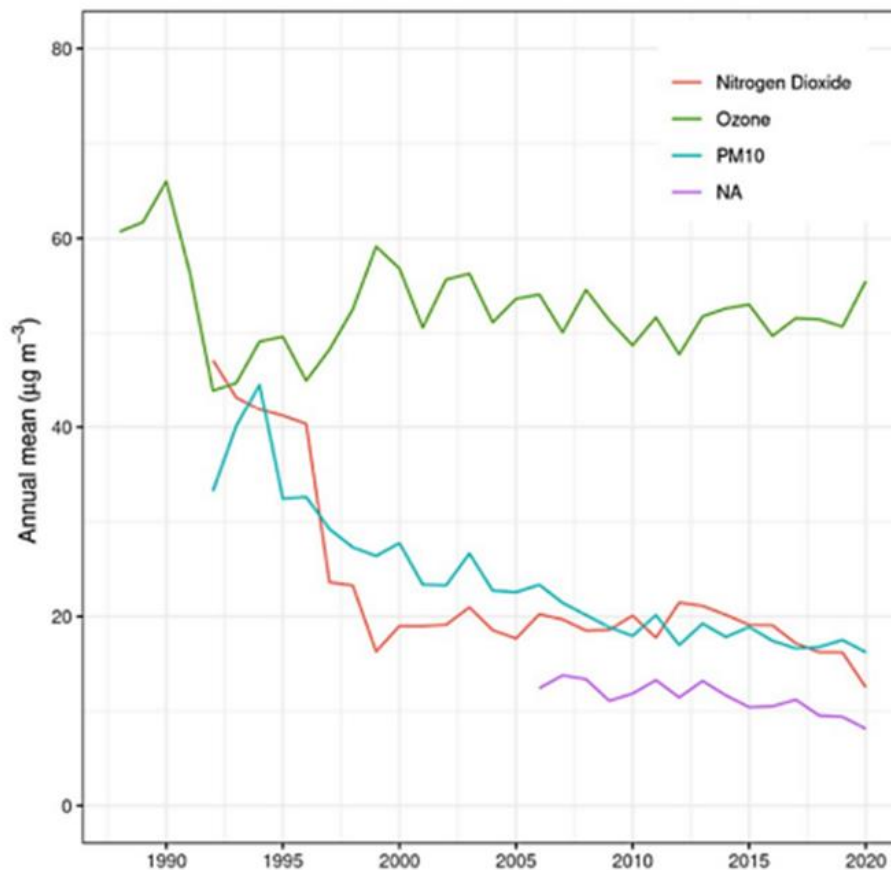
Source: Ricardo Energy, 2020

3.1.3 Data gaps

- Do the poor air quality hot spots have any relation to areas of economic disparity?
- The individual transport mode contributions to air quality as opposed to road transport.

3.2 Noise

3.2.1 Relevance to the NTDP

Noise pollution can have a damaging effect on people's health and the environment, from disrupting protected habitats to causing hearing loss and tinnitus. Transport is responsible for a lot of noise pollution in the UK. The NTDP must plan transport networks to avoid areas sensitive to noise pollution. It must also seek to implement measures that will seek to reduce traffic overall, leading to a reduction in overall noise pollution and reduction in pressure on tranquil environments.

3.2.2 Baseline Conditions and trends

Noise pollution from railways mostly takes place in the south of Wales around Cardiff[46]. Figure B-10 shows the noise from railways in 2019.

Figure B-10: Noise from railways in Wales
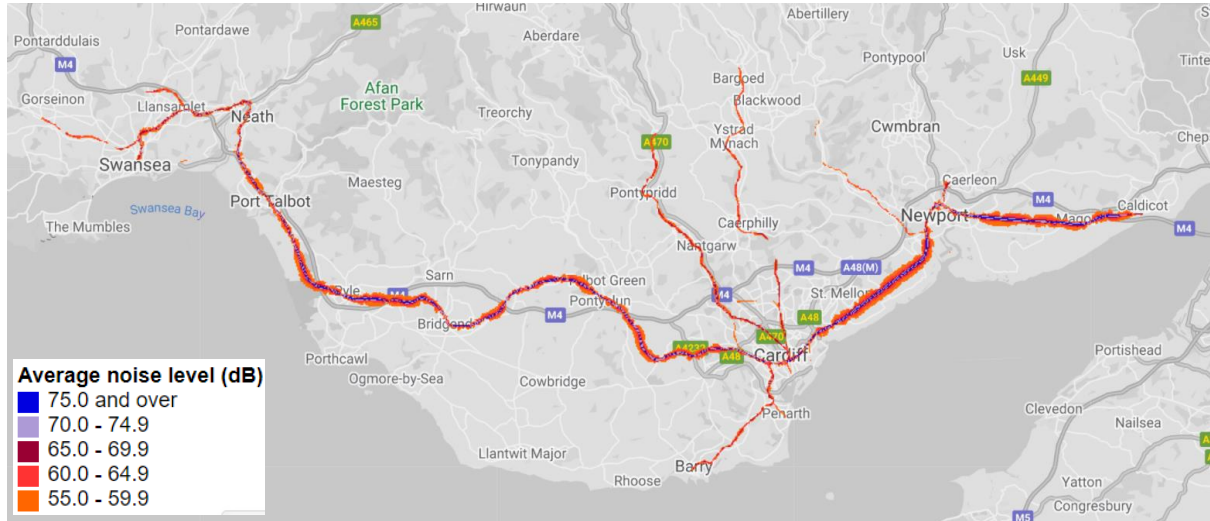
Source: Extrium

Figure B-11 highlights that road noise emitted from roads is focused around the M4 in South Wales and adjoining 'A' roads. The A55 and adjoining 'A' Roads in North Wales, and the A483 in Mid Wales, also contribute to high levels of noise pollution[47].

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[46] Extrium (2019) Wales Noise Viewer – Rail. Available at: http://extrium.co.uk/walesnoiseviewer.html [Accessed: 01.12.21]
[47] Extrium (2019) Wales Noise Viewer – Roads. Available at: http://extrium.co.uk/walesnoiseviewer.html [Accessed: 01.12.21]

Figure B-11: Noise from road in Wales
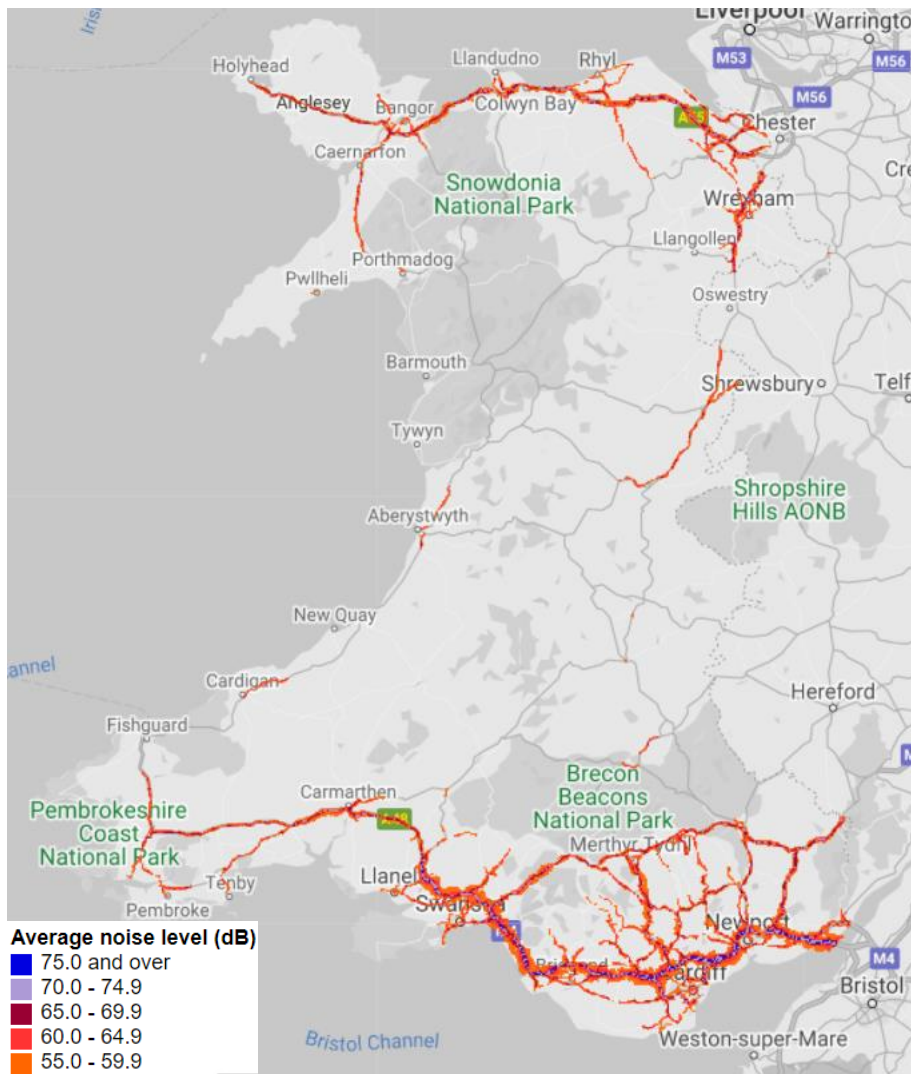
Source: Extrium

The Welsh government has received many complaints about transport noise, the location of these complaints is shown in Figure B-12[48].

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[48] Welsh Government (2018) Noise and Soundscape Action Plan 2018 – 2023. Available at: https://gov.wales/sites/default/files/publications/2019-04/noise-and-soundscape-action-plan.pdf [Accessed: 01.12.21]

Figure B-12: Transport noise complaints received by the Welsh Government in 2018
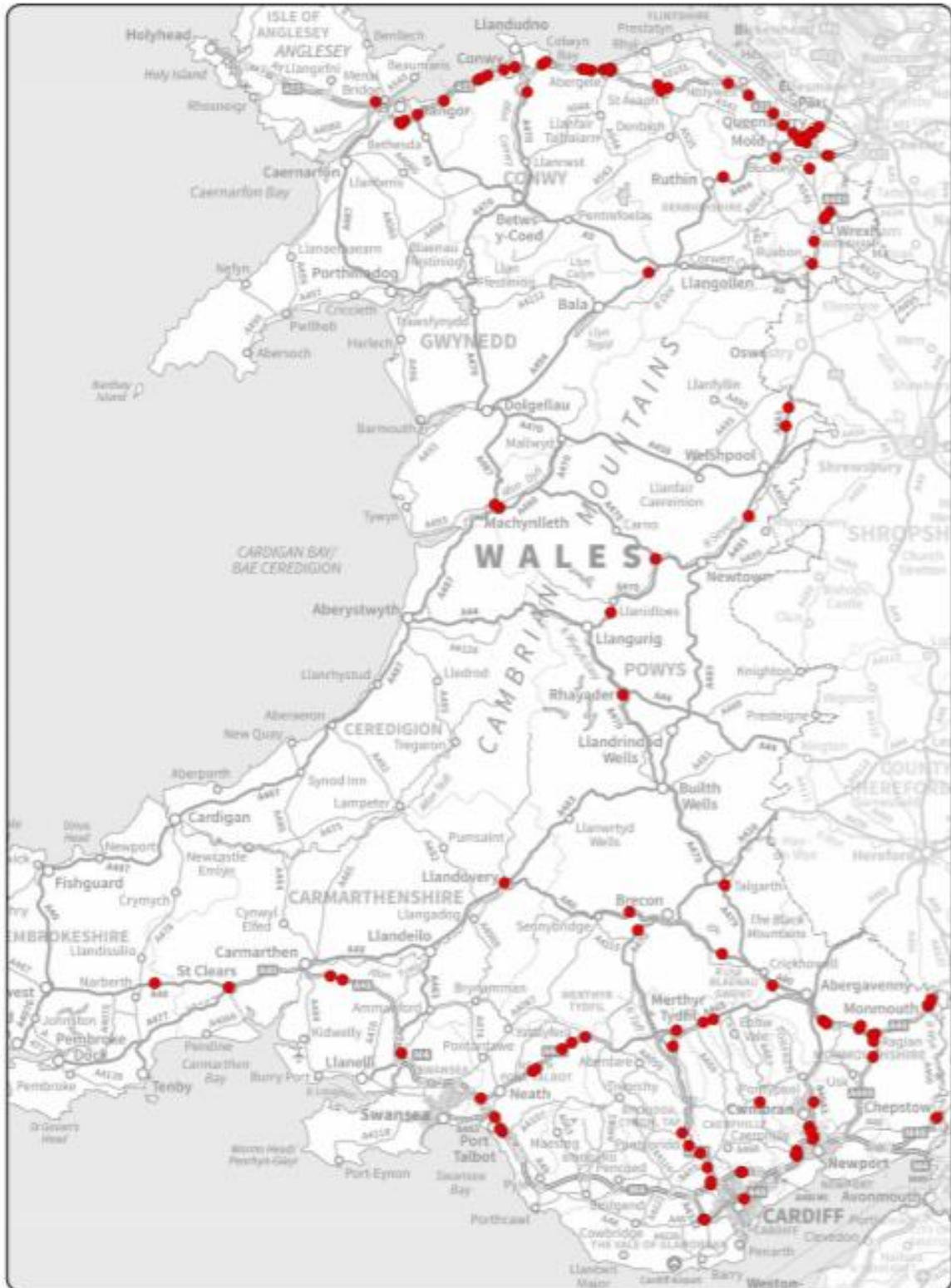
Source: Welsh Government, 2018

When surveyed on noise complaints, 24% of Welsh people said they had regularly been bothered by noise from outside their home in the previous 12 months, 45% of

these complaints were related to traffic, business or factories[49]. It should be noted that noise is now considered a form of air pollution and as such is covered by Welsh Government's Clean Air Plan[50].

In Wales there is an official designation for areas of tranquillity, the study for which was carried out in 2009, these different areas are mapped out below in Figure B-13[51].

[49] Welsh Government (2018) Noise and Soundscape Action Plan 2018 – 2023. Available at: https://gov.wales/sites/default/files/publications/2019-04/noise-and-soundscape-action-plan.pdf [Accessed: 01.12.21]

[50] Welsh Government (2020) The Clean Air Plan for Wales: Healthy Air, healthy Wales. Available at: https://gov.wales/clean-air-plan-wales-healthy-air-healthy-wales [Accessed: 01.12.21]

[51] NRW (2009) Tranquil Areas Wales. Available at: http://lle.gov.wales/catalogue/item/TranquilAreasWales [Accessed: 01.12.21]

Figure B-13: Map of Tranquil areas Wales 2009

Legend:
- Undisturbed (green)
- Urban (cyan)
- Zone B (magenta)
- Zone C (blue)

Source: NRW
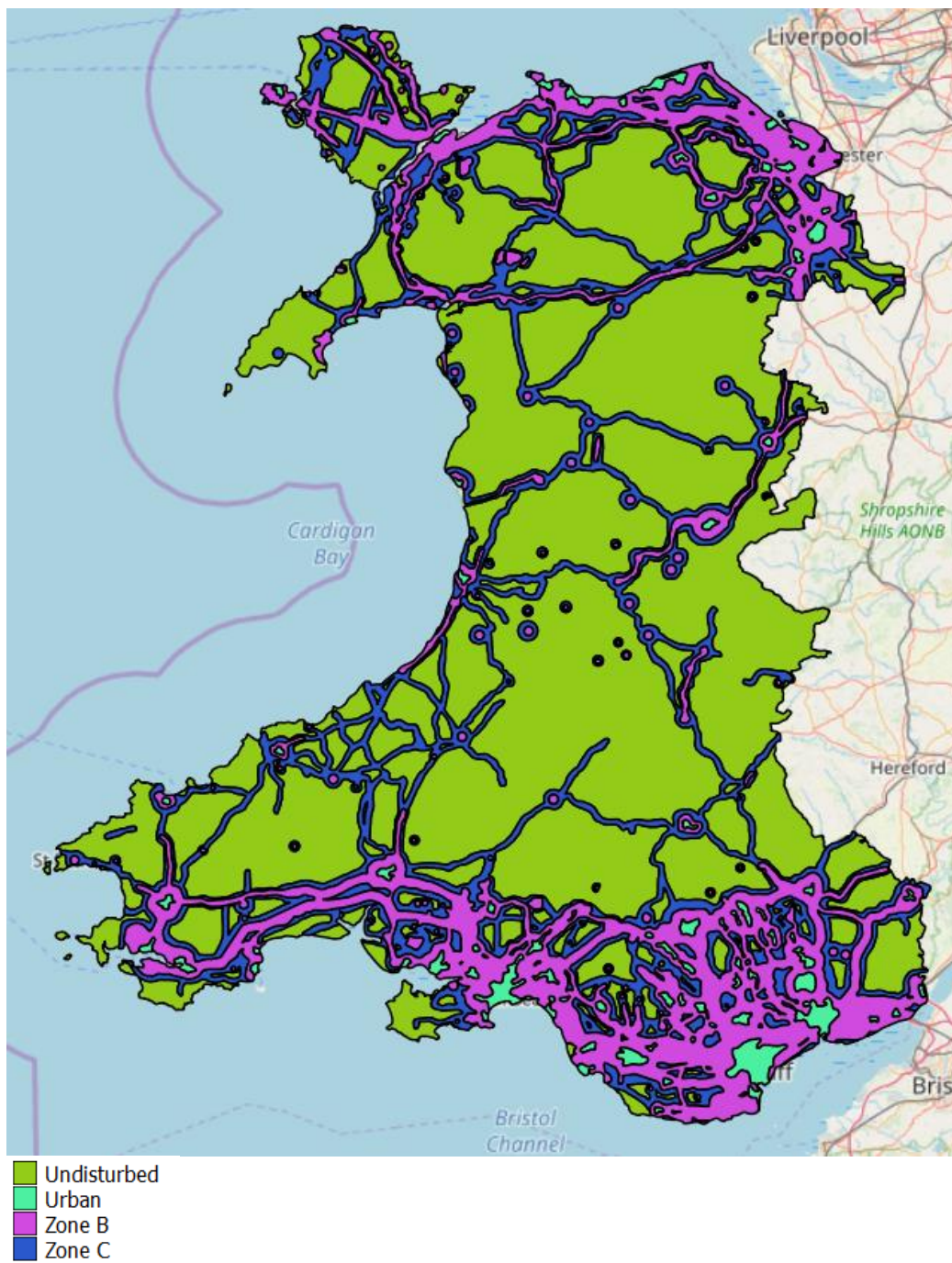
3.2.3 Data gaps

- Do noise complaints made in Wales have any relation to economic disparity e.g. poorer households may be within closer proximity to factories or roadsides.

3.3 Biodiversity, Flora and Fauna

3.3.1 Relevance to the NTDP

Biodiversity refers to the variety of all living organisms. It can be seen at a number of levels, in terms of the diversity within species, the diversity between different species, and the diversity of different ecosystems (i.e., the environments within which species live). High levels of diversity ensure habitats and species are more robust and able to cope with changes in the environment, both in terms of natural fluctuations and those caused by human activity, therefore supporting their long-term survival.

Ensuring the protection of biodiversity, including important marine and terrestrial habitats, species and protected sites, as well as biodiversity in general (including non-designated sites) and its resulting benefits in terms of ecosystems services, in turn, will have benefits to an improved economic and social health of an area. Therefore, conserving biodiversity not only fulfils our global responsibility but will improve the quality of life for Wales's residents and help maintain its attraction as a place to live and visit.

The NTDP can significantly influence biodiversity through helping to guide decisions through the planning of transport infrastructure to ensure features of ecological importance, as well as their connectivity and the ecosystems services they provide, are protected and enhanced. The NTDP has the potential to make a significant contribution to national and local biodiversity targets, particularly for those habitats and species that occur commonly on the Welsh trunk road and motorway network. The Trunk Road Estate Biodiversity Action Plan (TREBAP) audit of the network identified those habitats and species that are most at risk from the operation of the trunk road network, and those that could benefit from appropriate management of the soft estate.

The Welsh Assembly Government soft estate extends across the whole of Wales, traversing a wide variety of rocktypes, landscapes and habitats, from purple moorgrass and rush pasture to reedbed, coastal floodplain grazing marsh, and rock habitats. The associated soft estate currently extends to approximately 1700 hectares.

Increasingly, the soft estate is being acknowledged as holding areas of value for biodiversity. This can be because of the presence of remnants of original habitats, the often low ecological value of adjacent land, its value as a wildlife corridor and in some cases, as a result of the management applied. Road verges can be of particular value if they comprise intrinsically valuable habitat that also adjoins larger areas of the same habitat type, such as Sites of Special Scientific Interest or local wildlife sites.

The RSPB[52] has provided guidance on the potential impacts to be considered in transport (particularly road) schemes. These include:

Habitat loss effects

- Permanent habitat loss on site
- Temporary habitat loss on site e.g. land taken up by construction equipment/temporary roads
- Physical removal of soils and vegetation

Habitat fragmentation effects

- Reduced habitat connectivity in the landscape – can disrupt the established relationships between different habitats or patches of the same habitat e.g. routes linking sleeping or roosting areas to feeding grounds or migration routes may be physically interrupted
- Barrier effects on species – can affect the movement of wildlife: population viability may be affected if populations of a scarce species are separated especially if they have poor dispersal activities
- Increased mortality due to wildlife casualties
- Edge effects – if vegetation is removed the new linear gap creates a new microclimate and a change in physical conditions which can extend varying distances from the road edge. This newly created habitat may provide habitat for edge species and facilitate dispersal for some species.
- Reduced patch size - may reduce populations of key plant species, which in turn may affect the abundance of insects including butterflies they support.
- These require a minimum area to sustain viable populations and may in turn affect other species e.g. predatory birds. Also small patch size may not be able to support the range of habitat structure needed to sustain a range of different species.

Changes in habitat quality and other indirect impacts

Changes to natural processes

- Groundwater regimes - changes in the groundwater regime may adversely affect habitats dependent on the water table e.g., marsh, fen and bog.
- Depending on the geology, lowering the water table can impact habitats a considerable distance from the development.
- Stream/river flows - Increases or reductions in natural rates of flow e.g., flash flooding from hard surfaces may affect aquatic ecosystems.

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[52] RSPB (2000) Biodiversity and Environmental Impact Assessment: A Good Practice Guide for Road Schemes. Available at: http://ww2.rspb.org.uk/Images/BiodiversityImpact_tcm9-257019.pdf [Accessed: 01.12.21]

- Accumulation of construction spoil can alter flow, volume and composition of water. These increased solids increase turbidity which can cause abrasion damage and gill blockage in fish and lead to the disappearance of filter feeding invertebrates.
- Flooding regimes.
- Soil leaching and changes in soil structure.
- Soil erosion patterns.

Water pollution

Water pollution from accidental spillages, de-icing chemicals, runoff, and road spray can lead to adverse changes in aquatic biodiversity as can changes in sediment and solid loads in watercourses.

Soil pollution

Road spray, vehicle emissions and dust and other particulates (including aggregate and sealant materials used in road construction) can be deposited directly on the land or by polluted precipitation and by polluted

groundwater. These can change soil pH and structure. Soil conditions can also greatly alter the effective toxicity of pollutants.

Air pollution

Emissions of lead, zinc, nitrogen, de-icing materials and particulates such as dust can affect biodiversity.

Changes to microclimate

Light and radiation emissions may alter the microclimate. These microclimatic changes may be sufficiently great to alter the performance of some species of plants and animals.

Windfunnelling

Where woodlands are bisected interior trees become exposed and liable to wind-blow effects leading to changes in the new marginal vegetation. Cuttings can have an additional windfunnelling 'jet' effect increasing

windblow and evaporation that may result in a water supply shortfall which may lead to changes in species composition.

Disturbance

Fauna can be disturbed by noise, lighting and vibrations from traffic and by road lighting.

Reduced visibility

Road structures e.g. bridges and viaducts may cause problems for certain birds/mammals by reducing visibility

Introduction of exotics

The edge habitat or ecotone and traffic on the road may facilitate dispersal for some species. This may result in dispersal and establishment of alien and invasive species or pest species that may have secondary effects on biological communities.

Changes to habitat management eg frequency of verge cutting.

Public pressure

Surrounding habitats may be placed under increasing public pressure, because of access, leading to effects including the disturbance of animals, and physical destruction of ground flora. Also, litter may accumulate along road

Offsite habitat losses and changes in habitat quality

In relation to the obtaining and disposal of materials e.g., mining for aggregates for road building.

Cumulative effects

Even relatively minor habitat loss, fragmentation and indirect impacts of an individual road project can, when added to other past, present and reasonably foreseeable future impacts of other projects and activities, contribute to significant impacts in an area. All relevant types of future projects and activities should be considered (i.e. not just other road projects) including induced development.

Positive effects

- Habitat enhancement
- Improved habitat management
- New structures e.g. bridges and tunnels may provide habitats for some species e.g. bats
- Habitat creation

3.3.2 Baseline conditions and trends

The land area of Wales covers 2,078,224 ha. The Welsh marine area extends out to 12 nautical miles, covering just under 15,000 km^2 or 41% of the territory of Wales.

Wales has a wide representation of species across a broad range of taxonomic groups with estimates varying from 25,000 to 50,000 different species of animals, plants and other organisms. There are 21 Special Protection Areas (SPAs) for internationally important populations of birds and 95 Special Areas of Conservation (SACs) for other threatened species and natural habitats[53]. There are 1,078 Sites of

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[53] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]

Special Scientific Interest (SSSI) in Wales, covering over 12% of the nation's land area. Many of the same species are also found on sites that qualify for their habitat.

Species

The 2019 Joint Nature Conservation Committee (JNCC) Habitats Directive Report found that 46% of listed species were in favourable conservation status at the UK level[54]. The figure is the same for species occurring in Wales. In Wales, 44% of species are reported as stable, while 17% are shown to be deteriorating. Following global trends, Wales continues to face biodiversity loss, with 1 in 6 species that have been assessed in Wales at risk of extinction[55].

In Wales, the interim Section 7 list of the Environment (Wales) Act[56] has 557 species and 55 habitats of principle importance. These were originally selected for the Section 42 list of the Natural Environment and Rural Communities Act 2006[57] for prioritised action from the UK Biodiversity Action Plan using criteria based on the level of threat they face, the level of responsibility in Wales for their populations and whether remedial action could be taken to improve their status. The list includes species as diverse as slow-worm (*Anguis fragilis*), hornet robber fly (*Asilus crabroniformis*) and long-snouted seahorse (*Hippocampus guttulatus*).

An assessment of the status of some of the interim Section 7 species in comparison to their condition at the time of the last Biodiversity Action Plan report in 2008 is shown in Box B-1 below. Official lists of priority species (Section 7 for Wales) for each UK country confirm there are 2,890 species on the combined list. By 2016, the index of relative abundance of priority species in the UK had declined to 40% of its baseline value in 1970An assessment of trends of some priority species is presented in Box B-1[58].

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[54] JNCC (2019) Article 17 Habitats Directive Report 2019. Available at: https://jncc.gov.uk/our-work/article-17-habitats-directive-report-2019/ [Accessed: 01.12.21]

[55] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]

[56] Environment (Wales) Act 2016. Available at: https://www.legislation.gov.uk/anaw/2016/3/contents/enacted [Accessed: 01.12.21]

[57] Natural Environment and Rural Communities Act 2006. Available at: https://www.legislation.gov.uk/ukpga/2006/16/contents [Accessed: 01.12.21]

[58] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]

Box B-1: Assessment of the state and trends of some of the Welsh priority species

Of the 6,500 species in Wales with an IUCN Regional Red List assessment, 8% are threatened with extinction from Great Britain.

The abundance indicator of 33 butterfly species has fallen by 52% in Wales since 1976. Across the UK moths have declined by 25% (1970-2016), with insects experiencing a 10% decrease in average distribution between 1970 and 2015.

Since 1970, the UK abundance of priority species has declined by 60% and their distribution has declined by just over a quarter. Declines in farmland birds have been more severe than those for any other habitat, with a decline of 54% in the Farmland Bird Indicator since 1970.

Between 1960 to 2018, invasive and non-native species have become more prevalent, increasing the pressure on native biodiversity.

However, there are some positives: in Wales, monitoring of 37 wintering water bird species since 1970 shows a statistically significant increase in average abundance of 30% and the mammal abundance indicator shows a 10% increase between 2006 and 2016.

A study of the impact of the 1995 drought on butterfly abundance showed that some widespread species, including large skipper (*Ochlodes sylvanus*) and green-veined white (*Pieris napi*), were particularly drought-sensitive. The impact of extreme weather events is also relevant to many invertebrates and birds on a yearly basis.

Climate change impacts such as acidification, sea temperature rises and extreme weather events have the potential to affect marine species through a number of factors including prey population dynamics, reproduction and distribution.

Habitats

The land-cover of Wales can be divided broadly into semi-natural habitats and modified land-cover types. Semi-natural habitats retain many of their characteristic species. Modified land-cover types include the built environment as well as land where ecological processes and species composition have been hugely altered, for example, improved grassland, arable land and conifer plantations. The representation of semi-natural habitat varies significantly across Wales. The Welsh lowlands are highly modified as shown in Figure B-14. Approximately 31% of Wales is considered to be semi-natural habitat. At least 40% of Welsh habitats are spread out in such small patches that this implies low resilience, with very few habitats reported as being in good condition. In Wales connectivity is at its lowest in lowland

habitats where the landscape has been simplified by the loss of semi-natural habitats and intensively managed land dominates[59].

Figure B-14: Summary of the representation of semi-natural habitats and modified land-cover types in Wales

Source: Blackstock et al, 2010
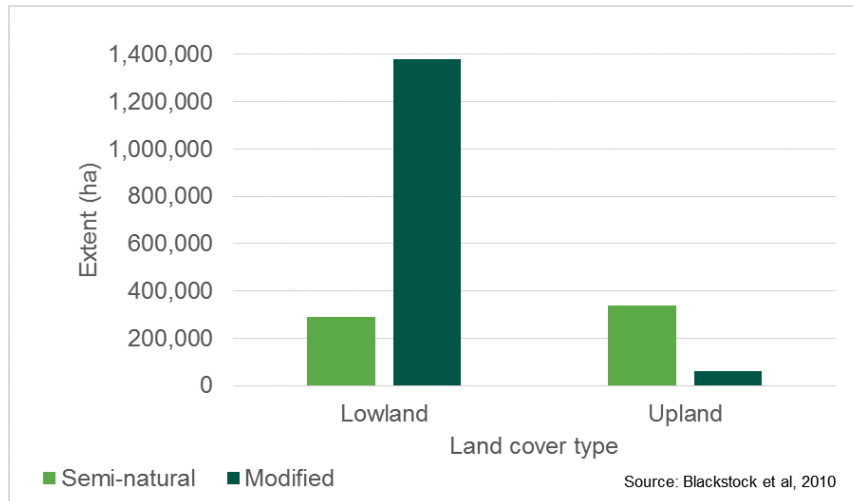
The extent, condition and trends of terrestrial species in Wales are influenced primarily by habitat management and by climate change. Habitat management directly influences plant community composition, amounts of bare substrate, shading and vegetation structure. Shading due to scrub encroachment, following changes in grazing regime, can be as damaging for butterflies and many other species groups as overgrazing or agricultural improvement. These effects are compounded by direct habitat loss which leads to fragmentation of suitable habitat types or conditions and the increasing influence of nutrient enrichment which leads to changes in plant communities and patterns of growth. As above, climate change is also a significant threat to both habitats and the species they support.

Habitats of Principal Importance

In Wales, the interim Section 7 list has 55 habitats of principal importance, which were originally selected for the Section 42 list of the Natural Environment and Rural Communities Act 2006. These habitats cover terrestrial, freshwater and marine. They include blanket bog, ponds and seagrass beds and were selected for prioritised action from the UK Biodiversity Action Plan (BAP) using criteria based on the level of threat they face, their relative importance as habitat in Wales and whether remedial action will be able to improve their status. Terrestrial habitats of principle importance extend over a total area of 387,300 ha. The most extensive of these in Wales (each

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[59] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]

with a resource of greater than 30,000 ha) include upland heathland, blanket bog, upland oak woodland, purple moor-grass and rush pasture, lowland dry acid grassland and coastal and floodplain grazing marsh. However, some key habitats of conservation importance are scarce, small in extent and highly vulnerable. Marine Intertidal BAP habitats extend over 15,000 ha. The most extensive intertidal BAP habitat, mudflats, covers over 14,000 ha and is found all around the coast of Wales. Honeycomb worm reefs cover 476 ha and are mainly found in South and West Wales. .

Ancient Woodland

The area of Ancient Woodland in Ancient Wood Inventory (AWI) 2011[60] is 33,000ha (53 percent) greater than in AWI 2004. Largely, the revised figure consists of Ancient Semi-Natural Woodland (ASNW) in private ownership (29,000ha). 5,000 ha more Ancient Woodland has been identified on the Welsh Government Woodland Estate managed by Natural Resources Wales, compared with the AWI 2004. The AWI shows that South Wales Valleys and South Powys are the most populous ancient woodland areas. Most of these woodland resources are designated Plantations on Ancient Woodland Sites.

European and UK Protected Sites

European protected sites are designated either as exemplars of listed habitat and species types or specifically to conserve wild birds that are listed as rare and vulnerable. The protection of these sites makes a significant contribution to conserving the habitats and wildlife species that live there. Protected sites also exist in the marine environment, and work continues to ensure these sites contribute to an ecologically coherent network of marine protected areas in UK seas.

Special Protection Areas (SPA)

SPAs are strictly protected sites classified in accordance with Article 4 of the EC Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species[61].

SPAs in Wales include the coastline between Burry Port and Saundersfoot, sections of the Pembrokeshire coast and the coastline from Penarth to the Severn Bridge in South Wales. The area between Llandrindod Wells and Tregaron in Mid Wales and the South Gwynedd area and Northern coastline in North Wales. The spatial

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[60] NRW (2021) Ancient Woodland Inventory. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/ancient-woodland-inventory/?lang=en [Accessed: 01.12.21]
[61] JNCC (2020) Special Protection Areas – overview. Available at: https://jncc.gov.uk/our-work/special-protection-areas-overview/ [Accessed: 01.12.21]

distributions of Welsh SPAs can be found in Figure 1 - Designated Nature Conservation Sites.

Special Areas of Conservation (SAC)

A Special Area of Conservation (or SAC) is a site designated under the Habitats Directive. These sites, together with SPAs, are called Natura 2000 sites and they are internationally important for threatened habitats and species[62].

SACs in Wales include the coastline between Burry Port and St. Davids; sections of the Pembrokeshire coast; and the coastline from Penarth to the Severn Bridge in South Wales. Large sections of the coastline between Cardigan up to Caernarfon in Mid Wales and the coast between Bangor and Conwy in North Wales are also protected under this designation. The spatial distributions of Welsh SACs can be found in Figure 1 – Designated Nature Conservation Sites.

Ramsar Sites

The Ramsar Sites in Wales include wetlands that are considered to of international importance under the Ramsar Convention[63]. Wales currently has 10 Ramsar Sites including The Dee Estuary, Llyn Idwal, Llyn Tegid and Corsydd Mon a Llyn in the north, Cors Caron, Cors Fochno and Midland Meres and Mosses in Mid Wales/Midlands and Burry Inlet, Crymlyn Bog and Severn Estuary in the south. The spatial distributions of Welsh Ramsar sites can be found in Figure 1 – Designated Nature Conservation Sites.

Sites of Special Scientific Interest (SSSI)

SSSIs are the most important sites for Wales' natural heritage. They help conserve and protect the best of the nation's wildlife, geological and physiographical heritage for the benefit of present and future generations. SSSIs in Wales include coastline, freshwater, upland and lowland sites and range from small fens or sand dunes to woodlands and vast reaches of mountain[64]. They contain important types of land, plants and wildlife. Geological sites range from quarries to rocky outcrops and massive sea-cliffs . As demonstrated in Figure 1 – Designated Nature Conservation Sites, the SSSIs in Wales are geographically spread across the country with a slight

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[62] JNCC (2020) Special Areas of Conservation – overview. Available at: https://jncc.gov.uk/our-work/special-areas-of-conservation-overview/ [Accessed: 01.12.21]

[63] JNCC (2018) Designated and Proposed Ramsar Sites in the UK, and the UK's Overseas Territories & Crown Dependencies. Available at: https://jncc.gov.uk/our-work/ramsar-sites/#wales [Accessed: 01.12.21]

[64] NRW (2021) Sites of Special Scientific Interest (SSSI). Available at: http://lle.gov.wales/Catalogue/Item/ProtectedSitesSitesOfSpecialScientificInterest/?lang=en [Accessed: 01.12.21]

cluster in the rural areas North Powys and South Gwynedd. As of 2019 there are 1,080 SSSIs within Wales as of November 2021.

National Nature Reserves

There are a total of 76 National Nature Reserves (NNRs) in Wales which tend to occupy the coastal areas of the country[65]. There is a strong presence of nature reserves in the coastal areas of Wales. The highest concentration is to the east of the Llyn Peninsula. The spatial distributions of Welsh NNRs can be found in Figure 1 – Designated Nature Conservation Sites.

Marine Conservation Zones (MCZ)

The marine environment of Wales includes 2,740 km of coastline. The marine ecosystems in Wales form part of two wider biogeographic regions: the Irish Sea, and the Western Channel and Celtic Sea. There is a high diversity of habitats and species including sediment and biogenic habitats, sessile and highly mobile species. A proportion of marine habitats are surveyed and mapped, but for some areas our understanding only comes from modelling.

In 2014, the first MCZ in Welsh waters was established[66]. Skomer MCZ is situated around the island of Skomer and the Marloes Peninsula in Pembrokeshire, South West Wales. This is clearly visible in Figure B-15 below.

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[65] NRW (2018) National Nature Reserves. Available at: https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/protected-areas-of-land-and-seas/national-nature-reserves/?lang=en [Accessed: 01.12.21]
[66] NRW (2021) Marine Conservation Zones. Available at: http://lle.gov.wales/Catalogue/Item/ProtectedSitesMarineNatureReserves/?lang=en [Accessed: 01.12.21]

Figure B-15: Skomer Marine Conservation Zone

The Environmental and Rural Affairs Monitoring & Modelling Programme (ERAMMP) has accumulated and carried out many surveys of the habitats of Wales that is used to inform SoNaRR reports, they include both areas where the habitats excel and areas that need improvement[67]. These areas that need improvement should be considered in the NTDP:

- 20% of vegetation plots in Wales are on neutral grassland, but only <1% are on semi-natural neutral grassland.
- Topsoil carbon declined in the uplands since 2007. This includes acid grassland.
- 74-90% of farmed grassland fields contain no trees.
- Recent topsoil carbon declines in the uplands include Mountain, Moor and Heath.

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[67] UK Centre for Ecology & Hydrology (2020) ERAMMP Report-30: Analysis of National Monitoring Data in Wales for the State of Natural Resources Report 2020. Available at: https://erammp.wales/sites/default/files/ERAMMP%20Rpt-30%20GMEP%20re-analysis%20for%20SoNaRR2020%20v1.0.pdf [Accessed: 01.12.21]

3.3.3 Data gaps

No significant data gaps have been identified for this topic at this stage. Information in this section comes mostly from the SoNaRR 2020 report.

3.4 Climate Change Adaptation and Flood Risk

3.4.1 Relevance to the NTDP

Measurements indicate that over the past century air and ocean temperatures have increased, rates of ice melt in valley glaciers and ice caps have accelerated and sea levels have risen. However, the extent of future warming and both the nature and geographical distribution of its impacts are the subject of much greater uncertainty. Scientists predict that climate change will result in increased sea-levels, increased average annual temperatures, warmer wetter winters, hotter drier summers and an increase in extreme weather events. These factors have significant implications for both our human and natural environment.

The implications of climate change for the NTDP are related to the need to arrest the causes of climate change, and to adapt to future conditions. Flooding is a key area in which the effects of climate change are felt locally.

3.4.2 Baseline conditions and trends

Flooding is a key area in which the effects of climate change are felt locally. Flood risk is a significant issue in Wales including coastal, fluvial and surface water flooding.

Figure B-16 presents the Development Advice Map from Technical Advice Note (TAN) 15: Development and Flood Risk[68], including the identification of areas served by significant infrastructure including flood defences; areas without flood defences; areas known to have had past flooding events; and areas at little or no risk of fluvial coastal or tidal flooding. TAN 15 was due to be updated in December 2021, but this has been delayed to June 2023[69]. An accurate reflection of flood risk information for Wales can be found in the Flood Mapping for Planning[70] interactive map, which should be used alongside planning to understand localised flood risks. The Flood

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[68] Welsh Government (2004) Technical Advice Note 15: Development and Flood Risk. Available at: https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf [Accessed: 01.12.21]
[69] Welsh Government (2021) Letter sent by the Minister for Climate Change to local authorities on the suspension of TAN 15: 23 November 2021. Available at: https://gov.wales/technical-advice-note-tan-15-development-flooding-and-coastal-erosion [Accessed: 01.12.21]
[70]Natural Resources Wales (2022) Flood Map for Planning. Available at: https://flood-map-for-planning.naturalresources.wales/ [Accessed 01.02.22]

Map for Planning will be updated every six months and provides the most accurate information.

TAN 15 notes that, historically, the topography of Wales has generally resulted in transport infrastructure being concentrated on valley floors, lowland areas and in the coastal fringes. The North West, North East, and South East regions are areas that have a high risk of flooding due to the extent of watercourses. A large proportion of the Welsh population is also located within urban centres along the coastal plain in North and South Wales, particularly Cardiff, Swansea and Newport and the coastal settlements of North Wales. Shoreline Management Plans (SMPs) provide a large-scale assessment of the risks associated with coastal processes that result in both erosion and flooding and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner. Wales is covered by the following SMPs:

- SMP 19 Anchor Head to Lavernock Point (Severn Estuary);
- SMP 20 Lavernock Point to St Ann's Head (South Wales);
- SMP 21 St Ann's Head to Great Ormes Head (West of Wales); and
- SMP 22 Great Ormes Head to Scotland (North West England and North Wales).

Figure B-16: Development Advice Map
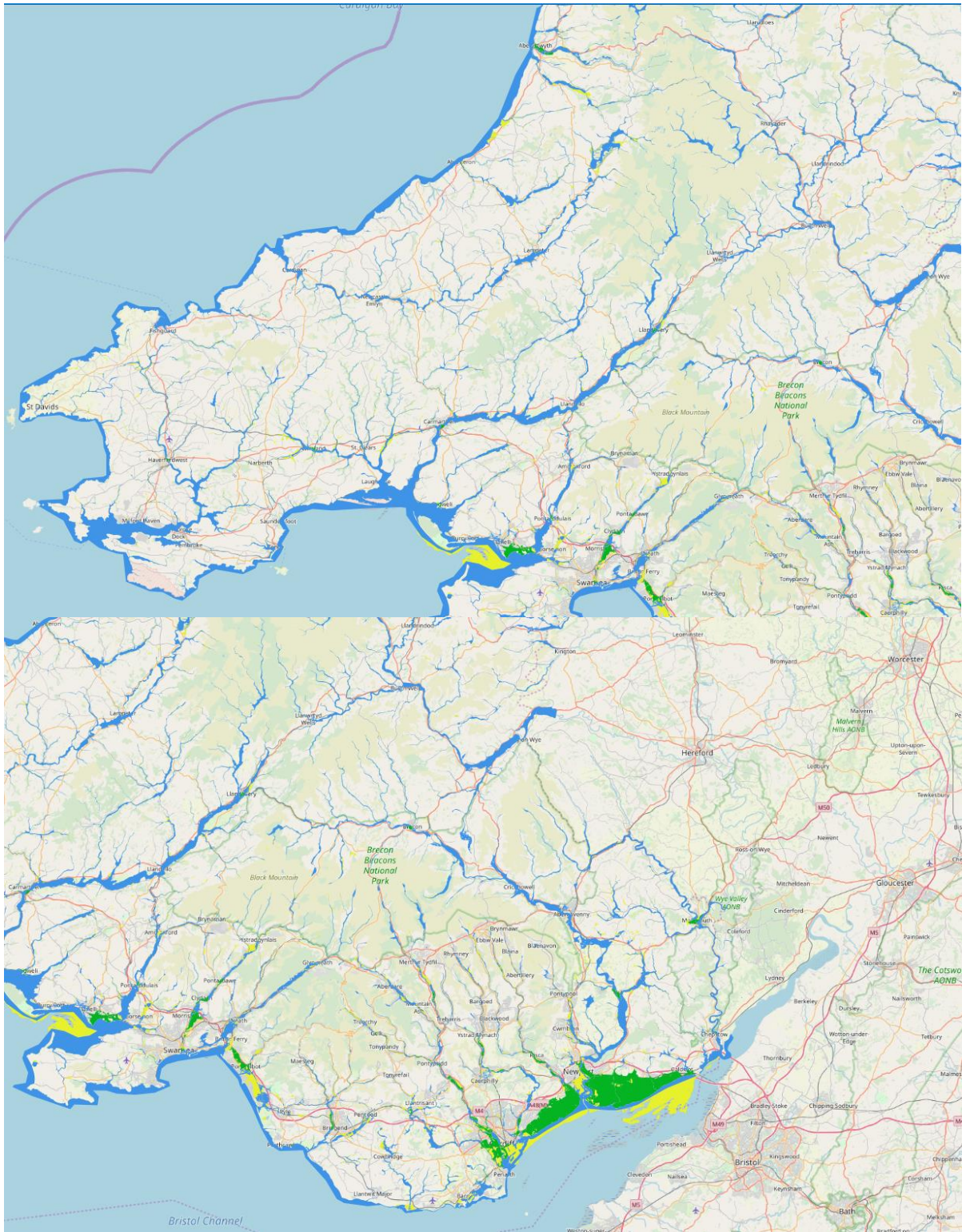
Zone C1: Served by significant infrastructure, including flood defences

Zone C2: Without significant flood defence infrastructure

Zone B: Areas known to have been flooded in the past

Zone A: Considered to be at little or no risk of fluvial or coastal/tidal flooding

Source: TAN 15

Based on 2019 data, there are around 156,312 properties at risk from flooding from tidal and rivers systems in Wales. There also around 129,858 properties at risk of surface water flooding[71].

The National Strategy for Flood and Coastal Erosion Risk Management in Wales[72] estimates that a total of 245,118 properties are at risk of flooding from all sources in Wales. Table B-4 shows the number of properties at high, medium or low risk of flooding.

Table B-4: Number of properties at risk

Combined Flood Risk	Properties at risk
High (being greater than or equal to 1 in 30)	117,100
Medium (less than 1 in 30 but greater than 1 in 100)	44,668
Low (less than 1 in 100 but greater than 1 in 1,000)	83,350
Total	**245,118**

Source: National Strategy for Flood and Coastal Erosion Risk Management in Wales

Figure B-17 demonstrates how some properties are prone to more than one source of flood risk. This overlap helps to explain the double-counting inherent in flood risk data and why the individual numbers of properties at risk from different source can be greater.

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[71] Welsh Government (2021) Properties at Risk of Flooding in Wales. Available at: https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Flooding/environment-and-countryside-state-of-the-environment-our-local-environment-properties-at-risk-of-flooding [Accessed: 19.12.21]

[72] Welsh Government (2020) The National Strategy for Flood and Coastal Erosion Risk Management in Wales. Available at: https://gov.wales/sites/default/files/publications/2021-03/the-national-strategy-for-flood-and-coastal-erosion-risk-management-in-wales.pdf [Accessed: 01.12.21]

Figure B-17: Venn diagram showing properties at risk, by three sources of flooding
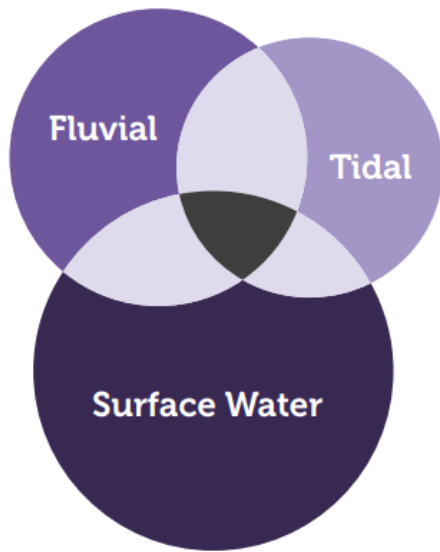
1 source	Fluvial only	43,643
1 source	Tidal only	33,129
1 source	Surface Water only	101,565
2 sources	Fluvial and Tidal	29,977
2 sources	Tidal and Surface Water	11,825
2 sources	Surface Water and Fluvial	20,358
3 sources	Fluvial, Tidal and Surface Water	4,621
	Total	**245,118**

Source: National Strategy for Flood and Coastal Erosion Risk Management in Wales

Flood risk and the need to manage and adapt to it is a very significant issue for Wales in the future as the risks brought about by climate change are anticipated to exacerbate flooding issues in the future. The most recent information for Wales from the UK Climate Projections (UKCP18)[73] forecasts that by the 2070s there will be an increase in winter mean precipitation of 19% under a low emission scenario, and 29% wetter under a high emission scenario. For summer rainfall change, it is predicted to get 39% drier under a low emission scenario and 56% drier under a high emission scenario. The combination of warmer summers and more intense rainfall may lead to an increased incidence of storm conditions and flash flooding. Severe

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[73] Met Office (2021) UKCP18 key results. Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/key-results [Accessed: 01.12.21]

weather events, including storms and flooding, currently account for 6% of all rail delays in Wales[74]

Almost 28% of the coast has some form of artificial protection, whilst around a quarter of the Welsh coast is considered to be eroding, with the potential to affect people, properties and infrastructure. Assets important for wellbeing and culture, such as heritage sites and the Wales Coastal Path, are also under threat. The Welsh coastline contains over 100,000 historic assets of all periods and types, of which 16% are at risk from sea level rise, and coastal flooding is an additional risk for 62,300 residential properties and 8,750 non-residential properties[75]. 28% of residents in Wales are concerned about the risk of flooding in their area [76].

At present, 809km of rail track and 79 stations are at risk of flooding from surface water, and 345km and 30 stations are at risk from river flooding[77]. The impact of flooding on transport infrastructure, in particular the road network, is projected to have a number of significant cascading impacts on other infrastructure including pipelines and emergency response.

Flooding is not only a pressure on communities and built structures but also causes impacts on the environment, as seen in the 2013-14 winter storms. These storms caused £8.1 million of damage to flood defence structures, in addition to the financial costs associated with the approximately 300 properties that were flooded. The work by NRW, Lead Local Flood Authorities, Internal Drainage Boards and Water and Sewerage companies has sought manage flooding and coastal erosion. In the winter storms of 2013/14, it is estimated that approximately 75,000 properties and 34,000 hectares of agricultural land was protected from flooding. It is estimated that £2.96 billion of damage to properties was avoided as a result of protection from defences.

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[74] Welsh Government (2021) Llwybr Newydd A New Wales Transport Strategy Consultation Draft Supporting information Transport data and trends. Available at: https://gov.wales/sites/default/files/consultations/2020-11/supporting-information-transport-data-and-trends.pdf
[75] Natural Resources Wales (2020) The Second State of Natural Resources Report (SoNaRR2020) Coastal Margins. Available at: https://cdn.cyfoethnaturiol.cymru/media/694107/coastal-margins.pdf [Accessed 29.11.21]
[76] Natural Resources Wales (2020) The Second State of Natural Resources Report (SoNaRR2020) Assessment of the Achievement of SMNR Aim 3: Wales has Healthy Places for People, Protected from Environmental Risks. https://cdn.cyfoethnaturiol.cymru/media/693612/165960736_8330461_1785381.pdf [Accessed 29.11.21]
[77] UK Climate Change Risk Assessment (2020) Third UK Climate Change Risk Assessment Technical Report: Summary for Wales https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Wales-Summary-Final.pdf [Accessed 29.11.21]

Additionally, a range of measures may be put in place to protect urban and rural areas from flood risk. The National Strategy for Flood and Coastal Erosion Risk Management[78]emphasises the use of green and green-grey infrastructure to minimise flood risk, including introducing SuDS and natural flood management.

The trends in hydrological processes, which include sea-level rise and increased storminess, are likely to increase the likelihood and consequences of coastal flooding and erosion. Since the release of the first National Strategy in 2011, the Welsh Government has invested over £600 million in Flood and Coastal Erosion Risk Management. Given there are approximately 245,118 properties are currently still at risk, Wales are set to invest over £350 million in flood and coastal erosion risk management activities by 2021[79].

3.4.3 Data gaps

- Data gaps relating to transport links and routes, including active travel routes, affected by flooding.
- Data gaps relating to transport structures affected by scour.
- Data gaps relating to the demographics of households most likely to be affected by flooding.
- Data gaps relating to the risks to transport infrastructure associated with extreme heat
- Data gaps relating to the use of electric vehicle charging infrastructure.

3.5 Geology and Soils

3.5.1 Relevance to the NTDP

Wales has some of the most varied geology in the world representing all geological periods and spanning 1.4 billion years of the Earth's history. This diverse geology not only underpins the country's biodiversity and landscape but also provides important mineral resources. The protection and sustainable use of geological diversity, soil resources and minerals can be delivered through careful decision making within the NTDP.

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[78] Welsh Government (2020) The National Strategy for Flood and Coastal Erosion Risk Management in Wales. Available at: https://gov.wales/sites/default/files/publications/2021-03/the-national-strategy-for-flood-and-coastal-erosion-risk-management-in-wales.pdf [Accessed 29.11.21]
[79] Welsh Government (2019) Wales and the Sustainable Development Goals. Available at: https://www.futuregenerations.wales/wp-content/uploads/2019/07/Wales-_-SDGs-_-VNR-_-Supplementary-Report-for-Wales-_-Version-10.1-Final-w-cover-ENG.pdf [Accessed 29.11.21]

3.5.2 Baseline conditions and trends

As identified above, Wales's geodiversity is significant. Geodiversity provides many of Wales's natural resources, strongly influences the landscape, biodiversity and culture, and is internationally important for geoscience research. Of the over 1,000 SSSIs in Wales, 300 of these, contain some 500 geological features covering 48,815 ha and 93% of these features are in favourable condition. These may be working or disused quarries, mine spoil, road or rail cuttings, soft or hard coastal cliffs, active landforms such as sand dune systems or meandering rivers, or fixed landforms such as glacial cwms or drumlins. Figure B-18 illustrates the distribution of geological SSSIs and Regionally Important Geodiversity Sites (RIGS). RIGS in Wales cover some 20,000 ha and each was selected to supplement the SSSI network, but also include areas of educational, aesthetic and historical interest. Two UNESCO Global Geoparks, Geo Môn and Fforest Fawr, cover 1,483 km^2 of Wales and are also designated for the primary purpose of promoting geo-tourism. UNESCO estimate the annual economic benefit from each of the Welsh Geoparks is £2.7m Other areas of Wales, such as the Wales Coast Path, National Parks and Areas of Outstanding Natural Beauty (AONBs), are underpinned by geodiversity and promote the varied landscape that attracts millions of tourists and contributes significantly to the Welsh economy[80].

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[80] Natural Resources Wales (2016) The State of Natural Resources Report (SoNaRR): Assessment of the Sustainable Management of Natural Resources. Annex Technical Annex for Chapter 3. Available at: https://cdn.cyfoethnaturiol.cymru/media/684352/annex-chapter-3-final-for-publication.pdf [Accessed 29.11.21]

Figure B-18:Welsh Geodiversity Sites
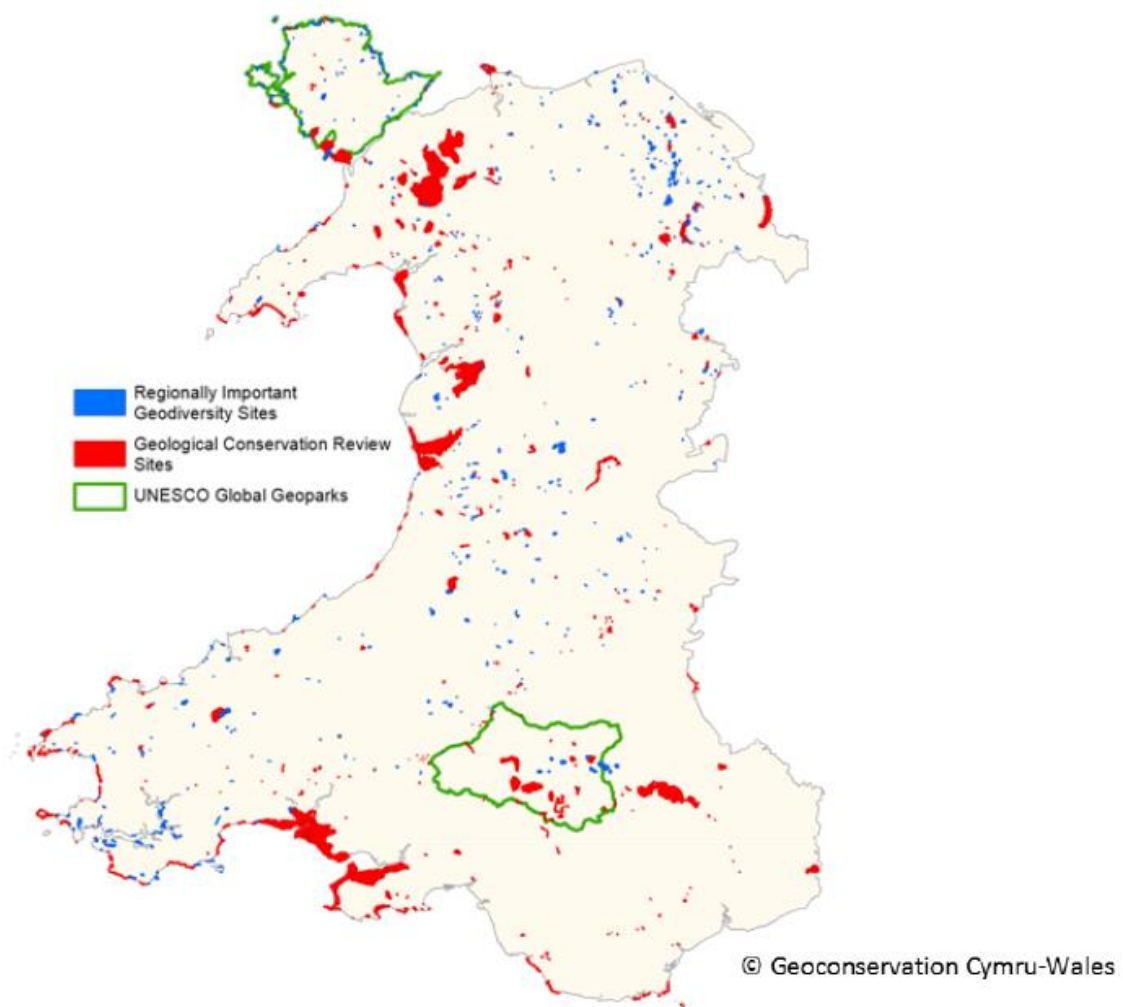
Source: SoNaRR, 2016

In the future, geological hazards may change as a response to climate change. For example, coastal erosion, landslides and pollution from former mine sites may increase as a result of increased rainfall and flooding events. It is not expected that the exploration for conventional or unconventional sources of oil and gas is likely in Wales, as the Welsh Government has declared an ambition to reach net zero by 2050 and will work with the UKCCC and other stakeholders to understand how this could be achieved[81]. However, Wales is still reliant on gas for domestic heating and energy, and therefore the possibility of future gas extraction cannot be ruled out entirely.

The soil and agricultural land quality of Wales is reflective of the topography and geology of the country. The soil types are diverse with over 400 different soil types

[81] Welsh Government (2018) Energy Generation in Wales. Available at: https://gov.wales/sites/default/files/publications/2019-10/energy-generation-in-wales-2018.pdf [Accessed 01.12.21]

present across the country, which contribute to a rich geodiversity and biodiversity, landscapes and land uses. The majority of Wales is either Grade 4 or 5 in the Agricultural Land Classification (see Figure B-19). This classification is generally considered to be of poor or very poor quality agricultural land and is largely due to the predominantly upland nature of Wales. This has a strong influence on the types of agriculture feasible, lending itself more towards livestock farming. The soils of best quality and most productive agricultural land are a scarce and finite resource in Wales accounting for less than 7% of land area. Soil quality has deteriorated over time across all habitats apart from woodlands where there has been some improvement.

Figure B-19: Agricultural Land Classification Map of England and Wales (extract)
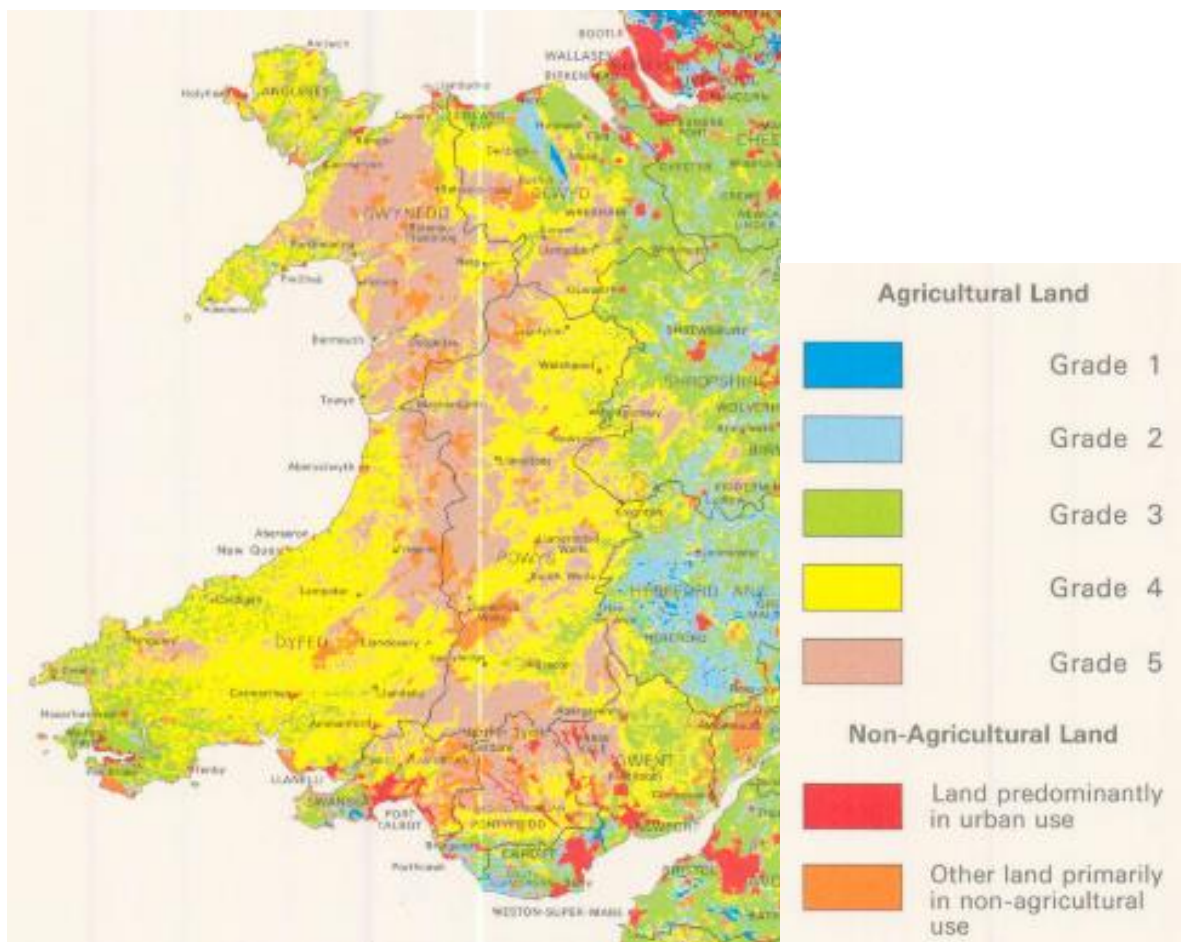
Source: Natural England

Whilst the severity and spatial extent of soil erosion has not been directly quantified in Wales, around 10-15% of grassland fields in England and Wales are thought to be affected by severe soil compaction and 50-60% are in moderate condition. However,

on a national level, soils do not appear to show evidence of widespread compaction[82].

Remediation has been completed at 97 of the 111 Contaminated Land sites identified in Wales, but around 9,330 potentially contaminated sites have yet to be investigated, 414 of which are considered to be high priority.

Welsh soils contain 410 million tonnes of carbon. The carbon density of Wales on the whole, is relatively high with the densest areas mainly being upland parts of the country. Again, this reflects the country's upland nature and large quantities of peaty soils. Figure B-20 shows the carbon density of Wales at a depth of 0-100cm. Topsoil carbon concentrations are generally stable and there is ongoing recovery from soil acidification.

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[82] Natural Resource Wales (2020) State of Natural Resources Report (SoNaRR) for Wales 2020. Available at: https://naturalresources.wales/evidence-and-data/research-and-reports/state-of-natural-resources-report-sonarr-for-wales-2020/sonarr2020-structure-and-contents/?lang=en [Accessed: 30.11.21]

Figure B-20: Distribution of soil carbon in Wales, shown as carbon density (t/ha) depth 0-100 cm
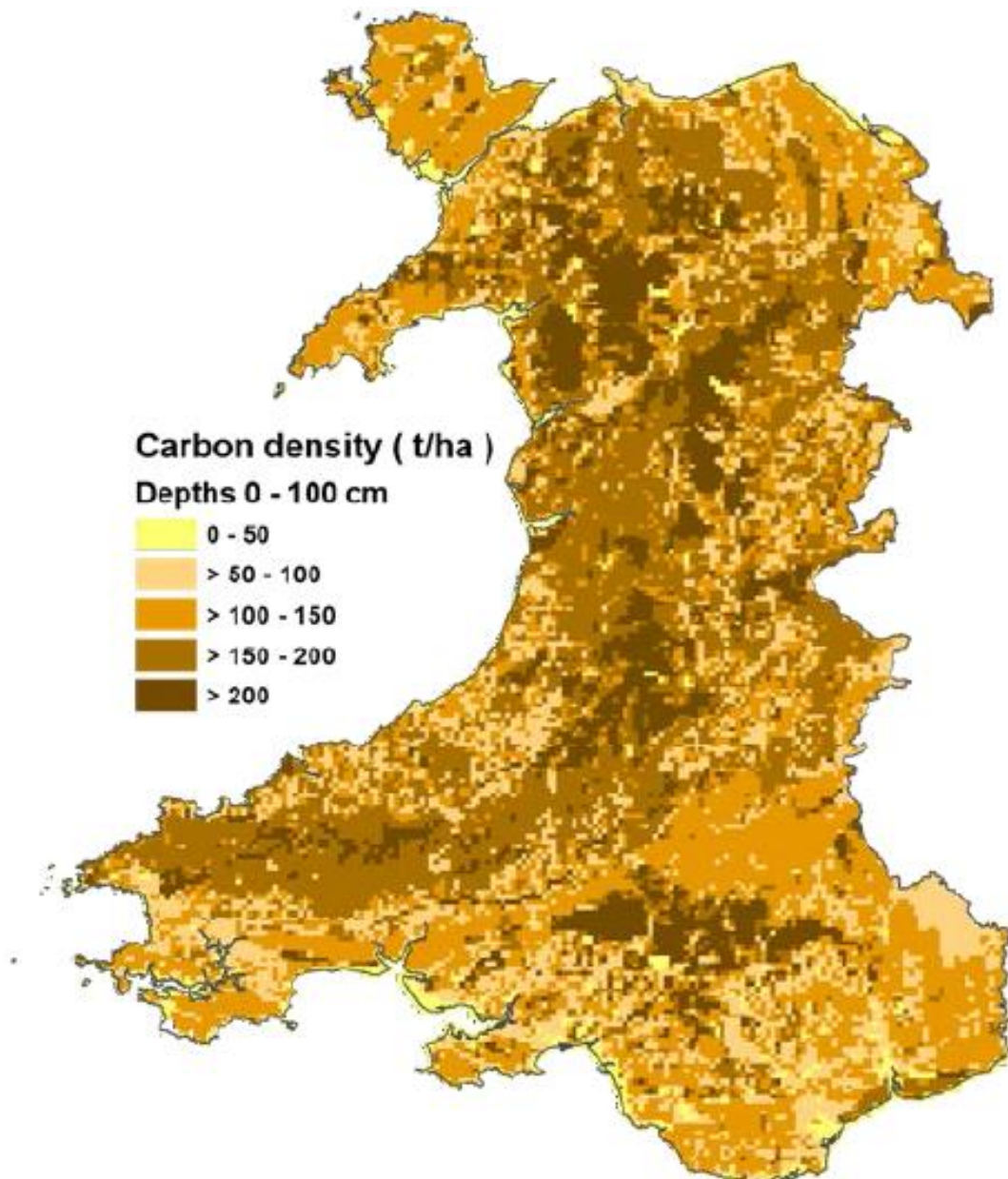
Source: SoNaRR, 2016

3.5.3 Data gaps

- The potential impact new transport infrastructure can have on geology and soils.

3.6 Water Environment

3.6.1 Relevance to the NTDP

Water is central to life. Wales relies on considerable quantities of water to produce resources, transport goods, provide recreational benefits, as a drinking resource and

to grow food. The quality and quantity of water is therefore vitally important. It is also important to note that a lack of local water availability can be a limitation to infrastructure and construction.

The NTDP can help manage the water environment through helping to guide decisions relating to development of transport infrastructure that could harm water quality or put pressure on water resources.

3.6.2 Baseline conditions and trends

The water features map of Wales in Figure B-21 was produced under the requirements of the Water Framework Directive[83]. The map shows the river catchments and other water features in Wales. Waterbody quality across Wales tend to range from a good to poor classification but are very rarely classed as bad. In particular, the river catchments in the south and Cardigan Bay are classed as moderate or good.

The Water Framework Directive required the UK to achieve 'good' status of all water bodies (including rivers, streams, lakes, estuaries, coastal waters and groundwater)[84].

In 2014, 42% of water bodies in Wales were classified as being of 'good' ecological status compared to 21% in England. There was a slight decrease to 39% classified as being of 'good' ecological status in 2015. As of 2020, 40% of water bodies in Wales were classified as being of 'good' ecological status, with 51% being moderate and 9% being poor[85].

In many Welsh rivers, flows are particularly vulnerable to climate change because they tend to rise and fall quickly in response to rainfall. Increased flows during winter may also increase pressure upon sewerage and drainage systems and diffuse pollution.

Under the Water Framework Directive, a management plan is required for each River Basin District. Wales. NRW produces two River Basin Management Plans (RBMP) for Wales, one for the Western Wales catchment and the other for the Dee River Basin District. Additionally, the Environment Agency produce the RBMP for the Severn. The plans are updated in 6-yearly cycles and contain information on the status of the waterbodies and a summary of the programme of measures required to achieve statutory objectives to maintain and enhance the quality of the water

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[83] Water Watch Wales (2020) Water Watch Wales Map Gallery. Available at: https://waterwatchwales.naturalresourceswales.gov.uk/en/ [Accessed: 01.12.21]
[84] Environment Agency (2017) Water Framework Directive assessment: estuarine and coastal waters. Available at: https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters [Accessed: 01.12.21]
[85] JNCC (2019) B7. Surface water status. Available at: https://jncc.gov.uk/our-work/ukbi-b7-surface-water-status/ [Accessed 29.11.21]

environment. Catchment Abstraction Management Strategies are developed at a catchment level to manage permitting and abstraction rates to ensure sustainable water levels.

Figure B-21: Water Framework Directive river catchments symbolised by classification in 2015 and 2018

OverallStatus

- Not Assessed
- Bad
- Good
- Moderate
- Poor
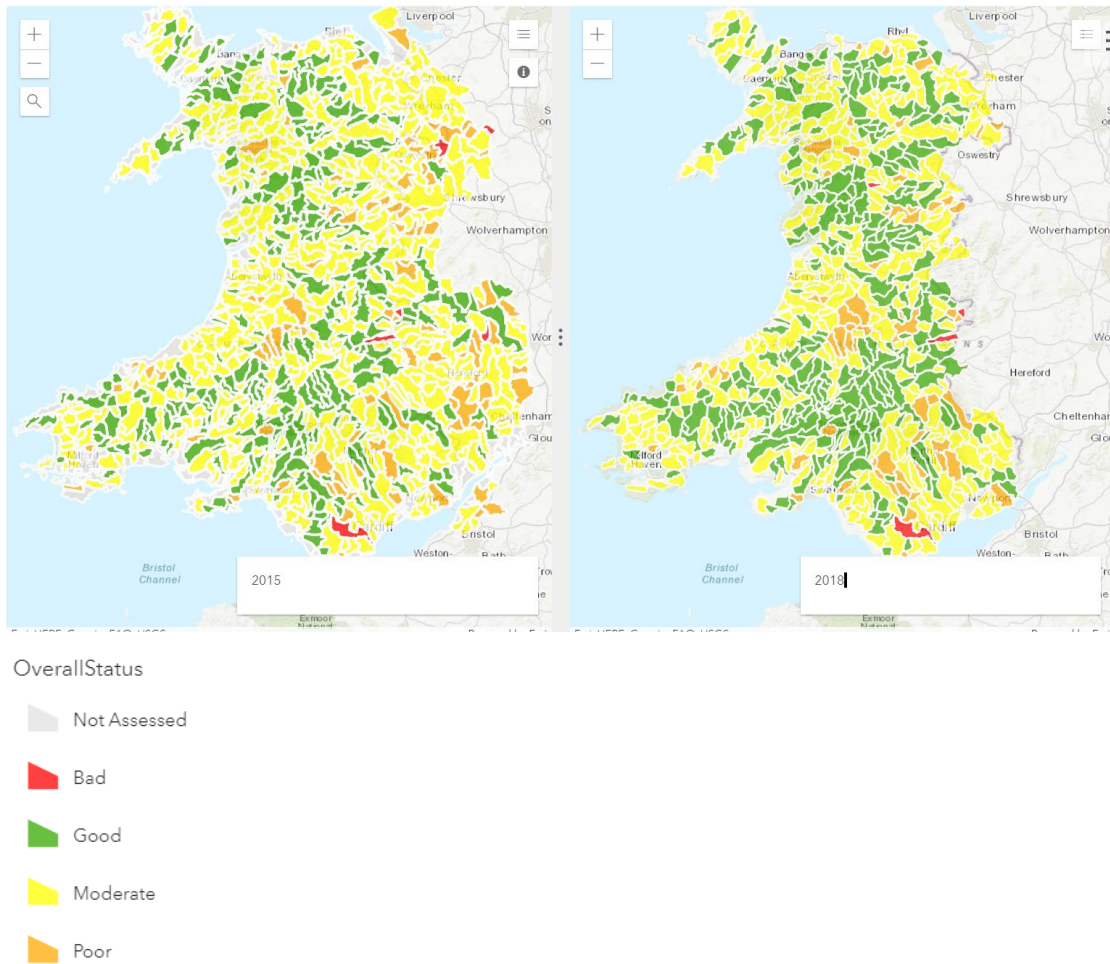
Source: Water Watch Wales

Groundwater provides a third of the drinking water in England and Wales, and it also maintains the flow in many of our rivers. All of Wales is classified as groundwater inner source protection zone. The zone is defined as the 50-day travel time from any point below the water table to the source. These areas apply at and below the water table. The criteria are set to protect against transmission of toxic chemicals and water-borne disease.

In Wales, the EC Nitrates Directive[86] was brought into law through the Nitrate Pollution Prevention (Wales) Regulations 2013[87]. A Nitrate Vulnerable Zone (NVZ) is an area of land draining into ground or surface waters that are currently high in nitrate; or may become so if appropriate actions are not taken. Around 2.4% of Wales is currently within an NVZ[88].

3.6.3 Data gaps

- Water quality data is from 2018 and could be out-of-date.
- Data gaps in relation to future water scarcity.

3.7 Minerals and Waste

3.7.1 Relevance to the NTDP

As described above, Wales's diverse geology provides important mineral resources which underpins the country's construction and energy industries and is therefore an important aspect of the economy. Waste can also be viewed as a resource, both in terms of recycling and re-use for other purposes or as a source of energy. The future of transport in Wales will interact with this through both Waste creation, pathways for minerals and waste and use of waste and minerals in development of transport infrastructure.

The sustainable use of these minerals and waste resources could be delivered through the decision making and choice of projects and programmes within the NTDP.

3.7.2 Baseline conditions and trends

Following a long history, metal mining has ceased and there is only localised coal mining and slate quarrying in Wales. The aggregates industry is now the main mineral extraction industry in Wales, including marine and terrestrially derived aggregates. In 2014, the largest extraction of minerals in tonnes was limestone and

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[86] Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01991L0676-20081211&from=EN [Accessed: 01.12.21]

[87] The Nitrate Pollution Prevention (Wales) Regulations 2013. Available at: https://www.legislation.gov.uk/wsi/2013/2506/contents/made [Accessed: 01.12.21]

[88] NRW (2020) Nitrate vulnerable zones. Available at: https://naturalresources.wales/about-us/what-we-do/water/nitrate-vulnerable-zones/?lang=en [Accessed: 01.12.21]

dolomite (see Table B-5)[89].

Table B-5: Mineral Production in Wales for 2014

Mineral	Thousand Tonnes Extracted
Coal (deep-mining)	91
Coal (opencast)	2,343
Igneous Rock	1,905
Limestone and Dolomite	8,934
Sand and gravel (land)	673
Sand and gravel (marine)	632
Sandstone	2,774
Total	**17,352**

The sales of aggregates in Wales was published in the South Wales Regional Aggregates Working Party Annual Report for 2017, and is shown in Figure B-22[90].

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[89] Natural Resources Wales (2016) State of Natural Resources Report (SoNaRR): Assessment of the Sustainable Management of Natural Resources. Technical Report. Chapter 3. Summary of extent, condition and trends of natural resources and ecosystems in Wales. Available at: https://naturalresources.wales/media/681127/chapter-3-state-and-trends-final-for-publication.pdf [Accessed 30.11.21]

[90] South Wales Regional Aggregates Working Party (2020) Annual Report For 2020. Available at: http://www.swrawp-wales.org.uk/Html/SWRAWP%20Annual%20Report%202017%20FINAL.pdf [Accessed 21.11.21]

Figure B-22: Primary Aggregate Sale 2008-2017
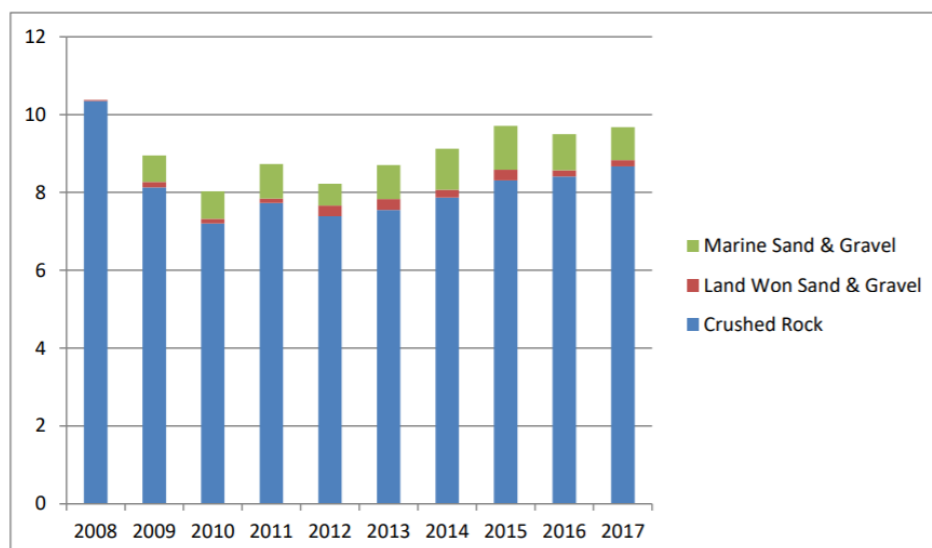
Source: South Wales Regional Aggregates Working Party

Towards Zero Waste 2010–2050[91] aims for Wales to become a a high recycling nation by 2025 and a zero-waste nation by 2050. The 2015 Progress Report[92] identifies the following key statistics and trends:

- Wales leads the UK in recycling municipal waste by a significant margin, achieving 54.3% in 2013/14.
- Wales has reduced waste sent to landfill at permitted sites by 37% between 2010 and 2013.
- Since 2009-10, Wales has made progress in reducing household waste arisings by an average of 1.8% per year, and the recycling rate of local authority collected waste has improved by 13.8%.
- Wales met the EU target 2020 for biodegradable waste collected by local authorities and others sent to landfill eight years early.
- Wales has also reduced the greenhouse gas emissions from waste by 4.7% per year since 2007, exceeding the target reduction of 3% per year set in the Climate Change Strategy.

Table B-6 shows the total amount of waste per sector that was not recycled, re-used or composted as a percentage of overall municipal waste production[93]. This shows a

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[91] Government (2010) Towards zero waste: our waste strategy. Available at: https://gov.wales/towards-zero-waste-our-waste-strategy [Accessed 01.12.21]
[92] Welsh Government (2015) Towards Zero Waste 2010–2050 Progress Report July 2015. Available at: https://gov.wales/sites/default/files/publications/2019-05/towards-zero-waste-progress-report-july-2015.pdf [Accessed 01.12.21]
[93] DEFRA (2021) UK statistics on waste data - July 2021 update. Available at: https://www.gov.uk/government/statistical-data-sets/env23-uk-waste-data-and-management [Accessed: 01.12.21]

steady decrease in the amount of waste sent to landfill. Following an increase in 2017, the amount of biodegradable municipal waste sent to landfill is decreasing.

Table B-6: Amount of Municipal Waste and Biodegradable Municipal Waste sent to Landfill

Year	Municipal waste sent to landfill (thousand tonnes)	Biodegradable municipal waste sent to landfill (thousand tonnes)
2016	900	286
2017	678	311
2018	574	285
2019	507	250

The latest quarterly statistical release for Landfill Disposals Tax by the Welsh Revenue Authority states that for waste disposed to landfill in the period July to September 2021 there were 355 thousand tonnes of authorised disposals, which is a 28% increase from the same period in 2019[94]. These disposals resulted in £14.1million tax due, the highest quarterly figure seen to date . Data suggests seasonal patterns such as shorter days in winter are a potential factor, which is further impacted and complicated by Covid-19.

The Natural Resource Policy (NRP)[95] puts an emphasis on taking a place-based approach and delivering nature-based solutions. There is an emphasis within the document of using a solid baseline to understand how to sustainably plan for the future.

The four policy themes, drawn from the NRP, were:

1. Marine and Freshwater Water Quality

2. Natural Flood Management

3. Woodland Planting (for various objectives)

4. Urban and Peri-Urban Green Infrastructure

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[94] Welsh Government (2021) Landfill Disposals Tax statistics: July to September 2021. Available at: https://gov.wales/landfill-disposals-tax-statistics-july-september-2021-html [Accessed: 01.12.21]
[95] Welsh Government (2018) Natural resources policy. Availabel at: https://gov.wales/natural-resources-policy [Accessed: 01.12.21]

3.7.3 Data gaps

- Data gap relating to how recycled materials are used in the transport industry as a percentage of total materials used.
- Data gaps relating to the transportation and management of waste and minerals.
- There may be data gaps due to some of the data being five years old or more, this data may no longer be an accurate representation.

3.8 Key Issues relevant to the NTDP and opportunities for it to address them

3.8.1 Issues

Air Quality

Air quality in Wales is generally very good, reflective of its largely rural nature and high-quality natural environment. However, targets are being breached for a number of key pollutants which pose a risk to human health and the natural environment so the transport plan must take this into account. These notably occur in urban areas and adjacent to busy roads.

90% of semi-natural nitrogen sensitive Welsh habitats are subject to nitrogen deposition in excess of critical load limits.

Ammonia remains an issue, both as a local air pollutant and as a contributor to the formation of secondary particulate matter, including the formation of ultra-fine particulates ($PM_{2.5}$), which can have a more serious impact on human health and ecosystems than the larger PM_{10}s.

Road transport accounts for nearly a third of all NO_2 emissions in the UK and transport is the biggest source of air pollution in the UK.

Noise Pollution

Road noise is focused around the M4 in South Wales and adjoining 'A' roads. The A55 and adjoining 'A' Roads in North Wales, and the A483 in Mid Wales, also contribute to high levels of noise pollution. Noise pollution from railways mostly takes place in the south of Wales around Cardiff.

Biodiversity, Flora and Fauna and Ecosystem Resilience

Wales has a rich and varied natural environment including a wide representation of important habitats and species. However, the condition of species features in European designated sites in Wales and the condition of priority habitats in Wales remains mostly unfavourable, the transport plan must do its best to not impede on the habitats via habitat fragmentation or indirect effects such as nitrogen deposition, wildlife fatalities or noise disturbance.

Terrestrial and marine biodiversity is under threat from transport infrastructure, pollution and climate change, all of which are effects that come from the transport network.

Changes in habitat quality coming from changes to the groundwater regime, changes in natural rates of flow from hard surfaces increasing surface water flooding.

A change in soil leaching and erosion patterns.

Changes to microclimate from light and radiation emissions.

Windfunnelling from bisected trees.

Disturbance to fauna from noise, lighting and vibrations from traffic and road lighting.

Road structures may cause problems for certain birds/mammals by reducing visibility.

The edge habitat or ecotone and traffic on the road may facilitate dispersal for some species. This may result in dispersal and establishment of alien and invasive species or pest species that may have secondary effects on biological communities.

Surrounding habitats may be placed under increasing public pressure, because of access, leading to effects including the disturbance of animals, and physical destruction of ground flora. Also, litter may accumulate along road

Off-site habitat losses and changes in habitat quality in relation to the obtaining and disposal of materials e.g. mining for aggregates for road building.

Even relatively minor habitat loss, fragmentation and indirect impacts of an individual road project can, when added to other past, present and reasonably foreseeable future impacts of other projects and activities, contribute to significant impacts in an area. All relevant types of future projects and activities should be considered (i.e. not just other road projects) including induced development.

Climate, Flood Risk and Coastal Erosion

The effects of climate change are increasing and adaptation and resilience to its effects is an increasing necessity. Notably, flood risk is a significant issue in Wales including coastal, fluvial and surface water flooding that may affect transport infrastructure. This is exacerbated by an increase in extreme weather events and this means that properties and businesses are increasingly becoming at risk. Disruption can disproportionately impact communities with fewer and less resilient transport options.

Climate change will impact on Wales in ways other than just flooding, such as more extreme weather events, an increase in storminess, higher maximum and minimum temperatures, more severe droughts and exacerbated rates of coastal erosion. Climate change will also affect habitats and species throughout Wales.

The Third UK Climate Change Risk Assessment Technical Report[96] highlights a number of key risks and opportunities facing Wales with regard to transport, including the need to transition towards low-emission vehicles and enhanced active travel options.

Geology and Soils

In the future, geological hazards may change as a response to climate change. For example, coastal erosion, landslides and pollution from former mine sites. This poses significant risks to the transport system.

The soils of best quality and most productive agricultural land are a scarce and finite resource in Wales and soil quality has deteriorated over time across all habitats. This is important for biodiversity, landscape character, tourism, agricultural productivity and climate change resilience. Topsoil, in particular peaty soils in Wales are a major carbon sink which needs protection. All of this must be taken into account when planning the location of future transport infrastructure.

Water Environment

The quality of Wales's water bodies is still not up to Water Framework Directive requirements with only 40% being of good ecological status in 2020. Transport activities can be a big contributor to poor water quality.

In many Welsh rivers, flows are particularly vulnerable to climate change because they tend to rise and fall quickly in response to rainfall. Increased surface water flows during winter, resulting from increased precipitation from climate change, may increase pressure upon sewerage and drainage systems and diffuse pollution.

Whilst Wales is perceived to be water-rich, it is already facing challenges in terms of supply and water resources can become relatively scarce during prolonged warm, dry weather.

Run off from roads and spillages on roads and during construction can all lead to pollution in surface waters, ground waters and marine environments (around ports).

Minerals and Waste
The country still has substantial resources if required. sustainable management of this extraction is necessary for ongoing or future activity. Minerals safeguarding can sometimes also conflict with other forms of development e.g. transport infrastructure.

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[96] Betts, R.A. and Brown, K.(2021) Introduction. In: The Third UK Climate Change Risk Assessment
Technical Report [Betts, R.A.,Haward, A.B. and Pearson, K.V.(eds.)]. Prepared for the Climate Change Committee, London Available at:
https://www.ukclimaterisk.org/wp-content/uploads/2021/06/Technical-Report-The-Third-Climate-Change-Risk-Assessment.pdf [Accessed 01.12.21]

There may be high material requirements for construction of transport infrastructure putting further strain on the limited resources.

Covid-19

The Covid-19 pandemic has impacted most on the most vulnerable individuals and deprived communities. The long-term impacts of the pandemic are currently unknown and, whilst there have been some beneficial impacts, including improved air quality and greater reliance on active travel, the approach to recovery should promote social, health and economic equality.

3.8.2 Opportunities

Air Quality

The transport system is a significant contributor to air pollution at present, an opportunity to reduce this negative effect on air quality could be affected by helping to minimise pollution from transport through minimising the distance travelled and encouraging more sustainable modes of transport. Sustainable design and landscaping policies could help to provide opportunities for absorbing some pollutants.

Noise Pollution

The NTDP can affect noise pollution through ensuring decisions are based on the principle of reducing emissions through the transition to implementing the sustainable transport hierarchy. Sustainable design and landscaping policies could help to reduce the effect of noise and the potential impact from transport on tranquil areas.

Biodiversity, Flora and Fauna and Ecosystem Resilience

The NTDP can both benefit and enhance biodiversity through guiding the location and manner in which new transport infrastructure occurs. It provides opportunities to ensure biodiversity is protected and enhanced through the transport system, not just in terms of protected sites but also in terms of biodiversity and connectivity in general. Other benefits might include improved habitat management; new structures e.g. bridges and tunnels may provide habitats for some species e.g. bats; and habitat creation. There is opportunity for the NTDP to introduce additional green infrastructure as part of future transport proposals to support placemaking as well as biodiversity, flora and fauna.

Climate, Flood Risk and Coastal Erosion

The NTDP has a significant role to play in terms of climate change adaption and resilience. Flooding and coastal erosion are key areas in which the effects of climate change are felt locally, and the programmes set out in the NTDP could be designed to help minimise flood risk. Transport infrastructure should be designed to be

resilient to erosion and other impacts of climate changes, including increased storminess and temperature extremes.

The NTDP should focus on significantly reducing greenhouse gas emissions from transport, through the promotion of more sustainable transport methods such as public transport and active travel. Provision could be made within the NTDP for increasing the provision of electric vehicle charging points to encourage the uptake of electric vehicles.

Geology and Soils

The NTDP has an opportunity to guide the sustainable use of Wales's geology and soils in the transport system in terms of their use in the construction of transport infrastructure or utilising previously developed land and contributing to the ongoing remediation or land and soils. Aspects such as this, as well as the management or avoidance of geological hazards could be noted in the ISA for further specific projects in lower-level plans or projects, should the relevant spatial detail not be included at the high level of the NTDP.

Water Environment

The NTDP could help facilitate the development of new of transport infrastructure and transport routes in a manner that seeks to avoid pollution of water bodies. Aspects such as this could be noted in the ISA for further specific projects in lower-level plans or projects, should the relevant spatial detail not be included at the high level of the NTDP.

Minerals and Waste

The NTDP has an important role to play with regard to minerals demand (through economic aspirations), planning and management. It can help to guide the sustainable use of such resources through its policies. Aspects such as this could be noted in the ISA for further specific projects in lower-level plans or projects, should the relevant spatial detail not be included at the high level of the NTDP.

Covid-19

The NTDP has a role to play in the recovery from Covid-19, particularly addressing changes in mobility. The NTDP should address inequalities that have been exacerbated by Covid-19 and should promote sustained, equal recovery.

4 Well-Being Goal: A Healthier Wales and A More Equal Wales

This section provides data relating to the following well-being goal:

"A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood" and *"To deliver better public services, helping everyone who needs them, when they need them, where they need them".*

The data relates primarily to:

- Human Health;
- Well-Being; and
- Population.

4.1 Health and Well-being

4.1.1 Relevance to the NTDP

In terms of equality, transport plays an important role in delivering an inclusive Wales, everyone, regardless of age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex and sexual orientation should be able to, and have the confidence to, make seamless independent and unassisted journeys across all modes of transport – from door to door and on a turn-up-and-go basis.

4.1.2 Baseline conditions and trends

In many ways, health in Wales is improving; people are living longer and rates of certain types of diseases are coming down. In many parts of Wales, the health of those living in rural communities is generally good, in comparison to those in a more urban setting. However, there are factors specific to a rural environment compared to those of urban environments that can impact on health more significantly and lead to inequalities and poorer health, such as distance from public services and support; availability of transport; housing standards; and an ageing population.

Active Travel

'Active travel' is walking or cycling as a means of transport; that is walking or cycling in order to get to a particular destination such as school, work, shops, visit friends and many other journeys.

In a Statistical Bulletin on the use of active travel in Wales (2019-2020)[97], it was found that:

- 4% of adults cycled at least once a week for active travel purposes. This is down 2% on the same period between 2018 and 2019.
- 60% of adults walked at least once a week for active travel purposes (see Figure B-23). This is up 3% on recent years.
- 74% of people in urban areas walked for more than 10 minutes as a means of transport at least once a month, compared with 59% of people in rural areas (see Figure B-24). Both urban and rural walking rates are up on 2018-2019.
- Men, younger people, and those without limiting illnesses were more likely than others to cycle.
- 44% of children actively travel to primary school, and 34% to secondary school.
- 226 seriously injured pedal cyclists were admitted to hospital in 2019-2020. This is roughly in line with previous years, and a 16% decrease on 2014 numbers.
- National Survey respondents who were in 'very good' or 'good' health were more likely to walk or cycle regularly.

Figure B-23: Frequency of active travel by walking
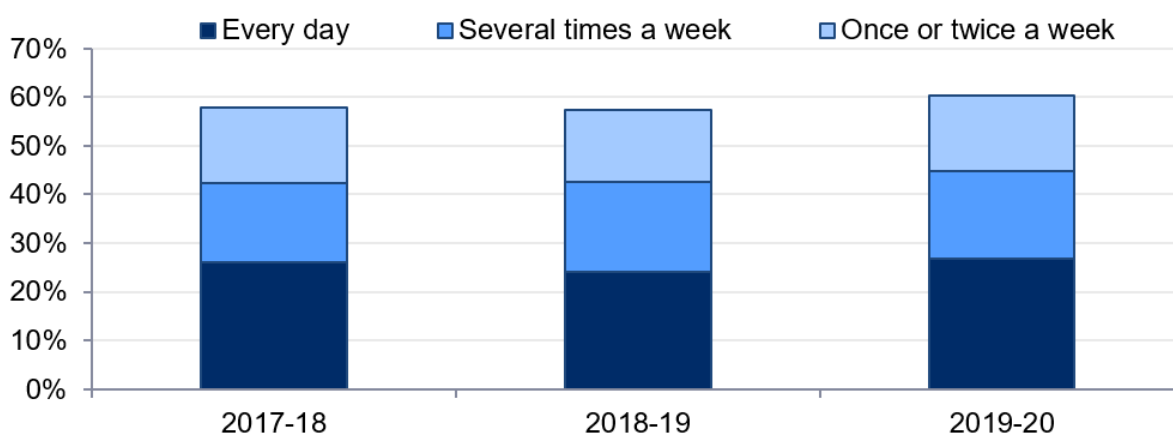
Source: National Survey for Wales

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[97] Welsh Government (2020) Active travel (walking and cycling): April 2019 to March 2020. Available at: https://gov.wales/active-travel-walking-and-cycling-april-2019-march-2020-html [Accessed: 01.12.21]

Figure B-24: Active travel (walking) by urban and rural classification

Source: Gov.Wales

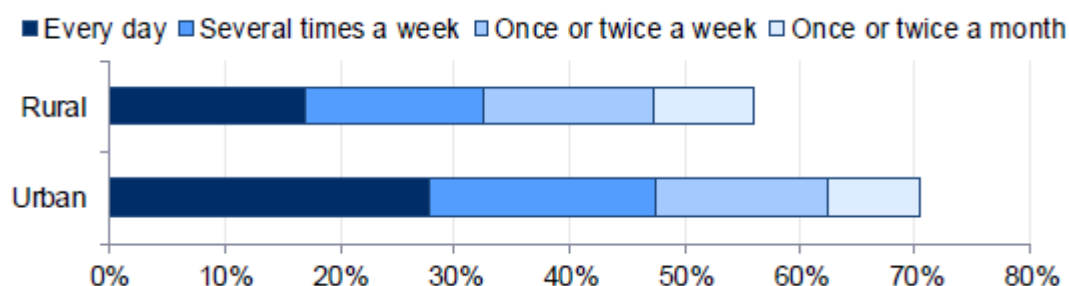**Healthy lifestyle behaviours**

The 2020-21 National Survey for Wales[98] assessed whether Welsh respondents exhibited the following healthy lifestyle behaviours:

- Not smoking;
- Not drinking above daily guidelines in the previous week;
- Eating five or more portions of fruit and vegetables the previous day;
- Being physically active for at least 150 minutes in the previous week; and
- Maintaining a healthy weight/body mass index.

Around 7% of adults reported following less than two healthy lifestyle behaviours. Over 50% of adults reported that they had been active for at least 150 minute the previous week and 37% reported a healthy weight. Approximately 14% of adults said they smoked and 17% reported that they drank more than the weekly guideline.

In terms of specific groups, the percentage of adults who followed fewer than two healthy lifestyles was more common in men (14%) than women (5%), and among adults aged 45-64.

The Survey established that when considering adult lifestyle by health board, the highest reports of 'Active less than 30 minutes a week' (45%) and lowest reports of 'Active 150 minutes a week' (39%) was in Cwm Taf Morgannwg in the first quarter of 2021. In contrast, Powys has the highest records of 150 minutes of exercise (61%) and Cardiff and Vale has the lowest records of less than 30 minutes of exercise (22%).

Percentage of people who are lonely

In 2017-18, the National Survey for Wales asked people whether they agreed with a series of statements about their current life status. Users of care and social services

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[98] Welsh Government (2021) Adult lifestyle (National Survey for Wales): January to March 2021. Available at: https://gov.wales/adult-lifestyle-national-survey-wales-january-march-2021 [Accessed: 01.12.21]

were the most likely to agree that they often felt lonely (29% compared with 13% of those who were not users or carers). During the coronavirus pandemic, Public Health Wales undertook weekly surveys to record the changes in national feeling. At the start of the pandemic, 43% of respondents reported never feeling isolated[99], which rose to 56% by week 14[100] of the pandemic as restrictions were lifted.

Health facilities in Wales

There are a number of hospital facilities within Wales spread across a number of departmental requirements, the number and types of facilities are shown in Table B-7. As of 2019 there were 407 GP Practices in Wales (nine fewer than 2018) of which 89% were for all daily core hours were open for all of core hours or within one hour of core hours (08:00 to 18:30), Monday to Friday[101].

Table B-7: Number and Type of Hospital Facilities within Wales

Hospital Facility Type		Number
Major A&E Unit		15
Minor A&E Unit		0
Minor Injuries Unit		27
Other Hospitals	Acute	2
	CHC Local Committee	3
	Clinic	19
	Community	28
	Community Hospital: Elderly Mental Infirm	3
	Day Hospital	5

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[99] Public Health Wales (2020) How are we doing in Wales? Public Engagement Survey on Health and
Wellbeing during Coronavirus Measures Week 4. Available at: https://phw.nhs.wales/topics/latest-information-on-novel-coronavirus-covid-19/how-are-you-doing/week-4-report-how-are-we-doing-in-wales/ [Accessed 22.11.21]
[100] Public Health Wales (2020) How are we doing in Wales? Public Engagement Survey on Health and Wellbeing during Coronavirus Measures Week 14. Available at: https://phw.nhs.wales/topics/latest-information-on-novel-coronavirus-covid-19/how-are-you-doing/how-are-we-doing-in-wales-reports/week-14-report-how-are-we-doing-in-wales/ [Accessed 22.11.21]
[101] Welsh Government (2020) GP Access in Wales, 2019. Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-03/gp-access-2019.pdf [Accessed 22.11.21]

Hospital Facility Type	Number
Major Acute	2
Psychiatric: Learning Disability	2
Psychiatric: Mental Illness	17
Psychiatric: Mental Illness / Learning Disability	2
Specialist Acute	3

Source: NHS Wales

Obesity in Wales

In 2019, 59% of adults were classified as overweight, including 23% classed as obese. Obesity levels in Wales have seen an increase since the Welsh Health Survey began in 2003/2004. Childhood obesity rates were higher in Wales in 2014 than in England, with over 25% of children overweight or obese. The prevalence of overweight and obese children in Wales was highest in Merthyr Tydfil (34%), Gwynedd and Bridgend (both 30%) and lowest in Monmouthshire (21%) and the Vale of Glamorgan (22%)[102] Around one in four of Wales's four-to-five year olds start school overweight or obese, and rates of childhood obesity is worse in more deprived areas[103]. The COVID-19 pandemic has slowed progress the Welsh Government had wished to make on preparing the Healthy Weight: Healthy Wales 2020 – 2022 Delivery Plan[104]. In addition, the pandemic has meant that families across Wales will have lost incomes, found it more difficult to eat healthy food and seen a decline in their physical activity. This will have impacted upon their mental health, which is also strongly linked to obesity

WIMD 2019: access to services

Latest figures for the LSOAs in Wales (there are 1,909 LSOAs in total in Wales) include average travel times using private transport when access to services have been considered. The WIMD 2019 access to services domain results have demonstrated that there is a widespread deprivation across Wales and also

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[102] Public Health Wales (2019) Obesity in Wales. Available at: https://phw.nhs.wales/topics/obesity/obesity-in-wales-report-pdf/ [Accessed 23.11.21]
[103] Welsh Government (2020) Healthy weight strategy (Healthy Weight Healthy Wales). Available at: https://gov.wales/healthy-weight-strategy-healthy-weight-healthy-wales [Accessed: 01.12.21]
[104] Welsh Government (2021) Healthy Weight: Healthy Wales delivery plan 2021 to 2022. Available at: https://gov.wales/healthy-weight-healthy-wales-delivery-plan-2021-2022-html [Accessed: 01.12.21]

particularly within rural areas in terms of access[105]. Furthermore, there are some deprived pockets near large urban areas.

The local authorities with the highest proportion of small areas in the most deprived 10% in Wales for access to services were Powys (50.6%) and Ceredigion (50.0%).

Cardiff, Neath Port Talbot, Bridgend, Rhondda Cynon Taf, Blaenau Gwent and Torfaen local authorities had no areas in the most deprived 10%.

The most deprived small area in Wales was Cynwyl Gaeo, Carmarthenshire, the same as for WIMD 2014.

Access to services and facilities

In the National Survey for Wales[106], 69% of people surveyed were satisfied that good services and facilities are available in their local area, but 3% said that there were no services or facilities in their area. 80% were satisfied with their ability to get to or access the facilities and service they needed.

Figure B-25 shows the deprivation levels of the LSOAs in Wales with regard to access to services.

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[105] Welsh Government (2020) Welsh Index of Multiple Deprivation: 2019. Available at: https://gov.wales/welsh-index-multiple-deprivation-full-index-update-ranks-2019 [Accessed: 01.12.21]
[106] Welsh Government (2019) National Survey for Wales, 2018-19 Community cohesion and safety in the local area. Available at:https://gov.wales/sites/default/files/statistics-and-research/2019-11/community-cohesion-and-safety-local-national-survey-wales-april-2018-march-2019-739.pdf [Accessed: 01.12.21]

Figure B-25: Access to Services Deprivation Map for Wales

Welsh Index of Multiple Deprivation 2019
Access to Services Domain

by Lower Level Super Output Areas

Rank	Most Deprived	
1 - 191		10% most deprived
192 - 382		10-20% most deprived
383 - 573		20-30% most deprived
574 - 955		30-50% most deprived
956 - 1909		50% least deprived
	Least Deprived	

Local Authority Boundary ——

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Cartographics • Welsh Government • MLA5/19.20
November 2019
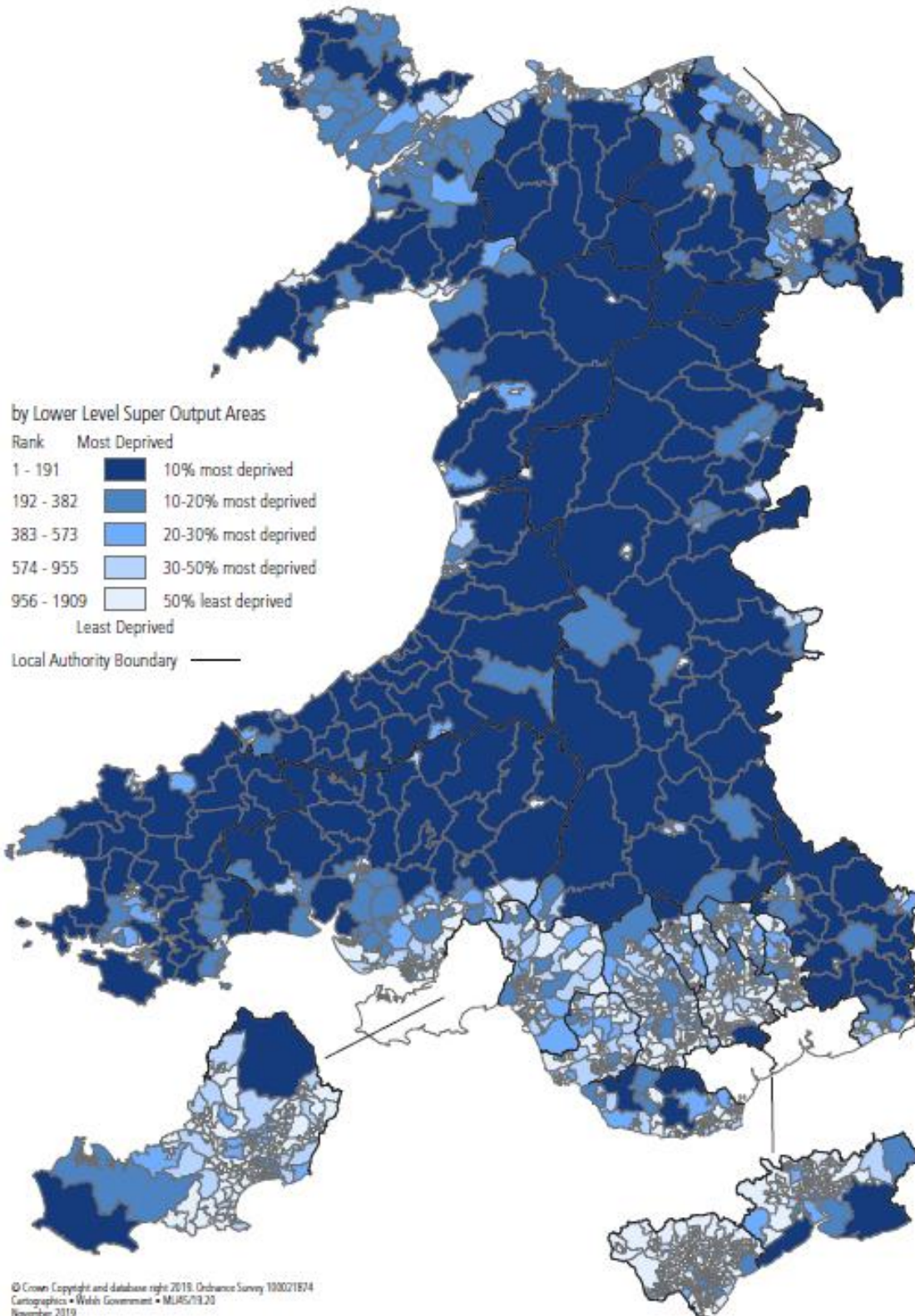
Source: WIMD 2019

WIMD 2019: Health

Patterns in health deprivation in Wales have remained largely unchanged since the 2011 WIMD[107]. High deprivation levels were recorded in South Wales valleys and large cities, coastal areas of North Wales and border towns. The local authority the highest proportion of LSOAs in the most deprived 10% in Wales for health domain was Merthyr Tydfil. Three local authorities (The Isle of Anglesey, Ceredigion and Monmouthshire) were recorded as having had no LSOAs in the most deprived 10%. For the health domain, the most deprived LSOA in Wales was Rhyl West 2, Denbighshire.

In 2019-2020, 71% of people in Wales reported their general health as either 'Very good' or 'Good'[108]. The gap between local health board reporting the highest (Powys: 76%) and lowest (Cwn Taf Morgannwg and Aneurin Bevan: 69%) percentages of 'Very good' and 'Good' general health was 7%, down from 9% in 2016[109]. The concentration of low percentages of 'Good' general health recorded in 2019 corresponds with the former coal mining and heavy industrial centres of the Welsh valleys in 2019 suggesting that these former industries have had long term health implications.

Isle of Anglesey, Ceredigion and Monmouthshire had no LSOAs in the most deprived 10%. Only 8.7% of the LSOAs in Ceredigion were in the most deprived 50% in Wales. Merthyr Tydfil had the highest proportion of LSOAs in the most deprived 50% in Wales (88.9%). The next highest was Blaenau Gwent, with 87.2% of its LSOAs in the most deprived half of Wales[114].

Figure B-26 shows the deprivation levels of the LSOAs in Wales with regard to Health Domains.

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[107] Welsh Government (2020) Welsh Index of Multiple Deprivation: 2019. Available at: https://gov.wales/welsh-index-multiple-deprivation-full-index-update-ranks-2019 [Accessed: 01.12.21]
[108] Welsh Government (2020) National Survey for Wales: results viewer. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed 1.12.21]
[109] Stats Wales (2020) General health and illness by local authority and health board. Available at: https://statswales.gov.wales/Catalogue/National-Survey-for-Wales/Population-Health/Adult-general-health-and-illness/genhealthillness-by-localauthorityhealthboard [Accessed 29.12.21]

Figure B-26: Health Deprivation Map for Wales

Welsh Index of Multiple Deprivation 2019
Health Domain

by Lower Level Super Output Areas

Rank	Most Deprived	
1 - 191		10% most deprived
192 - 382		10-20% most deprived
383 - 573		20-30% most deprived
574 - 955		30-50% most deprived
956 - 1909		50% least deprived
	Least Deprived	

Local Authority Boundary ——

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Cartographics • Welsh Government • MLI45/19.20
November 2019
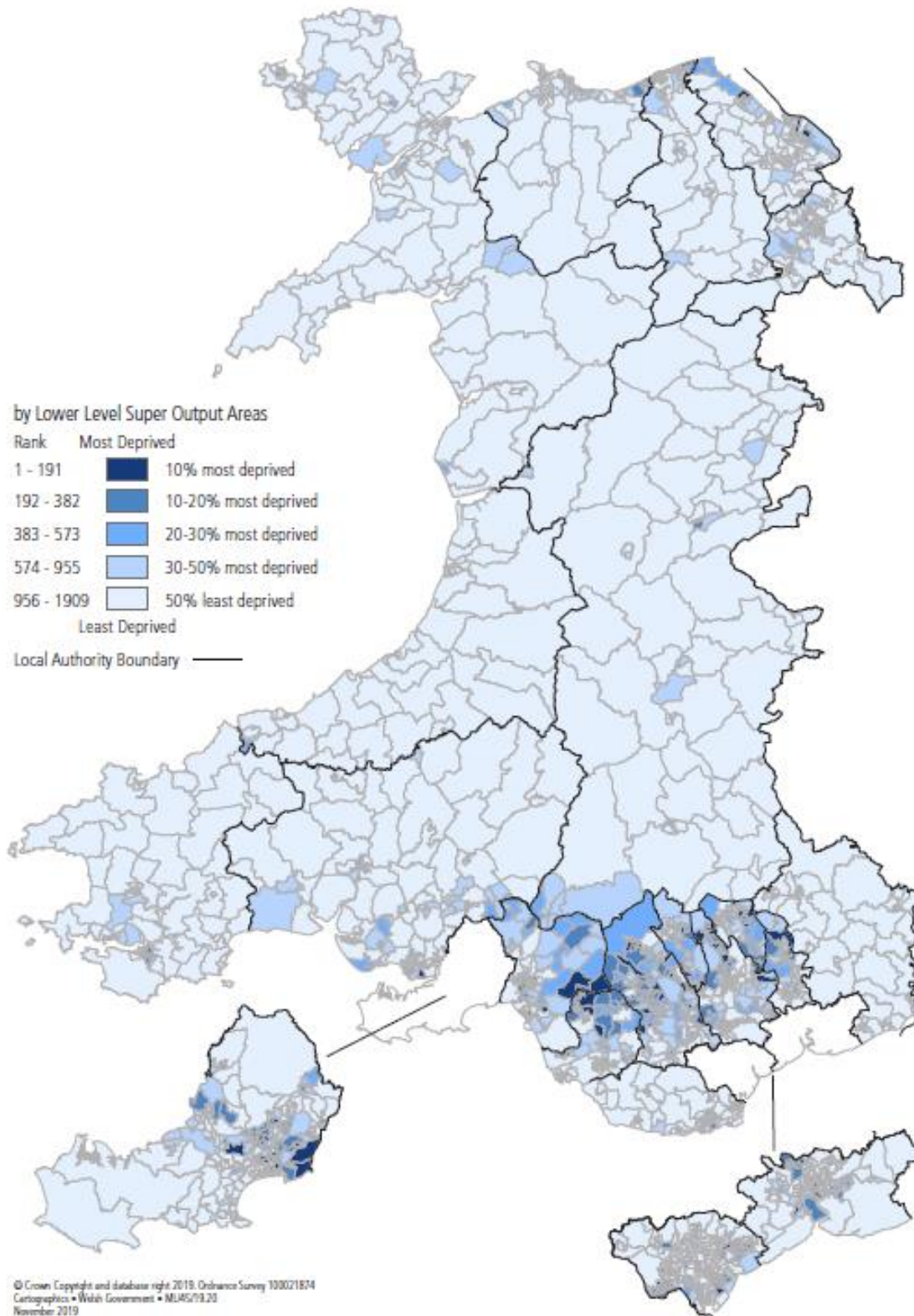
Source: WIMD 2019

4.2 Population

4.2.1 Relevance to the NTDP

An equal society in Wales can help to ensure that public transport services are fair and accessible to all and completely inclusive. The NTDP could contribute positively towards making more fair and inclusive societies.

4.2.2 Baseline conditions and trends

The following baseline indicators have been used to characterise existing conditions relating to goal 4 of the Well-being of Future Generations (Wales) Act 2015 for population in Wales:

Percentage of Ethnic Groups

The ethnic make-up of the Welsh local authorities compared to national figures is shown in Table B-8 below[110].

Table B-8: Percentage of Ethnic Groups in Wales and local authorities

Area	All categories: Ethnic group	White (%)	Mixed (%)	Asian (%)	Black (%)	Other (%)
United Kingdom	63,182,178	87.2	2.0	6.9	3.0	0.9
Wales	3,063,456	95.6	1.0	2.3	0.6	0.5
Anglesey	69,751	98.2	0.7	0.7	0.1	0.3
Blaenau Gwent	69,814	98.5	0.6	0.7	0.1	0.1
Bridgend	139,178	97.8	0.7	1.1	0.2	0.2
Caerphilly	178,806	98.3	0.7	0.8	0.1	0.1
Cardiff	346,090	84.7	2.9	8.1	2.4	2.0
Carmarthenshire	183,777	98.1	0.6	1.0	0.2	0.2
Ceredigion	75,922	96.7	1.0	1.4	0.4	0.5

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[110] Welsh Government (2012) Statistical Bulletin: 2011 Census: First Results for Ethnicity, National Identity, and Religion for Wales. Available at: https://gov.wales/sites/default/files/statistics-and-research/2018-12/121217sb1262012en.pdf [Accessed: 01.12.21]

| Area	All categories: Ethnic group	White (%)	Mixed (%)	Asian (%)	Black (%)	Other (%)
Conwy	115,228	97.7	0.8	1.1	0.2	0.3
Denbighshire	93,734	97.4	0.8	1.5	0.2	0.1
Flintshire	152,506	98.5	0.6	0.8	0.1	0.1
Gwynedd	121,874	96.5	0.8	1.8	0.2	0.7
Merthyr Tydfil	58,802	97.6	0.8	1.2	0.2	0.2
Monmouthshire	91,323	98.0	0.7	1.0	0.2	0.1
Neath Port Talbot	139,812	98.1	0.7	1.0	0.2	0.1
Newport	145,736	89.9	1.9	5.5	1.7	1.0
Pembrokeshire	122,439	98.1	0.6	1.0	0.1	0.2
Powys	132,976	98.4	0.6	0.9	0.1	0.1
Rhondda Cynon Taf	234,410	97.4	0.6	1.3	0.6	0.1
Swansea	239,023	94.0	0.9	3.3	0.8	1.0
The Vale of Glamorgan	126,336	96.4	1.3	1.6	0.4	0.3
Torfaen	91,075	98.0	0.7	1.1	0.2	0.1
Wrexham	134,844	96.9	0.7	1.7	0.5	0.2

Source: 2011 Census

In 2011, Wales had 8% more of its population who were white compared to the rest of the United Kingdom and a lower percentage of people who were Asian, black, mixed or other. The white ethnic group is dominant across all of the local authorities. The urban areas of Cardiff and Newport have a slightly more multicultural population and their percentages of white persons compares similarly with the UK figures. The 2021 Census data will be available in 2022.

Limiting long term illness or disability by local authority

Figure B-27 shows the extent of illness or disability by local authority in Wales[111]. In all cases, the majority of residents do not have an illness or disability that limits their day-to-day activities. The trend of results on a national scale for Wales is similar to that of the local authorities with 11.9% limited a lot and 10.8% limited a little. However, levels in Wales were slightly higher than that of England with 8.3% limited a lot and 9.3% limited a little in England.

Figure B-27: Limiting long term illness or disability by local authority
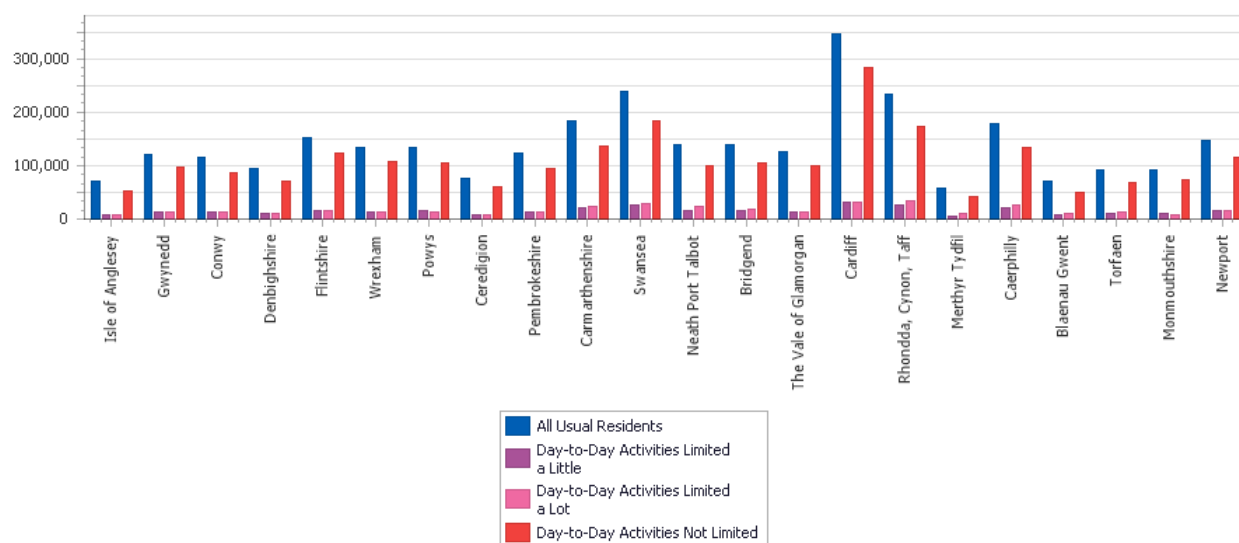
Source: StatsWales (2011)

Population Age Structure

Wales's population age structure for 2020 is shown in Figure B-28[112]. It shows the dominant age group is 45 – 64 years old. The results would also suggest that Wales is an 'aging' population with the higher figures leaning towards the older age groups. The number of people aged 65 and over is projected to increase by 292,000 (44%) between 2014 and 2039. Approximately 55% of people aged 60-74 say they are not

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[111] StatWales (2011) 2011 Census: Limiting long term illness or disability by local authority. Available at: https://statswales.gov.wales/Catalogue/Census/2011/LimitingLongTermIllnessDisability-by-LocalAuthority [Accessed: 01.12.21]
[112] Welsh Government (2020) Summary statistics for Wales, by region: 2020. Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-05/summary-statistics-regions-wales-2020-629.pdf [Accessed:25.11.21]

limited by a long-term condition or illness, with this dropping to 41% for those over 75[113].

In local authority terms, the majority of the authorities have a higher population between 25 and 64 with a fairly even split between the 25-44 and 45-64 age groups. Cardiff has a considerably higher proportion of 25-44 year olds.

**Figure B-28: Resident Population in Wales by age group**
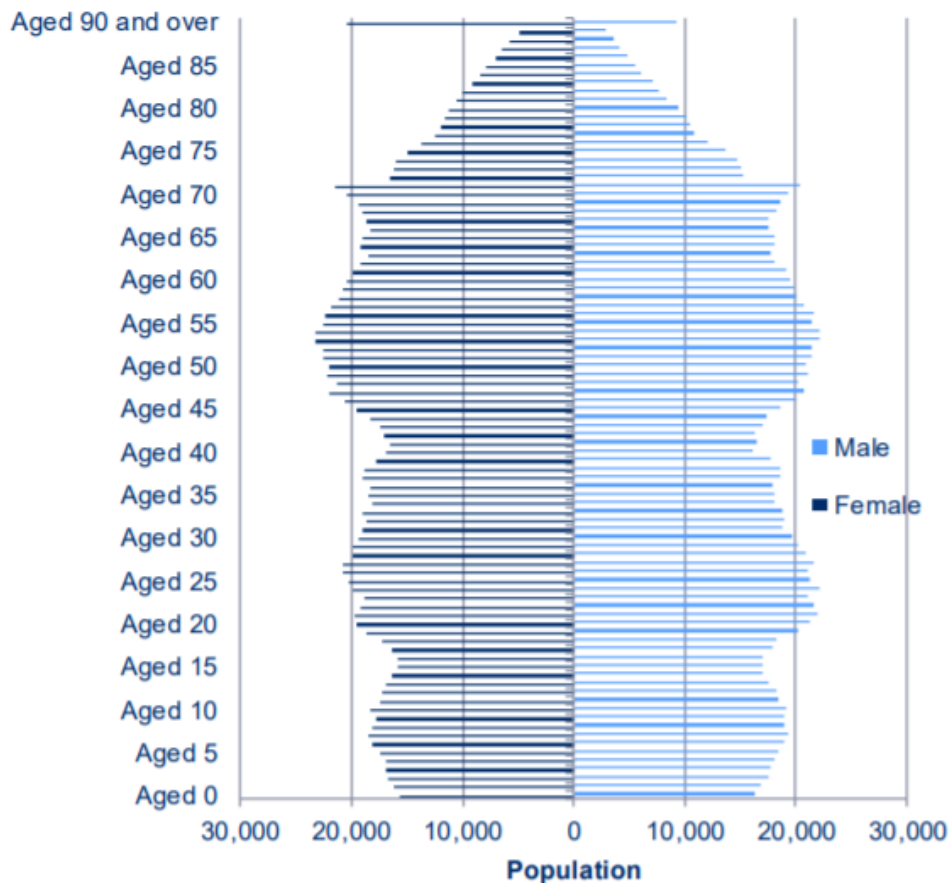
Source: Gov.Wales

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[113] The Older People's Commissioner for Wales (2019) State of the Nation: An overview of growing older in Wales. Available at: https://www.olderpeoplewales.com/Libraries/Uploads/State_of_the_Nation_e_-_online.sflb.ashx [Accessed 23.11.21]

Net Migration Trends

Net migration in Wales has fluctuated over the past 27 years[114]. Years of highest net migration include 2003 and 2006. Figure B-29 shows the changes of migration in Wales between 1991 and 2018.

Figure B-29: Migration in Wales between 1991 and 2018
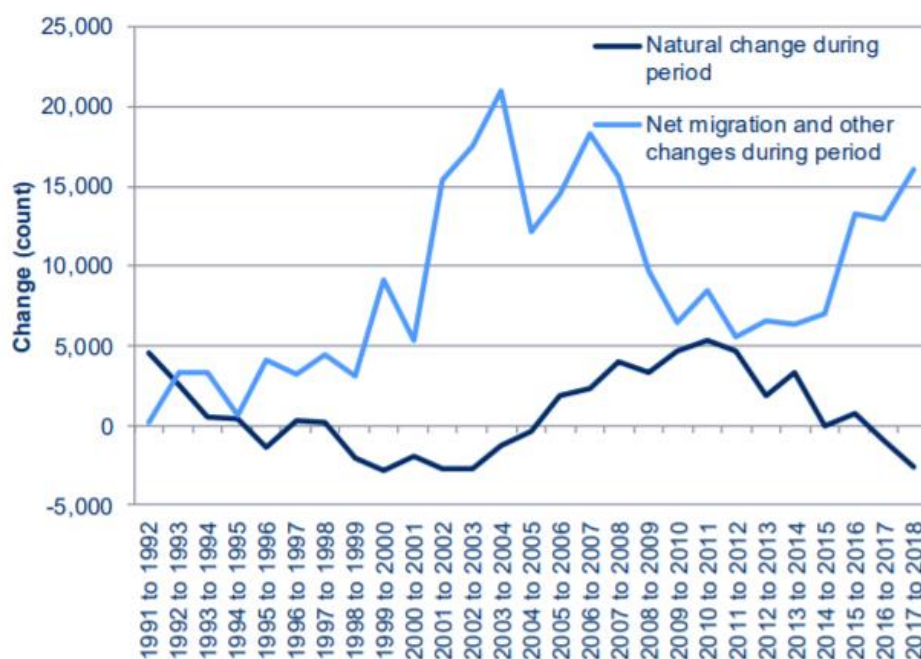
Source: Gov.Wales

Gender

Travel by public transport is highly gendered. In 2018 it was found that in England, a third more women than men travelled by bus and men made slightly more journeys by rail than women[115]. Overall, expenditure on UK public transport (2017/18) was £32.5bn. This includes £10.5bn on national and local roads, £2.5bn on public transport and £18bn on rail.

Gender Pay Gap

In 2019 the gender pay gap in Wales increased to 14.5%, this is a 1% increase on the 2018 figure of 13.5%, but still remains below the UK average of 17.3%[116].

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[114] Welsh Government (2020) Summary statistics for Wales, by region: 2020. Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-05/summary-statistics-regions-wales-2020-629.pdf [Accessed 23.11.21]

[115] Women's Budget Group (2019) Public Transport and Gender. Available at: https://wbg.org.uk/wp-content/uploads/2019/10/TRANSPORT-2019-1.pdf [Accessed: 01.12.21]

[116] Chwarae Teg (2019) Wales' Gender Pay Gap increases to 14.5%. Available at: https://chwaraeteg.com/news/wales-gender-pay-gap-increases/ [Accessed 01.12.21]

4.3 Links between transport, population and health of relevance to the study area

The identification of links between transport systems and health, covering health determinants, pathways and outcomes are presented in Table B-9. This analysis has informed the identification of potential health impacts of the Scheme on identified vulnerable groups during construction and operation (Section 7). Figure 4 – Transportation Networks covers the entire Wales and sets out railways, air ports, ports, motorways, A-roads and cycle routes.

The following definitions have been adapted:

- Health Determinants: Factors that cause outcomes and influence our state of health. Factors are personal, social, cultural, economic and environmental. They include our physical environment, income, employment, education, social support and housing (Birley, 2011);
- Health Pathways: Routes leading to a change in determinant which affect the health risks (the probability that a particular harms will occur) (Birley, 2011); and
- Health Outcomes: medically defined states of disease and disability, as well as community defined states of wellbeing (Birley, 2011).

Table B-9 identifies potential linkages between transport schemes and health, based on findings from research. However, the Medical Research Council (MRC) Guide advocates that the findings from research be assessed against the local profile and qualitative evidence, to determine whether these findings are likely to be applicable.

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Table B-9: Relevance to the NTDP: Health Determinants, Pathways and Outcomes Relevant to Transport Schemes

Determinant and Explanation	Pathways	Health Outcomes
Accessibility to transport options and community facilities Accessible and affordable transport, enabling good access to education, employment, fresh food, friends and family, leisure and health services, enhances general physical health and wellbeing. Accessibility is a critical component of locally-based travel, which is influenced by socio-economic activity. Poor transport provision disproportionately affects lower-income groups and vulnerable groups and can lead to social exclusion and contribute negatively to quality of life and health. Specific groups include teenagers, the elderly, job seekers, and people living in rural locations.	**Construction** Transport routes and modes can be adversely affected by construction activities. There can be disruption and reduced access to existing transport modes and routes from route closures and diversions.	**Construction** Limited and disrupted accessibility may reduce access to amenities and services, adversely affecting general physical health and wellbeing. This is due to greater difficulties in traveling to the service or amenities and the increased stress caused by the disruption while travelling. Research shows that journey duration, predictability and convenience appear to be associated with lower stress levels.[117] Disruption to pedestrian routes may result in a temporary increase in local traffic and congestion.
	Operation Transport schemes can lead to an increase in the provision of public transport use and an improvement of the walking/cycling environment. This can lead to a reduction in car usage.	**Operation** The identified pathways can lead to improvement in physical fitness, physical health and mental wellbeing.

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[117] MRC Social and Public Health Sciences Unit and Institute of Occupational Medicine, *Health Impact assessment of Transport Initiatives: A Guide*, 2007, p34

Determinant and Explanation	Pathways	Health Outcomes
Car ownership amongst vulnerable groups is low. Therefore, the availability of other transport options is important for the wellbeing of vulnerable social groups.		
Risk of injuries and deaths and highway user stress Road traffic accidents are a significant cause of mortality, disability and serious injuries across all age groups.[118] Since the development of the DMRB methodology, understanding of the principal factors which cause driver stress has developed. Frustration at the inability to drive at a constant speed, as well as unreliable journey times, are now considered to represent factors of increased importance in assessing driver stress.	**Construction** Increased construction traffic in residential area and alteration to existing traffic routes and patterns, can increase the risk of injury as a result of increase traffic levels and an unawareness of altered traffic movements. The risk of highway user stress could be increased during construction activity.	**Construction** Vulnerable road users, including motorcyclists, elderly drivers, children, pedestrians, new drivers and cyclists, may be at more risk of injury due to increased construction traffic and altered traffic movements. Highway user stress could be increased during construction activity.
	Operation Transport schemes can improve road safety, which can improve actual and perceived road safety. Highway user stress can be improved by the introduction of transport schemes.	**Operation** There can be a reduction in traffic-related injury and death and the risk of such. Vulnerable groups are similar to the ones identified for the construction stage. Highway user stress can be improved by the introduction of transport schemes.

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[118] Eastern Region Public Health Observatory, *Transport, Access and Health in the East of England, 2005, p16-23*

Determinant and Explanation	Pathways	Health Outcomes
Active travel Walking and cycling are physically active forms of transport. A supportive and safer environment for physical activity is a decisive factor in stimulating uptake. High quality, accessible new routes for pedestrians and cyclists with appropriate and safe crossing points are vital.	**Construction** Increased disruption, altered traffic movements and perception that routes have become unsafe can reduce active travel.	**Construction** Reduced levels of active travel may lead to increased prevalence of sedentary lifestyles, proven to increase risks of many preventable health conditions, including cardiovascular disease, obesity, osteoporosis and depression.[119]
	Operation Transport schemes can enhance walking and cycling through new and more accessible, attractive and improved walking and cycling routes.	**Operation** An increase in active travel would increase the rate of physical activity leading to a potential improvement in wellbeing and improvement in physical fitness. This could lead to a decrease in conditions related to sedentary lifestyles.
Access to green space and land blight Studies[120] have shown that exposure to the natural environment, or green space, has an independent effect on health and health-related behaviours.	**Construction** Transport schemes may lead to disruption of the normal uses of, or reduced access to, and potential loss of, green space. This can reduce the use of green space and have a negative aesthetic impact on the use and perception of the green space.	**Construction** Green space can affect health by inducing beneficial physical activity and by ameliorating stress level. Reducing or disrupting access to green space may therefore have negative health consequences. The fear of land being blighted by the proposals may lead to an increase in stress and affect wellbeing.

[119] Health Scotland, MRC Social and Public Health Sciences Unit and Institute of Occupational Medicine, *Health Impact assessment of Transport Initiatives: A Guide*, 2007, p18
[120] Mitchell, R and Popham, F, *Effect of exposure to natural environment on health inequalities: an observational population study,* 2008

Determinant and Explanation	Pathways	Health Outcomes
	Operation Transport schemes can encourage active travel and improve access to local amenities, including green spaces. However, transport schemes could also lead to a loss of green space due to land-take.	**Operation** An increase in access and interaction with green spaces could lead to an improvement in mental health and wellbeing. It would also lead to an improvement in physical fitness, and a potential decrease in conditions related to sedentary lifestyles or air pollution. Loss of green space could cause the reverse of the above, as well as generate blight. This could have a further negative effect on wellbeing and health.
Air pollution Road traffic is a main source of air pollution. Pollutants that adversely impact health from road traffic include particulate matter (PM) and nitrogen dioxide (NO2).	**Construction** Construction activities can have a short term negative impact on air quality. There can be dust from site works and construction vehicles carrying site materials or waste along with exhaust emissions from construction and other traffic due to road disruption and diversions. **Operation** Transport schemes can increase car or motor vehicle usage leading to an increase in air pollution. They can also reduce car usage, which in turn could reduce air pollution. Increased efficiency of the road network	**Construction and Operation** Increases in outdoor air pollution can lead to increased cardiovascular and respiratory mortality and morbidity. Some effects are more or less immediate and affect vulnerable groups (e.g. children or people whose health is already impaired) in particular, whereas the effects of long-term exposure are more widespread. PM is the constituent most closely associated with adverse health effects. Some evidence shows that PM from traffic is more toxic (per unit mass) than PM

Determinant and Explanation	Pathways	Health Outcomes
	could also lead to an overall neutral effect on air pollution, as although motor vehicle usage may increase, there may be less congestion.	from other sources[121]. A reduction in air pollution can reduce the above adverse health effects.
Noise pollution and vibration Motorised forms of transport are a common source of noise pollution.	**Construction** Construction activities can lead to an increase in localised noise and vibration. **Operation** Transport schemes can increase noise pollution and vibration through increase motor vehicle usage and the construction of new road and rail routes. They can also reduce noise and vibration by encouraging a shift from cars to active travel and public transport or through smoother traffic flows.	**Construction and Operation** Noise pollution and vibration at the levels generated by traffic can lead to annoyance, interference with speech and sleep disturbance. It can also have cardiovascular and physiological effects. Stress has been suggested as a possible mechanism through which noise may affect mental and physical health. Evidence suggests noise pollution may limit children's learning. An improvement in mental and physical health may result during operation, should noise and vibration levels decrease.
Soil and water pollution Surface water run-off containing particles from car tyres, brake linings and road	**Construction and Operation** Potential for localised contamination can occur during the construction period from construction spills and road run- off.	**Construction and Operation** Soil and water pollution can lead to public health impacts directly when people come into contact with water and soil through

[121] MRC Social and Public Health Sciences Unit and Institute of Occupational Medicine, *Health Impact assessment of Transport Initiatives: A Guide*, 2007, p26-31

Determinant and Explanation	Pathways	Health Outcomes
surfaces contribute to the spread of hazardous substances in the environment and impact on water and soil quality. Oil and vehicle fuel also contain harmful organic substances.	Road construction activities can bring about changes in groundwater levels and pollute nearby waterbodies. During operation, potential for pollution as a result of drainage contaminated with vehicle emission particulates and grit/salt spreading residues. Also, potential contamination as a result of fuel/chemical spillages following major traffic accidents.	recreation activities and or indirectly through the use of water for gardens or other green spaces.
Quality of life Quality of life is typically measured using a range of indices, encompassing health, happiness, prosperity, arts, safety, community, public realm, access to transport, access to green space, diet, etc.	**Construction** A combination of all pathways. Light pollution could result from an increase in lighting relating to construction activities.	**Construction** A combination of all outcomes. There is evidence showing that exposure to light at night can lead to associated problems including psychological stresses; increased cancer rates; disruption in sleeping patterns; and negative impacts on immune systems. Glare from poorly shielded outdoor lighting is also harmful to health, because it decreases vision by reducing contrast. This limits our ability to see potential dangers at night. Aging eyes are especially affected.[122]

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[122] International Dark-Sky Association (no date) Human Health. Available at: http://darksky.org/light-pollution/human-health/ [Accessed: 01.12.21]

Determinant and Explanation	Pathways	Health Outcomes
	Operation	**Operation**
	Increasing the accessibility of transport options can lead to an increase in access to education, employment facilities, health and social care facilities, leisure facilities, and family and friends. This could improve quality of life. Community severance could reduce accessibility and hence reduce quality of life. Light pollution could result from an increase in lighting as part of transport schemes, particularly new infrastructure such as roads.	Increased quality of life can improve wellbeing and mental health and vice versa. There is evidence showing that exposure to light at night can lead to associated problems including psychological stresses; increased cancer rates; disruption in sleeping patterns; and negative impacts on immune systems. Glare from poorly shielded outdoor lighting is also harmful to health, because it decreases vision by reducing contrast. This limits our ability to see potential dangers at night. Aging eyes are especially affected.
Personal safety and perceptions of safety More segregated spaces with limited natural surveillance may lead to enhanced fear of crime.[123]	**Construction** During construction, the perception of safety along routes could decrease due to the removal of open spaces, presence of site hoardings, construction activities, access diversions, a reduction on the attractiveness of walking and cycling, decreased interaction with other people (as construction reduces access and prevents people from walking or cycling) and the general construction environment generating noise/vibration, which may	**Construction** Fear of crime and perception of safety can be an important factor influencing travel choices. Women's fear is generally greater than men's. Women are therefore more likely to avoid segregated spaces and disrupted routes. Elderly people and people with disabilities may also avoid disrupted routes. Personal safety may also affect decisions to walk or cycle. This has implications for public health directly (fear of crime) and indirectly (decrease in active

[123] Hillier, B. and Sahbaz, O, Crime and Urban Design, 2009 In: Cooper, R. Evans, G. and Boyko, C. Designing Sustainable Cities, 2009

Determinant and Explanation	Pathways	Health Outcomes
	create the perception that the area is unsafe.	lifestyle).
	Operation Transport schemes can enhance actual and perceived safety through road safety improvements and increase natural surveillance. They can also enable more strangers to travel through an area which can reduce perceived safety. However, the use of underpasses could increase the fear or crime and reduce usage, in comparison to bridges.	**Operation** In addition to the above, an increased use of public transport during operation could increase interaction with other people, which could increase perceptions of a safer community through natural surveillance. This could reduce stress and improve mental wellbeing. Improvements to the walking and cycling environment should also increase perceptions of safety.
Social interaction and community severance There is an observed relationship between positive social capital and health. Well-connected and walkable neighbourhoods can enhance social capital by increasing co-presence and encounter opportunities, which are vital for interaction.	**Construction** During construction, there could be a decrease in access to services and amenities resulting from road closures/diversions and disruption to traffic and road flows. Construction can decrease transport mode and route options and can increase the cost of travel. There is also a risk of communities being severed by the construction traffic routes through an increase in the levels of traffic.	**Construction** Community severance can result from the divisive effects of major roads and railways running through an existing community including through the construction of new routes or increased traffic on existing routes. Potential severance during construction can lead to a decrease in interaction with other people. This can be of particular importance to those who rely heavily of local social networks e.g. the elderly and parents with young children. Reduced social interaction and increased community severance can reduce wellbeing and mental health as well as

Determinant and Explanation	Pathways	Health Outcomes
		lead to reduced active travel and reduced physical fitness and a potential increase in obesity and cardiovascular disease.
	Operation	**Operation**
	Enhanced connectivity and new travel modes and route options could increase social interaction and reduce community severance. However, new routes through or near existing communities could increase community severance and reduce social interaction.	An increase in social interaction and reduced community severance could improve wellbeing and mental health as well as lead to increased active travel and improved physical fitness. This could improve physical and mental health.
Climate Change Greenhouse gases (GHGs) from transport contribute to climate change.	**Construction** During construction, increased vehicle movements from construction vehicles and car movements, as well as the embodied energy in construction materials, can lead to an increase in fossil fuel use and an increase in GHG emissions.	**Construction** Climate change consequences, at local level, are likely to affect the health of the population, particularly with an increase in flooding, summer temperatures, levels of solar radiation and frequency of extreme weather events leading to, for example, increased levels of fatalities, injuries, infectious diseases, heat related deaths , skin cancer cases and cataracts.
	Operation Transport schemes may reduce the efficiency in the use of roads or a reduction in car usage. These aspects could decrease the use of fossil fuels,	**Operation** In addition to the above, a reduction in GHG emissions could have positive implications for public health.

Determinant and Explanation	Pathways	Health Outcomes
	which could lead to a reduction in GHG emissions.	
Employment The implementation of infrastructure projects generates new employment opportunities. Employment is a positive factor for health, providing financial security, promoting equality and contributing to self- esteem.	**Construction** New employment opportunities can be generated by construction activities. **Operation** Transport schemes may improve access to employment opportunities for various social groups.	**Construction and Operation** The HUDU planning tool states that unemployment generally leads to poverty, illness and a decrease in personal and social esteem. People in employment are healthier, particularly those who have more control over their working conditions. Employment is also associated with income, a feeling of security, increase friendship networks and social status. In turn, these are linked to better health. These positive impacts are particularly important at a time where economic downturn is recent, which may have had negative effects on mental health.

Source: Adapted from Highways England: M4 Junctions 3 to 12 smart motorway (Arcadis Ltd, October 2015) and Atkins Limited, South Bristol Link: Environmental Statement Volume 2: Health Impact, July 2013

4.4 Vulnerable or Priority Groups

A Health Impact Assessment (HIA) considers the effects of a project on both the health of the population affected by a project overall and the distribution of those impacts within the affected population. However, it is necessary to identify particular priority groups because changes to overall health determinants can have greater or lesser effects on population sub-groups depending on, for example, their age, health status, income and social support. The term 'Vulnerable or Priority Groups' is derived from the Healthy Urban Development Unit (HUDU) guidance[124].

Vulnerable sub-groups are more likely to be susceptible to the NTDP's impacts than other social groups due to various factors as explained in Table B-10. Other wider target groups including adults and professionals and the general population living in Wales may also be impacted by the NDTP.

Table B-10: Vulnerable or Priority groups and health outcomes related to the NTDP

Vulnerable/ Priority Group	Explanation and Health Outcomes
Younger people (children and young people, up to 18)	Children and adolescents constitute a vulnerable population group due partly to their need to be able to move around freely to and from school and recreational activities, whilst they lack the experience and judgement displayed by adults when moving around in traffic and public spaces. Hence, children and adolescents as pedestrians and cyclists are at elevated risk from danger distributed by motorised transport.
	Furthermore, children are more sensitive than adults to air pollution, noise and other environmental factors. A particularly sensitive group is children in low-income families.
	Walking, cycling and travel by bus are important modes of travel for young people. Over half of children will walk to school for at least part of the week and 40%will travel by bus. Bus travel is important for young people to access college, leisure facilities and work. Affordability of travel is an issue for younger people.
	16-24 year olds have higher risk of becoming a road casualty. They

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[124] NHS (2019) Rapid Health Impact Assessment Tool. Available at: https://www.healthyurbandevelopment.nhs.uk/our-services/delivering-healthy-urban-development/health-impact-assessment/#:~:text=HUDU%20is%20able%20to%20provide%20bespoke%20advice%20and,assessing%20the%20indirect%20implications%20for%20the%20wider%20community [Accessed: 01.12.21]

Vulnerable/ Priority Group	Explanation and Health Outcomes
	represent 11% of the population but 22[125]% of fatal and serious casualties.
Women	Women are more likely to not own a car and as a result can find it harder to travel to shops, employment, healthcare and other services. They are more reliant on the provision of public transport. Women may also have more safety and security concerns when travelling alone and when there are more strangers in an area e.g. resulting from an influx of construction workers.

Estimates for 2011/12 indicate 80%of men and 67% of women in Wales hold a full driver's licence, nearly identical to Great Britain as a whole. The National Travel Survey reports that women have different travel patterns to men and this has major implications for travel requirements. In particular women are:

- more likely to work irregular shifts and need to commute outside normal working hours
- more likely to be carers and to take escort trips
- more likely to travel with luggage, bags and pushchairs
- more likely to have a physical condition which makes it difficult to use the bus
- are more likely than male users to say they would prefer to travel by car
- are twice as likely as male users to say they feel unsafe using the bus at night

The Welsh Bus Passenger Survey also reported that a substantial number of bus users who are women were also travelling with children and / or with a pushchair.

Women are less likely to travel to work by car (80% compared to 85% of men) and more likely to travel by bus (6% compared to 3%).

Overall distance travelled per year by all modes is greater for men than women. Men tend to make more commuting and more business trips than women and travel further for both purposes. Both men and women will benefit from schemes to improve the road network, public transport and active travel facilities.

Women tend to be more likely to use rail transport less than buses, and less often than men. In2016/17, the expenditure on UK public transport (2016/17) was £29.1bn. 54% of this was spent on rail, compared to 8% on 'public transport' including local buses. As of 2018, in Wales there has |

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[125] Welsh Government (2021) Reported Road Casualties Wales, 2020. Available at: https://gov.wales/sites/default/files/statistics-and-research/2021-09/reported-road-casualties-2020-881.pdf [Accessed: 02.12.21]

Vulnerable/ Priority Group	Explanation and Health Outcomes
	been a cut of 39% in funding for buses since 2010/11.
	Women are less likely to be safe, and less likely to feel safe, when using public transport, public toilets and taxis, including due to physical or verbal aggression, sexual harassment or other forms of violence.
	Women earn less on average, and use public transport more on average, than men. Women also typically have higher rates of trip chaining with diverse patterns due to carrying out a multitude of tasks, particularly when accompanying a child. Women are therefore more economically sensitive to the cost of transport and are therefore more likely to face financial constraints to mobility.
	The way women, non-binary people and men interpret accessibility in physical, cognitive, financial and emotional terms can vary greatly and define how they use transport.
Older People (50+)	Generally, the older people are, the slower their movement and reactions are and the poorer their hearing and vision can be. Therefore, older people are considered to be more sensitive as users when compared with younger and middle-aged adults. Older people can be more at risk from injury, may fear falls, and may be concerned about a lack of safe crossing points and short crossing times at safe crossing points. This can deter them from outdoor activity, especially walking, which can be critical for muscle strength and reduces the risk of falls, amongst other benefits.
	Older people can feel more vulnerable using public transport. They also often need to seek health services. Their continuing independence at home is often dependent on having availability to a range of transport mode and route options.
	Around 48% of pensioner households do not have access to a car compared to 26% of all households.
People who are disabled	This group may not be able to access many forms of transport or need special arrangements and/or support to access those. They are more likely to find it difficult to walk or travel independently and can also be disadvantaged by the cost of transport.
	Chronically ill persons, for example, people with impaired lung function, can be more adversely affected by air pollution. The same is true of hypersensitive individuals such as asthmatics. Noise can cause hypertension and cardio-vascular problems. Those who already have these conditions can be more troubled by noise than others.
	People with existing physical and mental illnesses, including sleep disturbance, anxiety and depression, can be more sensitive to even small changes to their local environment.
	Disabled people or people with a long term illness are less likely than other people to have the use of a car (six of ten do so compared to 8 out of 10 other people). Employed disabled people are nearly twice as likely

Vulnerable/ Priority Group	Explanation and Health Outcomes
	not to have the use of a car as other people.
	The 2010 Welsh Bus Passenger Survey reported that 25% of respondents had a disability or long term illness. Within this group, around 12% of bus users had mobility problems and 1% used wheelchairs.
	Disabled passengers who use buses use them as intensively as other passengers.
	Some 75% of disabled bus users use a bus three or more times a week, compared to 72% of bus users without a disability. This is despite disabled users having a different pattern of bus use. Compared to non-disabled bus users, disabled people are less likely to use a bus to commute and travel to education, but more likely to us a bus for shopping, visiting friends and relatives, and for leisure. Around two-thirds of passengers reporting that they had a disability or long-term illness were entitled to free concessionary bus travel because they met either the age or disability criteria of that scheme.
	The availability of accessible information, including on-board audio and visual announcements and a high standard of customer care are key factors impacting on equality of travel opportunities.
	Rail – Passenger focus published its report on the experiences of disabled rail passengers in October 2012. Key conclusions from the report were: • About 5% of rail journeys are made by passengers with disabilities or long term illness; • Half of these journeys are undertaken by people with impaired mobility; • About 1% of passengers have sensory impairment; • Passengers with disabilities tend to be older and are less likely to be in work compared to passengers in general; • 30% of journeys by disabled people are for commuting although this rises to 40% in peak time; • 78% of passenger journeys by disabled people are made alone, although disabled passengers are more likely to travel with another adult than other passengers (22% compared to 15%); • A railcard is used in 43% of journeys made by disabled passengers; Disabled travellers will benefit from schemes to secure improved quality and accessibility of bus services, including bus driver training, to provide funding to support socially necessary services and continue to provide a concessionary fares scheme for disabled people.

Vulnerable/ Priority Group	Explanation and Health Outcomes
Those in low- income groups/ People without access to a car	People on low incomes (living in a deprived area is used as a proxy for a low income) and without access to a car are likely to walk further. Their lack of transport options, which may include affordability of public transport, may limit life and work opportunities. People living in deprived areas can be particularly vulnerable to road traffic incidents (deaths and injuries), noise and air pollution. Deprived areas are often characterised by higher traffic volumes as well as other environmental burdens such as industrial facilities.[126] This group is generally more likely to already have reduced access to health and social care as well as other services and amenities. This group may have existing increased stress levels due to the factors above. A poor physical environment can also act as a barrier to active travel, or travel in general. In addition, this group is more vulnerable to food insecurity (meaning "consistent access to adequate food is limited by a lack of money and other resources at times during the year"), which has an access dimension.[127]
Ethnic minority people e.g. Asian, Black	The National Travel Survey data shows that minority ethnic adults are more likely to live in a household without access to a car compared to a white British adult, so a greater reliance on public transport may exist in parts of Wales (South East and North East) where the majority of train and bus services are provided. About 60% of the passenger activity on the Wales and Borders Franchise area is focused on the Valleys Lines and Cardiff area. The same survey also suggested that minority ethnic adults make twice as many local bus trips as white adults. The ethnic background of bus users as compiled from the 2010 Welsh Bus Passenger Survey is that 93% reported that they were white, 5% were from another ethnic background, and 2% declined to answer. In comparison, around 4% of people in Wales are from a minority ethnic group. Rail – Railway crimes reported by British Transport Police and published by the Office of National statistics reported that 77 racially aggravated offences on the railways were reported in the three years to 2011/2012, representing almost 13% of the reported violent offences against the person. (Source Rail transport statistics 2011/2012 published by ONS 30 October 2012).

Source: Adapted from Highways England: M4 Junctions 3 to 12 smart motorway (Arcadis

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[126] Greater London Authority, London Health Commission and London Health Observatory (2002) Rapid review of health evidence for the draft London Plan; and Jarvis, S., Towner, E. et al 1995 cited in Cave, B (2001) "Accidents" in The health of our children ed. Botting, B, London, Office of Population Censuses and Surveys, HMSO

[127] S.Tsang, MHSc, RD (1); A.M.Holt, MHSc(2); E.Azevedo, MSc, RD (1), An assessment of the barriers to accessing food among food-insecure people n Cobourg, Ontario, Chronic Diseases and Injuries in Canada, Volume 31, no.3, June 2011

Ltd, October 2015) and Atkins Limited, South Bristol Link: Environmental Statement Volume 2: Health Impact, July 2013 as well as the National Transport Finance Plan 2015 – Impact Assessments

4.4.1 Data Gaps

- Up to date national data relating to access to open space.
- Up to date data regarding the specific distribution of hospital or healthcare facilities in Wales.
- Information relating to the potential impact of the NTDP on transgender people.
- Information relating to the potential impact of the NTDP on people by religion and belief or non-belief.
- Information relating to the potential impact of the NTDP on people by sexual orientation.
- Information relating to the potential impact of the NTDP on Asylum Seekers and Refugees
- Information relating to the potential impact of the NTDP on Gypsies and Travellers
- Information relating to the potential impact of the NTDP on Migrants
- Impact of health emergencies on transport
- The health impacts of schemes such as smart motorways
- Data relating to the National Cycle Network
- Data relating to the national walking networks and Wales Coastal Path
- There are also relevant data gaps to be considered from the data collated from the 2011 Census, as it may not be accurate to the current population and these figures will not be updated until 2022.
- Information relating to the percentage of men and women using different modes of public transport within Wales.
- For all data collected, there may be gendered differences that are not reflected in the sources they were collected from.

4.5 Key Issues relevant to the NTDP and opportunities for it to address them

4.5.1 Issues

Overall health statistics for Wales are improving, with life expectancy increasing and fewer people with reported poor health over the past decade. However health gains are not distributed equally across the country and in particular access to services is varied, being good in more urban areas, notably the south, but relatively poor across much of rural Wales. Although the health of those living in rural communities is generally good compared to those of urban environments. It is not clear how this is likely to change in the wake of the COVID-19 pandemic.

Factors specific to a rural environment compared to those of urban environments that can impact on health more significantly and lead to inequalities and poorer health, such as distance from public services and support, availability of transport, and the ageing

population. Access to healthcare can be limited in many parts of rural Wales. Public transport is important for both the sustainability and independence of rural communities.

Whilst people are living longer and the rates of some diseases is decreasing, challenges such as living environment and modern lifestyles can contribute towards increasing levels of chronic diseases such as diabetes, joint problems, heart disease and some cancers which in turn can lead to disability and increased demand on health services. In addition, poor mental health can also be an underpinning factor in a number of physical diseases and unhealthy lifestyles. Poor air quality, noise and light pollution as well as road traffic crashes can have direct effects on the physical and mental health of the population.

The transport system could be put under strain through a projected increase in net-migration mainly from within the UK and with urban areas projected to see greatest increase.

Increasing levels of those aged 65 and over could present pressures across the country (dependent on whether healthy life expectancy i.e. the number of years you live a healthy life, continues to track overall life expectancy) e.g. provision of appropriate services for an older generation (e.g. transport).

Issues relating to young people relate to their transition from dependence to independence, as transport plays an important role at particular 'trigger points' such as the move from primary to secondary school, and the move from education to employment.

Health inequalities reflect inequalities in the distribution of health determinants, such as access to transport, education and employment opportunities.

Disabilities and/or mobility impairments can be both physical and mental barriers to using the transport network across all modes.

Road transport has five main impacts on public health: air pollution, physical inactivity, road safety, noise and the isolation faced by vulnerable people due to fear of road danger, which prevents them accessing employment or educational opportunities, social networks, local amenities and services (including healthcare), adding to the risk of mental and physical ill-health.

Issues relating to women specifically can relate to a fear of crime on public transport.

Physical accessibility to transport may have an effect on disabled people accessing public transport.

There is still a high risk of road casualty for younger people which must be addressed by the NTDP.

There is still a large disparity between the number of drivers licenses owned by women and men, with women having much fewer, this makes it more difficult for women to have the same access to facilities and amenities as men.

Chronically ill or disabled people are extremely sensitive to noise or air pollution in their local environment, with impacts ranging from sleep disturbance to hypertension.

People on low incomes (living in a deprived area is used as a proxy for a low income) and without access to a car are likely to walk further. Their lack of transport options, which may include affordability of public transport, may limit life and work opportunities. People living in deprived areas can be particularly vulnerable to road traffic incidents. This group may also have increased stress levels, a poor physical environment can be considered a barrier to active travel.

Minorities are more likely to live in a household without a car and so will be more reliant on public transport. 77 racially aggravated offences took place across three years on British railways. The NTDP must provide for the safety and inclusion of minorities across all modes of public transport.

Women and minority groups are more likely to travel by bus, however more investment is being put into rail as a method of public transport. The NTDP must provision for a more equal Wales by placing the necessary investment in the public transport most used by these groups or removing any potential barriers to other types of transport to these groups.

Levels of noise pollution around key roads within Wales are high. Noise can have multi-ranging effects, including on landscape receptors, ecological resources and human health.

The gender pay gap overall is increasing within Wales. The NTDP must ensure that men and women working for the transport system are paid equally for carrying out the same job.

Women are more likely to have diverse patterns of trip chaining, particularly when accompanying a child. They therefore tend to be more economically sensitive to the costs of public transport, particularly buses, and particularly as women tend to earn less on average than men.

4.5.2 Opportunities

Overall, the NTDP could help to achieve the important balance of economic and social improvement that is also sustainable and respects the country's valuable natural and cultural environment.

The NTDP could recognise the potential for natural green spaces as places for health and recreation, connecting habitats and supporting community interaction. Improving the access to green and open spaces, including National Parks, could greatly encourage healthier lifestyles and a healthier population could enable people (including children) to achieve their potential and to make Wales a more equal society.

Protecting and enhancing green infrastructure throughout Wales is an opportunity to enhance people's access to green and open spaces. Access to a diverse range of semi-natural and natural habitats, as well as providing space for outdoor exercise and community engagement, is fundamental to physical and mental wellbeing.

The NTDP has an important contribution to make towards ensuring that human health is provisioned through improved access to health facilities, a focus on reducing air pollution emissions, road safety and the encouragement of active travel in order to improve health

and well-being and reduce inequalities. (It should be noted that a lot of active travel occurs within the context of trip chaining).

Overall, the NTDP can help to address issues surrounding the aging population through facilitating the provision of accessible transport services supported by connective infrastructure to meet local population growth needs and the needs of individual groups.

An equal Wales can enable people to reach their full potential whilst addressing social, economic, cultural and environmental inequality. The NTDP could provide an opportunity to reduce isolation and encourage the development of integrated and liveable communities through provisioning the inclusivity of public transport to allow everyone to have the same level of access.

The transport system should ensure that all groups are able to access public transport and the transport network equally and without fear or prejudice.

Reducing inequality can be achieved by increasing access for the most deprived more than the least deprived or increasing access for the most deprived and keeping the least deprived constant, any other form would involve the reduction of access to either or both groups so should not be an aim of the WTS.

Health inequalities can also be addressed through policies and infrastructure to promote active travel, thereby increasing physical activity, reducing pollution and noise. Active travel measures should be focussed in areas of deprivation to reduce inequalities.

5 Well-Being Goal: A Wales of Cohesive Communities

This section provides baseline data relating to the following well-being goal:

"Attractive, viable, safe and well-connected communities".

The data relates primarily to:

- Crime and Safety

5.1 Crime and Safety

5.1.1 Relevance to the NTDP

The creation of cohesive communities which are attractive, well-connected, safe and meet the needs of the population are important for Wales. The NTDP has a role to play in helping to guide decisions relating to the development of space which can help to reduce crime related to transport. Further information on this topic is included in Chapter 4 relating to Health and Well-being. Other aspects relating to the connectivity of communities are included throughout this Appendix.

5.1.2 Baseline Conditions and trends

Percentage of people feeling safe at home, walking in the local area and when travelling

In 2021, in the National Survey[128], people were asked how safe they felt in a variety of situations after dark:

- 78% of people said they felt 'very' or 'fairly' safe walking alone in their local area after dark;
- 97% of people felt 'very' or 'fairly' safe at home after dark;
- 78% of people felt 'very' or 'fairly' safe on public transport after dark; and
- 97% of people felt 'very' or 'fairly' safe travelling by car after dark.

Percentage of people satisfied with local area as a place to live

In 2019, the National Survey[129] included a series of questions on the quality of the local area. These were included in the survey to help investigate the environmental dimension of well-being.

- 72% of people were satisfied with the level of traffic noise in their local area; and
- 73% of people were satisfied with the level of air pollution in their local area.

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[128] Welsh Government (2021) National Survey Results. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed 26.11.21]
[129] Welsh Government (2019) National Survey Results. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed 26.11.21]

Latest figures for year ending June 2021[130] show the total crime rate per 1,000 number of vehicle owning households / unweighted base households in England and Wales. Broken down in key transport related crime statistics the crime rates compared to the change from year ending June 2020 figures are as follows:

- Total Vehicle related theft – 6/1,000 (-19%)
- Theft from vehicles – 19/1,000 (-28%)
- Theft of vehicles – 2/1,000 (-37%)
- Attempts of and from vehicles – 7/1,000 (3%)
- Criminal damage to a vehicle – 28/1,000
- Bicycle theft – 17/1,000

In the report, Family Spending in the UK: April 2019 to March 2020[131], it was found that the top spending categories in Wales are transport and recreation and culture, with households in Wales spending 15% of their total expenditure in these categories. This mirrors the statistic that 87% of households in Wales had access to a car or van in 2021[132]. Households in Wales spent an average of £35.80 a week on the operation of personal vehicles, which was 45% of total transport expenditure.

Crime on the rail network in Wales in 2017-18 increased by 15.3% compared to the previous year. Prior to this, the number of offences had been relatively stable. The largest categories of recorded offences were public order (308), violence against the person (294) and theft of passenger property (199), which accounted for 59%[133].

Transport user's satisfaction

Passenger satisfaction figures were collected by the National Passenger Survey (NPS)[134], in a report called 'Overall passenger satisfaction with their journey on Arriva Trains Wales', it was found that in Autumn 2019, 8% of passengers were dissatisfied with the service, 13%

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[130] Office for National Statistics (2021) Crime in England and Wales: year ending Jun 2021. Available at:
https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/bulletins/crimeinen glandandwales/yearendingjune2021 [Accessed: 01.12.21]
[131] Office for National Statistics (2021) Family spending in the UK: April 2019 to March 2020. Available at:
https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/ex penditure/bulletins/familyspendingintheuk/april2019tomarch2020 [Accessed: 02.12.21]
[132] Welsh Government (2021) National Survey Results. Available at:
https://gov.wales/national-survey-wales-results-viewer [Accessed 26.11.21]
[133] Welsh Government (2019) Rail Transport, April 2017 to March 2018. Available at:
https://gov.wales/sites/default/files/statistics-and-research/2019-04/rail-transport-april-2017-to-march-2018-824.pdf [Accessed: 02.12.21]
[134] Welsh Government (2019) Overall passenger satisfaction with their journey on Arriva Trains Wales by time of survey - up to 2019 only. Available at:
https://statswales.gov.wales/Catalogue/Transport/rail/rail-transport/overallpassengersatisfactionwiththeirjourneyonarrivatrainswales-by-timeofsurvey [Accessed: 02.12.21]

were neither satisfied nor dissatisfied and 79% were satisfied with the service. Across all regional operators 82% of passengers were satisfied with the service.

A study of Public Service Vehicles (buses and taxis) found that bus fares in Wales increased by 3.5% from 2018 to 2019[135].

Road accidents by area by year and people killed or seriously injured on roads

In 2019, police forces in Wales recorded 4,330 road accidents involving personal injury[136]. These recorded accidents resulted in 5,808 casualties, an increase of 2.6% from 2018.

Within the 5,808 casualties:

- 95 people were killed, 13 fewer (12.0% lower) than in 2018.
- 1,098 people were seriously injured, 69 more (6.7% higher) than in 2018.
- 4,615 people were slightly injured, 16 fewer (0.3% lower) than 2018.

In 2020, 819 road casualties were killed or seriously injured, a decrease of 31% compared with 2019. Of these, 72 were fatal accidents, 24.2% lower than 2019. In total, 3,692 casualties were reorced, a 36% decrease from the previous year, and of these, 2,873 were slightly injured. During 2020, motorised traffic in Wales has decreased by 23.4% compared to 2019, the largest decrease of the UK countries. It is, however, uncertain if these lower figures will increase again as the impact of the COVID-19 pandemic lessens[137].

Railway Incidents

In 2020, there were 11 railway fatalities, all of which were suicides[138]. In 2019-20 there were 1,459 notifiable offences reported on Welsh railways, a decrease of 5.9%from previous years.

5.1.3 Data Gaps

- Data gaps relating to crime and death/injury on buses or in bus stations.
- Data gaps relating to crime and death/injury on active travel routes.
- Data gaps relating to gendered differences within the data captured.

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[135] Welsh Government (2021) Public service vehicles (buses and taxis): April 2019 to March 2020. Available at: https://gov.wales/public-service-vehicles-buses-and-taxis-april-2019-march-2020-html#section-66265 [Accessed: 02.12.21]

[136] Welsh Government (2020) Police recorded road accidents: 2019 (revised). Available at: https://gov.wales/police-recorded-road-accidents-2019-html [Accessed: 02.12.21]

[137] Road Safety Wales (2021) 2020 Data. Available at: https://roadsafetywales.org.uk/statistics/2020/#:~:text=During%202020%2C%20police%20recorded%20road%20accidents%20resulted%20in,injured%2C%20down%20by%201%2C742%20%2837.7%25%29%20compared%20to%202019 [Accessed: 02.12.21]

[138] Welsh Government (2021) Rail Transport, April 2019 to March 2020. Available at: https://gov.wales/rail-transport-april-2019-march-2020 [Accessed: 02.12.21]

5.2 Key Issues relevant to the NTDP and opportunities for it to address them

5.2.1 Issues

Bus fares are rising in cost at a rate higher than inflation, this could exclude some people or communities from this form of transport due to a price barrier.

The number of deaths on the road is remaining consistent year to year when it should be improving, more efforts should be made to provision the safety of drivers and other road users as much as possible.

Levels of noise pollution around key roads within Wales are high. Noise can have multi-ranging effects, including on landscape receptors, ecological resources and human health.

Rural Isolation and loneliness can lead to mental health problems, this can be caused by a less accessible transport system reducing access to communities, but also cars travelling through communities can sever communities and promote isolation.

When people are travelling, they should be able to do so without the fear or threat of crime.

5.2.2 Opportunities

The NTDP could support the creation of connections between and within safe and well-maintained communities through public transport opportunities and active travel opportunities including foot and cycle paths.

The NTDP could also plan for reducing the need to travel; and provide opportunities to access new and existing development and services by a range of sustainable travel modes and or improvements to digital connectivity. By reducing the amount of single-occupancy car journeys, the risk to non-motorised users could be reduced and the issue of isolation be lessened.

The NTDP could consider strategic transport proposals in terms of the opportunities they present to encourage regional equality as well as improving human health, landscape and nature conservation from a reduction in noise and light pollution. Transport schemes can improve road safety, which can improve actual and perceived road safety. Driver stress can also be improved by the introduction of transport schemes.

6 Well-Being Goal: A Wales of Vibrant Culture and Thriving Welsh Language

This section provides baseline data relating to the following well-being goal:

"A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation".

The data relate primarily to:

- Welsh Language;
- Landscape and Townscape Character; and
- Cultural and Heritage Assets.

6.1 Welsh Language

6.1.1 Relevance to the NTDP

Wales is a bilingual country, and the Welsh language is an important component of Welsh national identity and culture. As such, the protection and promotion of Welsh Language needs to be a core element of the NTDP. Cymraeg 2050[139] sets out that Welsh-medium immersion education is the principal method for ensuring that children can develop their Welsh language skills, and for creating new speakers. Cymraeg 2050 incorporates three key themes: increasing the number of Welsh speakers, increasing the use of Welsh and creating favourable conditions through infrastructure and context.

The NTDP should seek to ensure that access to Welsh-Medium education facilities is specifically targeted as part of this aim, to support the strategy seeking to expand Welsh-Medium education provision. The NTDP could also seek to support the aim to increase the range of services offered to Welsh speakers, and an increase in use of Welsh-language services. The NTDP could also seek to 'support the socioeconomic infrastructure of Welsh-speaking communities' through its policies, helping to support the aim of 'Develop[ing] a new regional focus to economic development to help all parts of Wales to benefit from prosperity and support each area to develop its own distinctive identity.' Within the NTDP there will be opportunities to promote the Welsh language through its use in station announcements, road signs and signs within rail and bus stations.

6.1.2 Baseline conditions and trends

The historic decline in use of the Welsh language has been halted and has now been on a general upward trend since the early 1990s. This is, in part, due to Welsh entering the national curriculum and being a compulsory subject in schools. However, levels of fluency are still low and there are large regional variations. The February 2020 report 'The Welsh

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[139] Welsh Government (2017) Cymraeg 2050: A million Welsh Speakers. Available at: https://gov.wales/sites/default/files/publications/2018-12/cymraeg-2050-welsh-language-strategy.pdf [Accessed 24.11.21]

Language and the economy: a review of evidence and methods'[140] presents the findings of a review of the evidence available on the relationship between the Welsh language, and other languages relevant to the linguistic context in Wales, and the economy.

The average fluency in Welsh across Wales is 29.2% in people aged 3 and over. This is 0.6 percentage points higher than the previous year (July 2019-June 2020), equating to around 17,900 more people, and is a 3% increase on 2011. The highest proportion of Welsh speakers can be found in Gwynedd and the Isle of Anglesey, and the lowest proportion is in Monmouthshire and Blaenau Gwent Figure B-30 which shows the fluency of Welsh people across local authorities[141].

Figure B-30: Fluency in Welsh across Local Authorities
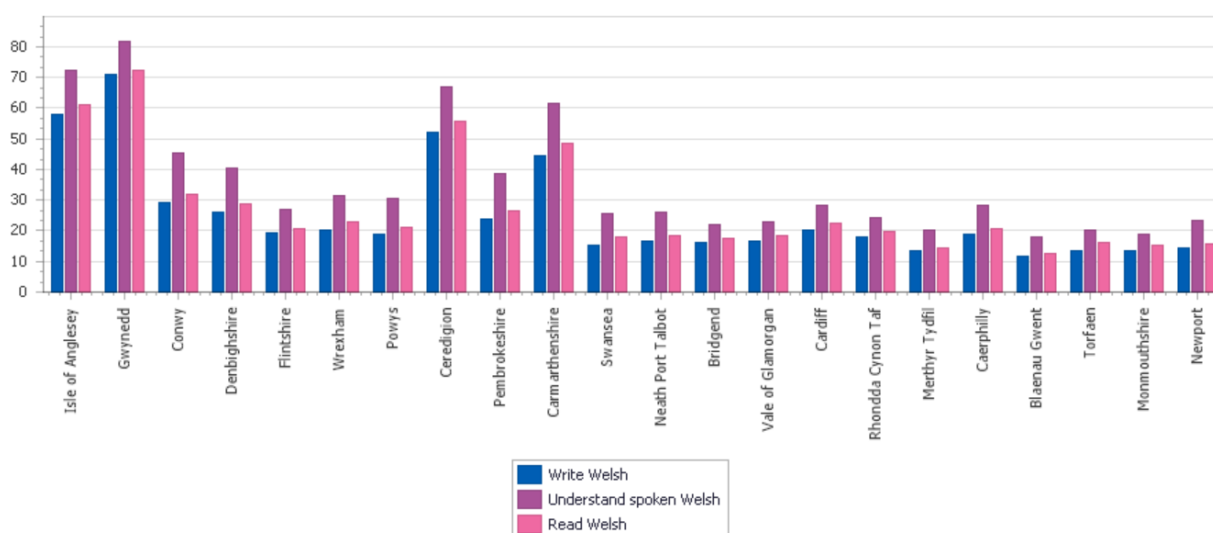
Local Government has a vital role to play in the delivery of services through the medium of Welsh, in the economic development of predominantly Welsh-speaking areas and in the strengthening of the Welsh language in daily use in the workplace and the wider community. In addition to their status as major employers and spenders, Local Authorities also influence local economic development through functions such as housing, education, regeneration and cultural activities. Some of these functions are statutory, others not[142].

Attitudes towards the Welsh Language

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[140] Welsh Government (2020) The Welsh language and the economy: a review of evidence and methods. Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-02/the-welsh-language-and-the-economy-a-review-of-evidence-and-methods.pdf [Accessed: 25.11.21]

[141] Stats Wales (2021) Annual Population Survey - Ability to read, write and understand spoken Welsh by local authority and year. Available at: https://statswales.gov.wales/Catalogue/Welsh-Language/Annual-Population-Survey-Welsh-Language/welsh-skills-by-la [Accessed 1.12.21]

[142] Working Group on the Welsh Language in Local Government Administration and Economic Development (2018) Welsh Language in Local Government Administration and Economic Development. Available at: https://gov.wales/sites/default/files/inline-documents/2018-11/written-statement-working-group-on-the-welsh-language-in-local-government-administration-and-economic-development.pdf [Accessed 01.12.21]

In the National Survey for Wales 2018-19, Welsh Language: Confidence and attitudes and the Annual Population Survey (2020)[143] it was found that:

In terms of ability:

- 18% said that they could speak at least some Welsh; and 11% said they spoke Welsh in everyday life[144].
- 33.6% of respondents could understand spoken Welsh
- 25.9% could read Welsh
- 23.7% could write Welsh

In terms of demographics:

- Younger people aged 16 to 24 were most likely to be able to understand, speak, read and write Welsh.
- Females are more likely to speak Welsh in their daily lives than males.
- It is shown that over 10% of Christians (all denominations) can speak more than a few words of Welsh compared to other religions and no religion which are both below 10%.
- Ethnicity also has an impact as twice as many White (Welsh, English, British etc.) can speak more than a few words and use it in daily lives over other white groups or any other ethnic groups.

The National Survey for Wales (2017-2018)[145] gathered data on Welsh Language confidence and attitudes, that was not asked in later versions of the National Survey. In terms of confidence:

- 68% of Welsh speakers felt confident speaking Welsh. 72% wanted to speak it with other Welsh speakers and 36% worried they would be judged on how well they spoke it.
- Welsh speakers' fluency levels were strongly correlated with their confidence when speaking Welsh.
- 95% of fluent Welsh speakers were confident speaking Welsh; however, 21% of fluent speakers worried they'd be judged on how well they speak it.
- Women were slightly more likely than men to worry about feeling judged.

In terms of attitudes:

- 86% of people felt the language was something to be proud of.
- 67% thought more effort needed to be put into supporting the language.

[143] Welsh Government (2021) Annual Population Survey - Ability to read, write and understand spoken Welsh by local authority and year. Available at: https://statswales.gov.wales/Catalogue/Welsh-Language/Annual-Population-Survey-Welsh-Language/welsh-skills-by-la [Accessed 26.11.21]

[144] Welsh Government (2020) What factors are linked to people speaking the Welsh language? Available at: https://gov.wales/sites/default/files/statistics-and-research/2020-03/what-factors-are-linked-to-people-speaking-the-welsh-language_0.pdf [Accessed 01.12.21]

[145] Welsh Government (2018) Statistical Bulletin National Survey for Wales, 2017-18 Welsh Language: Confidence and attitudes. Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-01/national-survey-wales-welsh-language-confidence-attitudes-2017-18.pdf [Accessed 26.11.21]

- 62% of those who couldn't speak Welsh would like to be able to speak it, and 85% of those with some ability in Welsh wanted to speak it better.
- People were least likely to agree with the statement 'The Welsh language will be stronger in 10 years' time': 40% agreed with that statement. Those living in the North East of Wales were least likely to agree with this statement.

The Report of the Welsh Language and Economic Development Task and Finish Group to the Minister for Economy, Science and Transport[146] sets out 27 recommendations for how economic development, and the public sector, can assist with enhancing the Welsh language. The recommendations include provisions for promoting opportunities for businesses to build on their use of the Welsh language for branding and as a marketing tool, including greater resources for innovation and opting for Welsh language capabilities. Public sector contractors and recipients of Welsh government grants should be able to demonstrate the ability to provide skills bilingually. Wales should learn from experience and good practice in other bilingual communities such as the Basque country, Quebec, and Catalunya, with analysis of the threats to the language in at-risk areas and recognising community successes. The report recommends that research should be undertaken to examine the effect of improving road and rail communications and public transport services between the strongly Welsh speaking areas and employment centres on the main transportation corridors.

6.1.3 Data Gaps

- There are no specific statistics found with regards to the satisfaction of Welsh speakers and their ability to travel using Welsh.
- A lack of recent data into attitudes towards speaking Welsh and Welsh speakers.
- A lack of recent data into the confidence of Welsh speakers to speak Welsh in their daily lives.
- Data gaps relating to access to Welsh Language education and the role transport plays

6.2 Landscape and Townscape Character

6.2.1 Relevance to the NTDP

Welsh landscapes reflect the extent and condition of a range of natural resources and ecosystems against the complexity of human influences and land-use decisions. Townscapes and urban character also reflect a long history of human development. Similarly, seascape information complements the landscape/townscape information and together the two types of information provide an understanding of the cultural benefits to be had from both the terrestrial and the marine environment.

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[146] Welsh Government (2014) Report of the Welsh Language and Economic Development Task and Finish Group to the Minister for Economy, Science and Transport. Available at: https://gov.wales/sites/default/files/publications/2019-05/report-of-the-welsh-language-and-economic-development-task-and-finish-group.pdf [Accessed 29.11.21]

These elements have been strongly shaped by human intervention and land-uses throughout history and the NTDP will continue to play an important role in shaping this character through infrastructure projects and programmes. Landscape, townscape and seascape character are important in terms of Wales's strong sense of place and cultural identity with close links to the tourism industry.

Transport can have many potential impacts on landscape and townscape character, negative impacts could be new infrastructure developments reducing the visual amenity of a valued landscape by building a new road through it, or the removal of buildings or green spaces within towns for road widening schemes that may have value to the local community. A positive potential impact could be enhanced access to greenspaces and viewpoints.

Figure B-31is from the 2014 Landscape Character Assessment (LCA Approach directly adapted from the 2002 guidance) and shows the range of factors generally considered to be part of landscape[147].

Figure B-31: The range of factors generally considered to be part of landscape
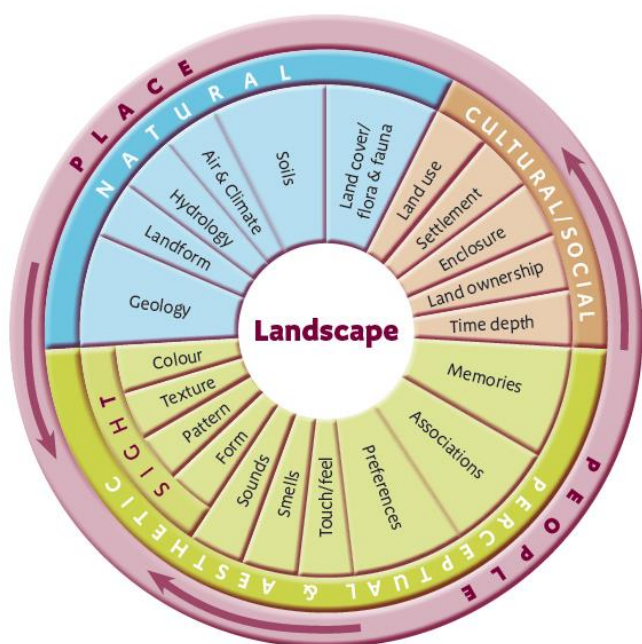
6.2.2 Baseline conditions and trends

Wales has a varied and generally high-quality landscape with over 50% of the land area being nationally valued for its scenic quality and character. Many Welsh landscapes are iconic with a clear sense of place and recognisable identity. The country is predominantly

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[147] Natural England (2014) An Approach to Landscape Character Assessment. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691184/landscape-character-assessment.pdf [Accessed: 30.11.21]

rural in character with 59% of the landscape defined as Field Pattern/Mosaic and 20% is categorised as Open Land[148].

National landscape change to 2015 has been small overall, but some changes have been substantial locally. The key contributors to landscape change in the built environment include: the expansion of settlements, commercial and industrial developments, quarries and road improvements, onshore windfarms, turbines and large recreational related developments. In the rural environment examples include: the felling of conifers and replanting with broadleaves, woodland expansion and changing bracken cover. Since 2016, the main changes have been an increase in tree cover on farms, more woodland, more permanent grassland, more arable land and more grass leys, alongside a decline in rough grazing and horticulture[149].

Climate change over time is likely to have significant impacts on landscape character, local distinctiveness and quality, directly through changing land cover (migrating habitat and species ranges) and indirectly by influencing land use decisions. Landscape changes may also be evident from mitigation measures, such as renewable energy generation, water resource management and adaptation through the planned expansion of woodland. Climate change also poses a risk to landscapes from pests, pathogens and invasive species and from changes in frequency and/or magnitude of extreme weather and wildfire events.

A total of 25% of Wales is designated as either National Park or Area of Outstanding Natural Beauty.

Protected Landscapes

Within Wales there are three National Parks; Brecon Beacons, Pembrokeshire Coast and Snowdonia. Each National Park also has local planning authority status in Wales. Combined these National Parks in Wales cover around 20% of the land area of Wales. The locations of the National Parks in Wales are presented on Figure 2 – Landscape Features.

Brecon Beacons

The Brecon Beacons National Park contains some of the most distinctive upland landforms in southern Britain[150]. The Park covers 520 square miles (1,344 square kilometres) and lies between rural Mid Wales and the industrial South Wales Valleys. It is a diverse landscape,

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[148] Natural Resources Wales (2018) Updated All Wales LANDMAP Statistics 2017 Visual and Sensory Aspect. Available at:
https://cdn.cyfoethnaturiol.cymru/media/684055/landmap-visual-and-sensory-all-wales-stats-2017.pdf?mode=pad&rnd=131625599140000000 [Accessed 01.12.21]
[149] Natural Resources Wales (2020) The Second State of Natural Resources Report (SoNaRR2020) Assessment of the achievement of sustainable management of natural resources: Land use and soils Available at:
https://cdn.cyfoethnaturiol.cymru/media/693310/sonarr2020-theme-land-use-and-soils.pdf [Accessed; 01.12.21]
[150] Brecon Beacons National Park Authority (2013) Brecon Beacons National Park Authority Local Development Plan 2007-2022. Available at: https://www.beacons-npa.gov.uk/planning/draft-strategy-and-policy/brecon-beacons-national-park-local-development-plan/ [Accessed: 30.11.21]

where sweeping uplands contrast with green valleys, with dramatic waterfalls, ancient woodland, caves, forests and reservoirs. The highest point is Pen y Fan, at the centre of the National Park. Its distinctive table topped summit stands at 886m, and it is climbed by hundreds of thousands of people each year.

The National Park is also home to 33,000 people, over 9000 different plants and animals, and has a strong Welsh heritage and rich economic, social and cultural life. The largest settlement is the cathedral town of Brecon with a population of approximately 7,500.

Snowdonia National Park

The Snowdonia National Park takes its name from Snowdon which, at 1,085m (3,560 feet), is the highest peak in Wales[151]. The Snowdonia National Park is rich in landscape and townscape and has 60km of coastline. In addition to this, Snowdonia has extensive areas of woodlands and over 96,000 hectares of moorland. The landscape within the National Park has been formed over millions of years. Since the end of the last Ice Age, 10,000 years ago, the interaction between people and nature has shaped the landscape of the National Park and there are strong cultural associations between people and place. The traditional rural character of settlements is distinct to the National Park and forms part of its historic landscape character. Fourteen towns and villages in Snowdonia have Conservation Areas and there are 1,900 listed buildings, 13 being Grade I and 119 buildings at Grade II*.There are also 21 Historic Parks and Gardens within the National Park. The Welsh language is a fundamental part of the area's culture. Welsh is spoken by approximately 58.6% of the population of Snowdonia and in some communities the percentage is as high as 85%. There are 15 Special Areas of Conservation and three Ramsar sites located within or partly within Snowdonia. There are also 107 SSSIs. The 2011 Census showed a population of 25,702 with a small increase on the 2001 Census.

Pembrokeshire Coast National Park

Pembrokeshire Coast National Park boasts some of the most spectacular scenery and diverse wildlife in Britain including internationally important nature reserves, geology and archaeology[152]. The Park was designated in 1952 and remains the only UK National Park recognised primarily for its coastline. It is one of the smallest UK National Parks; but has one of the most diverse landscapes – sandy beaches, rugged cliffs and islands, quiet wooded estuary and hill country with big sea views. The Park covers 232.5 square miles (602 sq km). At the widest point, it is about 16km, at its narrowest about 100m. Around 22,500 people live in the National Park. The area of the National Park covered by at least

[151] Snowdonia National Park Authority (2019) Eryri Local Development Plan 2016-2031. Available at: https://www.snowdonia.gov.wales/planning/planning-policy/local-development-plan-ldp [Accessed: 30.11.21]
[152] Pembrokeshire Coats National Park Authority (2020) Pembrokeshire Coast National Park Local Development Plan 2 (end date 2031). Available at: https://www.pembrokeshirecoast.wales/planning/planning-policy/local-development-plan-2/ [Accessed: 30.11.21]

one designation (candidate SAC, SAC, SPA, SSSI, NNR and Local Nature Reserve (LNR)) is 11,787.8 hectares, and therefore represents 19.2% of the total area of the National Park.

In Wales, there are four AONBs: Anglesey, Gower, Llŷn, the Clwydian Range and Dee Valley. The Wye Valley is also partly within Wales, straddling the Wales and England border. See Figure 2 – Landscape Features.

Anglesey AONB

Designated in 1966 the Isle of Anglesey's AONB, has one of the most distinctive, attractive and varied landscapes in the British Isles[153]. The AONB is also home to approximately 7,000 people, covering 221sq km, approximately one third of the island. Some of the main features of the Anglesey AONB are:

- Low cliffs alternating with coves and pebble beaches;
- Sheer limestone cliffs interspersed with fine sandy beaches; and
- Stretches of sand dunes with beaches.

A number of the habitats found on Anglesey are afforded even greater protection both through UK and European designations because of their nature conservation value, these include:

- 5 Special Areas of Conservation;
- 3 Special Protection Areas;
- 1 National Nature Reserve;
- 31 Sites of Special Scientific Interest; and
- 75 Scheduled Monuments.

Gower AONB

The Gower AONB was designated in 1956 for its classic limestone coast and the variety of its natural habitats, it was the first AONB designated in the UK[154]. Rich and diverse, Gower's scenery ranges from fragile dune and salt marsh in the north to the dramatic limestone cliffs along the south coast, intercut by sand beaches. Inland, the hills of Cefn Bryn and Rhossili Down dominate the landscape of traditional small fields, wooded valleys and open commons. Gower AONB covers an area of 188km^2. Although not part of the reason for designation, the AONB also has a rich archaeological and built heritage including over 80 Scheduled Ancient Monuments, nearly 130 listed buildings, and two areas recognised as Landscapes of Outstanding Historic Interest.

Pen Llyn AONB

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[153] Isle of Anglesey County Council & NRW (2015) The Isle of Anglesey Area of Outstanding Natural Beauty (AONB) Management Plan Review 2015 – 2020. Available at: https://www.anglesey.gov.uk/en/Residents/Countryside/Areas-of-Outstanding-Natural-Beauty-AONBs/Anglesey-AONB-Management-Plan.aspx [Accessed: 30.11.21]
[154] Swansea Council (2017) Gower Area of Outstanding Natural Beauty Management Plan 2017. Available at: https://www.swansea.gov.uk/gowermanagement [Accessed: 30.11.21]

The Pen Llyn was designated as an AONB in 1957, the third to be designated in the UK[155]. The Llŷn Peninsula is renowned for its diverse and interesting coastline. The AONB encompasses around one quarter of the peninsula a total of 15,500 hectares, mostly along the coast, but it also extends inland and includes prominent igneous protrusions. Llŷn, whose complex geology includes ancient pre-Cambrian rock formations, is a natural extension of the Snowdonia massif. The geology is typified by the wide variation of coastal landscapes, ranging from the steep cliffs of Aberdaron Bay and promontories to the sand dune systems in the Abersoch area. The highest point in Llŷn is the Eifl (564m) mountain range which levels out to a plateau that extends towards the sea and the black rocks of Mynydd Mawr at the tip of the Peninsula. The area is typified by narrow and winding roads, farms and whitewashed cottages and also includes open areas of ancient common land.

Clwydian Range and Dee Valley AONB

The Clwydian Range was designated as an AONB in July 1985, then in November 2011 the Welsh Government's Environment Minister confirmed a southerly extension to include much of the Dee Valley from Corwen to Newbridge along with stunning natural features such as the Eglwyseg Escarpment, Horseshoe Pass and Esclusham Mountain[156]. At the same time the whole area became known as the Clwydian Range and Dee Valley AONB. Its special qualities include historic landmarks such as Pontcysyllte Aqueduct and Canal and the Iron Age hillforts that crown the Clwydian Range. They also include cultural and artistic inspirations such as the eisteddfodau held all over the area, its quarrying and mining heritage.

Wye Valley AONB

The rich combination of breath-taking views, impressive geology, historic legacies and diverse wildlife in the valley of the River Wye between Hereford and Chepstow led to the designation, in 1971, of the valley and adjoining plateaux and hills as an AONB[157]. The Wye Valley AONB covers 92km (58 miles) of the lower reaches of the River Wye totalling an area of 327km². It stretches from Mordiford in the north, just east of the city of Hereford, southwards to the outskirts of Chepstow.

The location of AONBs in Wales are presented on Figure 2 - Landscape Features.

Quality of Landscapes

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[155] Gwynedd Council & NRW (2015) Penrhyn Llŷn Area of Outstanding Natural Beauty Management Plan 2015-2020. Available at: https://www.ahne-llyn-aonb.org/The-AONB-Management-Plan [Accessed: 25.11.21]
[156] Clwydian Range and Dee Valley AONB Joint Committee & NRW (2014) Clwydian Range and Dee Valley Area of Outstanding Natural Beauty Management Plan 2014 – 2019. Available at: https://www.clwydianrangeanddeevalleyaonb.org.uk/wp-content/uploads/2020/07/979717185-Clwydian-Range-and-Dee-Valley-AONB-Mgt-Plan-2016.pdf [Accessed: 30.11.21]
[157] Wye Valley AONB Partnership (2021) Wye Valley Area of Outstanding Natural Beauty Management Plan 2021 – 2026. Available at: https://www.wyevalleyaonb.org.uk/caring-for-wye-valley-aonb/management-plans/ [Accessed: 30.11.21]

The most detailed landscape baseline in Wales reporting on landscape state, condition and trend is LANDMAP[158]. LANDMAP is an all-Wales landscape resource where landscape characteristics, qualities and influences on the landscape are recorded and evaluated. LANDMAP explains the physical, geological, ecological, visual, historic and cultural landscape: the summary descriptions, evaluations and management recommendations aid understanding of landscape and identify important landscape qualities and characteristics. By capturing multi-dimensional landscape information, it ensures that all aspects of the landscape can be taken into account. It is the focus for landscape monitoring in Wales, enabling the tracking of change and identifying key factors determining landscape change, condition and resilience.

Landscape Character Areas (LCAs) are identified at both a local planning authority level and at a national level, with 48 National Landscape Character Areas (NLCA) identifying regional landscapes. They offer overall landscape summaries linked to the five LANDMAP layers, key characteristics, and forces for change, and may be linked to design or sensitivity studies.

Special Landscape Areas that identify areas of high landscape importance, often linked to LCAs, are identified by some authorities. Within Wales there are many of these landscapes designated.

Marine Character Areas

Approximately 70% of Wales's coastline is designated or registered AONB, National Park, Heritage Coast or Historic Landscape[159]. Seascape information complements available landscape information and together the two types of information provide an understanding of the cultural benefits to be had from the marine environment. The 29 national Marine Character Areas (MCAs)[160] and the local Seascape Character Assessments (SCA) of

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[158] NRW (2021) LANDMAP - the Welsh landscape baseline. Available at: https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/landmap-the-welsh-landscape-baseline/?lang=en [Accessed: 30.11.21]

[159] Welsh Government (2019) Welsh National Marine Plan. Available at: https://gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan_5.pdf [Accessed: 30.1.21]

[160] NRW (2021) Marine Character Areas. Available at: https://naturalresources.wales/evidence-and-data/maps/marine-character-areas/?lang=en [Accessed: 25.11.21]

Pembrokeshire[161], Snowdonia[162] and Anglesey[163] provide comprehensive seascape information for Wales as a whole.

Landscapes of Historic Importance

The landscape of Wales is a vital resource for social, economic, cultural and environmental well-being. It has also been historically shaped by human activity and is rich in evidence of the past. To recognise the value of historic landscapes, and raise awareness of their importance, Cadw, in partnership with NRW and the ICOMOS UK[164] have compiled a Register of Landscape of Outstanding and of Special Interest in Wales[165]. The Register identifies 58 landscapes of outstanding or special historic interest, which are considered to be the best examples of different types of historic landscapes in Wales. Figure 3 – Heritage Features shows the locations of historic landscapes. The Register provides information to decision makers and landscape managers, to help ensure that the historic character of the landscape is sustained, and that where change is contemplated, it is well-informed.

6.2.3 Data Gaps

- Data relating to transport within, to and from AONB's in Wales.
- Data relating to transport to major cultural events in Wales

6.3 Dark Skies and Tranquil Areas

6.3.1 Relevance to the NTDP

It is recognised that dark skies and tranquil areas can bring benefits to an area including enhancing the environment, attracting visitors and can boost the local economy. The NTDP has a key role to play in helping to guide decisions through the planning of new transport networks.

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[161] Pembrokeshire Coast National Park Authority (2013) Pembrokeshire Coast National Park Authority Seascape Character Assessment: Supplementary Planning Guidance to the Local Development Plan 1 for the Pembrokeshire Coast National Park. Available at: https://www.pembrokeshirecoast.wales/wp-content/uploads/2020/09/Seascape-SPG-2020.pdf [Accessed: 30.11.21]

[162] Snowdonia National Park Authority (2013) Snowdonia National Park Seascape Assessment. Available at: https://www.snowdonia.gov.wales/looking-after/state-of-the-park/landscape/snowdonia-national-park-seascape-assessment [Accessed: 30.11.21]

[163] Isle of Anglesey Council (2013) Anglesey Seascape Character Assessment. Available at: https://www.anglesey.gov.uk/documents/Docs-en/Countryside/Anglesey-Seascape-Character-Assessment.pdf [Accessed: 30.11.21]

[164] International Council on Monuments and Sites UK

[165] Cadw (2014) The Registered Landscapes of Outstanding and of Special Interest in Wales. Available at: http://lle.gov.wales/catalogue/item/RegisteredLandscapesOfOutstandingHistoricInterestInWales?la [Accessed: 30.11.21]

6.3.2 Baseline Conditions and trends

Dark sky areas are a good indicator of very low light pollution. There are several locations in Wales that have been nationally and internationally recognised as part of a dark sky places programme. Brecon Beacons National Park and Snowdonia National Park have each been internationally recognised as Dark Sky Reserves[166]. Elan Valley Estate in Powys has been designated as a Silver-tier International Dark Sky Park. Anglesey and the Llŷn Peninsula are nationally recognised dark sky parks.

Additionally, Barsey Island is established as a dark sky sanctuary, with the Clwydian Range and Dee Valley, Gower and Presteigne recognised as dark sky communities[167].

NRW have undertaken research into the dark skies of Wales, identifying that 68.1% of Wales falls into the darkest band, as defined by the study. Mid-Wales was identified as the darkest region, and 95% of the three National Parks and five AONBs fell within the two darkest categories. Whilst potentially influenced by the sensitivity of satellite sensors in the LED wavelengths, the amount of light emitted in cities appears to be decreasing, but the areas around cities seem to be getting brighter[168]. This is particularly evident around Cardiff and Newport.

The NRW commissioned a tranquil areas assessment in 2009, following an earlier assessment in 1997[169]. This identified 55% of Wales (11,600 km^2) as tranquil in 2009, a loss of 1500km^2 of tranquil landscapes from 1997. The tranquillity assessment is due to be updated in 2022.

The two largest Tranquil Areas on the 2009 Map are both over 1,000km^2. These areas are parts of the Berwyn Mountains, bordered by the towns of Dolgellau, Bala, Llangollen and Welshpool, and the southern part of the Cambrian Mountains, bordered by Llangurig, Rhayader, Llandovery, Lampeter and Tregaron.

Between 1997 and 2009, there was a loss of Tranquil Areas of nearly 1,500km^2 of land. This is over 6% of the total land area of Wales; and is greater than the area of the Brecon Beacons National Park.

A nationally consistent Tranquillity and Place resource has been produced by Natural Resources Wales to ensure access to dark skies information is available for planning[170].

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[166] International Dark-Sky Association (no date) Find a Dark Sky Place. Available at: https://www.darksky.org/our-work/conservation/idsp/finder/ [Accessed: 30.11.21]
[167] Visit Wales (n.d.) Discover the Best Dark Sky Spots in Wales. Available at: https://www.visitwales.com/inspire-me/days-out/dark-sky-destinations-go-stargazing-wales-winter [Accessed 16.02.2022]
[168] Green C, Manson D, Chamberlain K 2021. Tranquillity and Place – Dark Skies. NRW Report No: 514, 70pp.
[169] NRW (2009) Tranquil Areas Wales. Available at: http://lle.gov.wales/catalogue/item/TranquilAreasWales [Accessed: 02.12.21]
[170] Natural Resources Wales (2022) Dark Skies and Light Pollution in Wales. Available at: https://luc.maps.arcgis.com/apps/opsdashboard/index.html#/1cd6ba8a1d7d4a62aff635cfcb af4aec [Accessed: 02.12.21]

6.3.3 Data Gaps

- Up to date Data relating to tranquillity
- Data related to soundscapes

6.4 Historic Environment, Cultural and Heritage Assets

6.4.1 Relevance to the NTDP

Cultural heritage comprises archaeological remains, intact structures and relict landscapes associated with past human activity. This section also covers cultural activities undertaken by the population. Wales has a large number of designated and non-designated cultural heritage assets reflecting its long history of human occupation. Many of these provide important tourist attractions in addition to being central to Welsh cultural identify.

The NTDP has a key role to play in the provisioning of access, protection and enhancement of cultural heritage through transport infrastructure projects and programmes. New development can have a range of direct and indirect effects on heritage assets which need to be avoided or mitigated. This includes effects from noise and air pollution from construction of busy traffic routes near culturally significant areas which may make them less appealing to visit or decrease their visual amenity (indirect effects), it also includes the physical removal of heritage assets as this may be required for the development of new travel infrastructure. Impacts on the historic environment can include the intensification of existing traffic or the construction of new road or rail. Increasing levels of congestion can affect historic towns, cities and the countryside, while development of new transport infrastructure can affect historic landscapes and may cause direct damage to heritage assets.

Transport infrastructure may also be an important historic asset in its own right from prehistoric trackways and Roman roads, to medieval bridges, the development of canals and railways during the industrial revolution and the introduction of motor transport and aviation in the 20th century.

6.4.2 Baseline conditions and trends

Heritage assets in Wales are numerous. This section describes the key types of asset present.

World Heritage Sites

World Heritage Sites are regarded as being universally important and 'belonging to all the peoples of the world, irrespective of the territory on which they are located'. They are listed by UNESCO.

Wales currently has four world heritage sites[171]:

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[171] Cadw (2021) World Heritage Sites in Wales. Available at:
http://lle.gov.wales/catalogue/item/WorldHeritageSites/?lang=en [Accessed: 02.12.21]

- The Castles and Town Walls of Edward I in Gwynedd at Caernarfon, Conwy, Beaumaris and Harlech in North-West Wales;
- Blaenavon Industrial Landscape in South-East Wales;
- Pontcysyllte Aqueduct and Canal in North-East Wales; and
- The Slate Landscape of Northwest Wales.

Each of these cover large areas straddling a number of local authorities and have management plans which detail the planning policies of each authority regarding the protection of the World Heritage Sites. Some, such as Pontcysyllte, have buffer zones to add a supplementary degree of protection within the landscape adjacent to the site while others, such as Edward's Castles, have defined their Essential Setting and Significant Views within the management plan to protect the surrounding area. Each of the Welsh World Heritage Sites, their buffer zone, or their essential setting/significant view contain privately owned houses or land. Figure 3 – Heritage Features shows the locations of the World Heritage Sites in Wales.

Listed Buildings

The National Assembly for Wales is required by law to compile lists of buildings of special architectural or historic interest; and listed buildings. The lists are used to help planning authorities make decisions with the interests of the historic environment clearly identified. Compilation of the lists is undertaken by Cadw. Listed buildings are classified in grades to show their relative importance. The grades are[172]:

- I - Buildings of exceptional, usually national, interest. Currently, fewer than two per cent of buildings listed in Wales qualify for this grade;
- II* - Particularly important buildings of more than special interest; and
- II - Buildings of special interest, which warrant every effort being made to preserve them.

There are over 30,000 Listed Buildings (Grade I, Grade II and Grade II *) within Wales distributed across its counties varying from medieval halls and castles to Edwardian villas.

Scheduled Monuments

Cadw compile and maintain a Schedule of Ancient Monuments. The monuments included on this Schedule are of national importance and cover a diverse range of archaeological sites. Some examples may be completely buried below ground and may only be known through archaeological excavation. Others are more prominent and include the great standing ruins of well-known medieval castles and abbeys. The oldest known example in Wales is a natural cave — found to contain the earliest evidence of people in Wales — dating to a quarter of a million years ago. At the other end of the spectrum are twentieth-

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[172] Cadw (2021) Listed Buldings. Available at:
http://lle.gov.wales/Catalogue/Item/ListedBuildings/?lang=en [Accessed: 02.12.21]

century military structures. Scheduled monuments are often in a ruinous or semi-ruinous condition or take the form of earthworks[173].

Over 4,000 Scheduled Monuments have now been scheduled across Wales and the number is increasing as part of an ongoing planned policy of enhancing the Schedule.

Scheduled Monuments in Wales are distributed throughout its counties and their locations are presented on Figure 3 – Heritage Features.

Registered Historic Battlefields

The locations where historic battles took place can be significant historic assets. They often retain topographical and archaeological evidence, including war graves, which can increase understanding of these events. To date there is no formal Register of Historic Battlefields in Wales. However, this is something that is being developed by Cadw.

Historic Landscape

Cadw has compiled a register of landscapes of historic interest in Wales. 58 historic landscapes have been registered, which are considered to be best examples of different types of historic landscapes. The register promotes the conservation of the key characteristics of historic landscapes as those landscapes evolve.

Conservation Areas

There are over 500 conservation areas in Wales. They are designated by local planning authorities for their special architectural and historic interest[174]. Many local planning authorities have undertaken conservation area character appraisals which identify areas where enhancement through development may be desirable.

Conservation areas in Wales are distributed throughout its counties and are largely situated within urban settlements from small villages to areas within towns and cities.

Regional Historic Environment Record

The historic environment records (HER) contain and signpost information about historic landscapes, buildings, archaeological sites and finds. They also contain records of the investigation and management of the historic environment, including non-designated heritage assets. HER data is maintained by the four Welsh archaeological trusts — Clwyd-Powys, Dyfed, Glamorgan-Gwent and Gwynedd. Online public access to the core information contained in the HER is available through Archwilio[175].

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[173] Cadw (2021) Scheduled Monuments. Available at: http://lle.gov.wales/Catalogue/Item/ScheduledAncientMonumentsInWales/?lang=en [Accessed: 02.12.21]

[174] Cadw (2021) Conservation Area Boudnaries. Available at: http://lle.gov.wales/Catalogue/Item/ConservationAreas/?lang=en [Accessed: 02.12.21]

[175] Archwillio(2022) The Historic Environment Record of Wales. Available at: https://archwilio.org.uk/arch/index.html [Accessed 03.02.22]

Heritage Coasts

Heritage coasts are 'defined' rather than designated, so there isn't a statutory designation process like that associated with National Parks and AONBs. However, they are largely located within areas that are afforded with National Park or AONB status[176].

Within Wales there are 14 heritage coasts:

- Glamorgan;
- Gower;
- South Pembrokeshire;
- Marloes and Dale;
- St Brides Bay;
- St Davids Peninsula;
- Dinas Head;
- St Dogmaels and Moylgrove;
- Ceredigion;
- Llŷn;
- Aberffraw Bay;
- Holyhead Mountain;
- North Anglesey; and
- Great Orme.

The location of heritage coasts is presented on Figure 3 – Heritage Features.

Historic Parks and Gardens

Wales has a rich inheritance of historic parks and gardens. They form an important and integral part of the historic and cultural fabric of the country[177].

Cadw has undertaken a comprehensive survey of historic parks and gardens in Wales. Those thought to be of national importance are included on the Cadw / ICOMOS Register of Parks and Gardens of Special Historic Interest in Wales. The Register was compiled in order to aid the informed conservation of historic parks and gardens by owners, local planning authorities, developers, statutory bodies and all concerned with them. Through the Historic Environment (Wales) Act 2016[178] it is now statutory and has six volumes. It was completed in 2002 however, sites can be added (or subtracted) at any time. There are currently almost 400 sites on the Register.

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[176] NRW (2021) Heritage Coasts. Available at: http://lle.gov.wales/Catalogue/Item/ProtectedSitesHeritageCoast/?lang=en [Accessed: 02.12.21]

[177] Cadw (2021) Registered historic parks and gardens. Available at: https://cadw.gov.wales/advice-support/placemaking/legislation-guidance/registered-historic-parks-and-gardens [Accessed: 02.12.21]

[178] Historic Environment (Wales) Act 2016. Available at: https://www.legislation.gov.uk/anaw/2016/4/contents [Accessed: 02.12.21]

Sites on the Register are Graded I, II* and II in the same way as listed buildings. Approximately 10% are Grade I and 23% Grade II*. Grade I sites, such as Bodnant, Powis Castle, Dynevor Park, Margam Park, Erddig, Plas Brondanw and Raglan Castle, are of international importance.

Parks and gardens on the Register range from medieval to late twentieth century. Many are multi-period, with features of different styles and periods.

Locations of historic parks and gardens are presented on Figure 3 – Heritage Features.

Heritage at Risk

A key element of Cadw's heritage regeneration activity is action related to heritage assets in a deteriorating condition. Cadw have been working to identify the number and type of listed buildings at risk in Wales[179]. Surveys of the condition of listed buildings have been carried out in Wales for more than 15 years. 2015 data shows that the trend for buildings at risk is moving in the right direction. The number of buildings in an 'at risk' or 'vulnerable' condition has decreased since the last comparable data available (2013) and the percentage of buildings at risk has fallen from 8.92% to 8.54%. This figure is calculated using existing survey data and the most up-to-date data available from the 20% of the building stock which has been re-surveyed in the past year. The percentage of building at risk over time has fallen since 2013.

Over time, there have been additional buildings given listed status. The Historic Environment (Wales) Act 2016 aims to give more effective protection to listed buildings and scheduled monuments, to improve the sustainable management of the historic environment and to introduce greater transparency and accountability into decisions taken on the historic environment. These seek to preserve the cultural heritage and historic environment of Wales and in turn will provide greater financial gain for the Welsh tourism sector.

Cultural activity

According to the National Survey for Wales[180] 71% of people attended or participated in arts, culture or heritage activities at least three times in the past year. 70% of people had been to an arts event in the previous 12 months, 37% of people had visited a museum in the last 12 months and 63% of people had visited a heritage site within the past 12 months[181]

[179] Cadw (2021) Listed buildings at risk. Available at: https://cadw.gov.wales/advice-support/historic-assets/listed-buildings/listed-buildings-risk#section-managing-listed-buildings-at-risk [Accessed: 02.12.21]

[180] Stats Wales (2020) Percentage of people who attend or participate in arts culture or heritage activities three or more times a year by local authority. Available at: https://statswales.gov.wales/Catalogue/National-Survey-for-Wales/Sport-and-Recreation/percentageofpeoplewhoattendorparticipateinartcultureheritageactivities3ormoret imesayear-by-localauthority-year [Accessed: 02.12.21]

[181] Welsh Government (2021) National Survey for Wales: results viewer. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed: 02.12.21]

32% of people had used a public library service in the past 12 months; 98% of these had visited a library in Wales. In 2016, 14% of people visited a library at least once a month.

When people were asked why they had not attended a museum in the past 12 months in 2018, only 3% cited a lack of transport as their reason (consistent with previous years), with 6% saying "Not enough museums close to where I live". When people were asked why they had not visited a historic place in Wales in the past 12 months, only 5% cited a lack of transport as their reason (consistent with previous years), with 3% saying "Not enough museums close to where I live".

When people were asked "Whether they would go to more arts events if they were nearer" in the next year's survey (2018-19), 25% strongly agreed and 26% agreed, 21% were neutral, 19% disagreed and only 9% strongly disagreed[182]

6.4.3 Data Gaps

- The heritage value of transport infrastructure itself.

6.5 Key Issues relevant to the NTDP and opportunities for it to address them

6.5.1 Issues

Welsh Language

There has been an upward trend since the 1990s in the number of people using the Welsh language, noting large regional variations; there are opportunities to increase levels of fluency.

In some cases, opportunities to use the Welsh language when utilising public transport is limited, such as due to customer service staff not speaking Welsh.

Landscape and Townscape Character
Wales is renowned for its high-quality landscapes with over 50% of the land area being nationally valued for its scenic quality and character. National Parks and Areas of Natural Beauty are internationally recognised Designated Landscapes and cover 25% of Wales. This has implications for new transport infrastructure within these areas with a key challenge for sustainable management being to enable appropriate levels of growth whilst retaining the distinctiveness of places and landscapes. This must also recognise that the natural and historic components of landscape are important to both place and the cultural value of landscape.

The loss of visual amenity and character could have impacts on local people and tourists.

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[182] Welsh Government (2019) National Survey for Wales: results viewer. Available at: https://gov.wales/national-survey-wales-results-viewer [Accessed: 02.12.21]

Motor traffic, parking and associated impacts can blight the character of landscapes and townscape.

Historic Environment, Cultural Heritage and Assets

Wales has a wealth of historic and cultural assets which are important components of national cultural identity. Many such assets are at risk from, for example, decay, climatic factors, neglect and inappropriate development. As with other environmental factors, protecting and provisioning fair access to cultural heritage assets is a key challenge for sustainable planning of the transport system.

New development can have a range of direct and indirect effects on heritage assets which need to be avoided or mitigated. This includes effects from noise and air pollution from construction of busy traffic routes in close proximity to culturally significant areas which may make them less appealing to visit or decrease their visual amenity (indirect effects), it also includes the physical removal of heritage assets as this may be required for the development of new travel infrastructure. Effects on the historic environment can include the intensification of existing traffic or the construction of new road or rail. Increasing levels of congestion can affect historic towns, cities and the countryside, while development of new transport infrastructure can affect historic landscapes and may cause direct damage to heritage assets.

6.5.2 Opportunities

Welsh Language

The NTDP has an opportunity to protect and promote the use of the Welsh language through the transport system through encouragement of its use in sign posting and employees of bus and train stations.

The NTDP could seek to ensure that access to Welsh-Medium education facilities is specifically targeted as part of this aim, to support the strategy seeking to expand Welsh-Medium education provision.

The NTDP could also seek to support the aim to increase the range of services offered to Welsh speakers, and an increase in use of Welsh-language services.

The NTDP could also seek to 'support the socioeconomic infrastructure of Welsh-speaking communities' through its policies, helping to support the aim of 'Develop[ing] a new regional focus to economic development to help all parts of Wales to benefit from prosperity and support each area to develop its own distinctive identity.' Within the NTDP there will be opportunities to promote the Welsh language through its use in station announcements, road signs and signs within rail and bus stations.

Landscape and Townscape Character

The transport system has a major role to play in how future transport infrastructure development will affect landscape, townscape, and sense of place in general.

There is an opportunity for improved access to valued landscapes, townscapes and viewpoints, including by sustainable and active travel modes to reduce the impact of motor traffic.

The NTDP has an opportunity to provide high quality transport connections to National Parks for both tourists/visitors and local leisure users.

There is an opportunity to incorporate dark sky-friendly lighting to new developments to support the dark sky designations and efforts to maintain these, alongside dark-sky tourism.

Historic Environment, Cultural Heritage and Assets

As with landscape, the NTDP has a major role to play in the protection and enhancement of cultural heritage through guidance to the transport system. This could include the recognition that non-designated heritage assets are also an important part of the make-up of cultural identify and sense of place and that indirect effects on the setting of assets are also important considerations.

Opportunities also exist for the NTDP to promote awareness of cultural heritage and encourage the enhancement of access to cultural education centres.

The NTDP could seek to identify and protect transport infrastructure that may be of heritage value in its own right.

The NTDP has the opportunity to contribute towards the efficient management of the transport system during major events, including sporting, leisure and recreational activities and cultural events.

7 Well-Being Goal: A Globally Responsible Wales

This section provides baseline data relating to the following well-being goal:

"A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being".

In many ways, this well-being goal relates to all of the ISA topics. However, for the purposes of presentation, the data in this section relate primarily to:

- Energy Consumption, Greenhouse Gas Emissions and Ecological Footprint

7.1 Energy Consumption, Greenhouse Gas Emissions and Ecological Footprint

7.1.1 Relevance to the NTDP

Wales is a globally responsible nation, and the NTDP has an important role in helping to guide planning and transport in a way that contributes positively to this. In particular energy consumption and greenhouse emissions are two things that occur locally through homes, businesses and transport but contribute to global consequences.

7.1.2 Baseline conditions and trends

Energy Generation

Energy generation in Wales is relatively evenly split fossil fuels and renewable, with renewables currently accounting for 51% of all electricity consumption in Wales. Generation is overall significantly lower than in England and Scotland. Production has been in decline since 2010, largely due to the decline in energy from gas generation[183], with the closure of the last operational coal-fired power station in Wales, in March 2020. Figure B-23 below shows energy generation by fuel in 2016-2019 for England, Scotland, Wales and Northern Ireland.

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[183] Welsh Government (2020) Electricity Generation in Wales 2019. Available at: https://gov.wales/sites/default/files/publications/2021-01/energy-generation-in-wales-2019.pdf [Accessed: 02.12.21]

Figure B-32: Energy Generation by fuel type to 2019 for Wales, England, Scotland and Northern Ireland
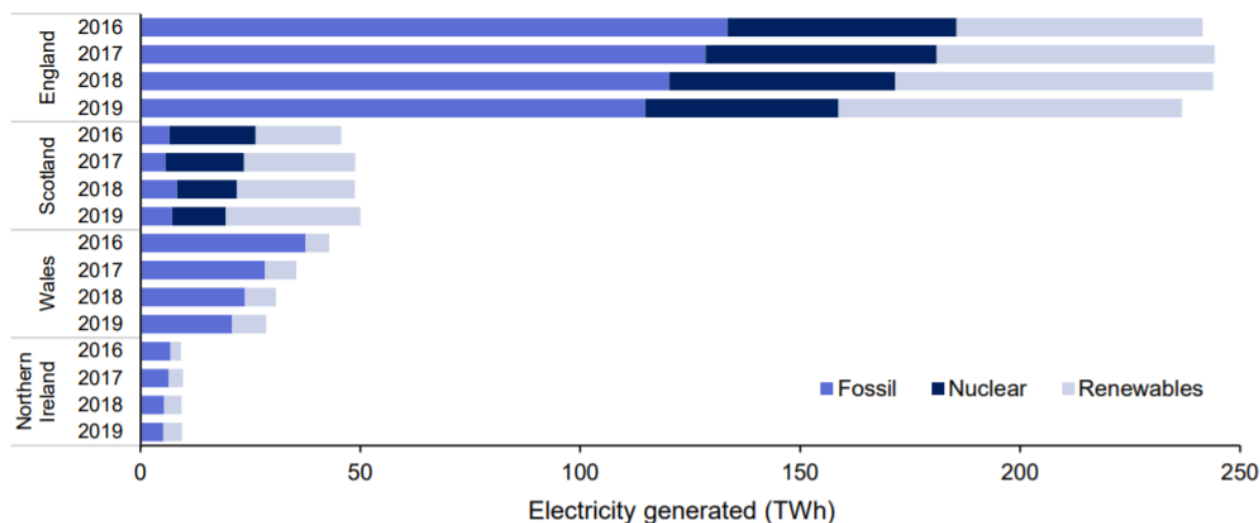
Source: BEIS (2020)

Between 2000 and 2013, the percentage of electricity generated from renewable energy sources increased from less than 3% to over 10%. This was largely as a result of wind generation. The use of renewable energy could help to reduce Wales's carbon footprint over time. The capacity (in GWh) of renewable energy generated in Wales in a recent study was 7,470 GWh[184].

Between 2016 and 2017 there was an increase from 12.3% of energy in Wales being generated by renewables to 20.0%, an increase of 7.7% in only a year[185]. As of 2019, renewables represented 27% of all electricity generation in Wales[186].

Energy Consumption

Total energy use in Wales in 2017 was 86.1TWh. Total energy consumption has been falling since 2005, though more so since 2007, which coincides with the economic downturn (as of 2017). The industry and commercial sector accounts for a large proportion of this decline. While total energy use has been falling, the energy use of the transport sector has remained consistent between 2005 and 2017, leading to a higher proportion of total energy use (26%). The highest use of transport energy is clustered around highly populated urban

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[184] Welsh Government (2020) Energy Generation in Wales 2019. Available at: https://gov.wales/sites/default/files/publications/2020-11/energy-generation-in-wales-2019.pdf [Accessed: 02.12.21]
[185] Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2014 to 2017
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770766/Regional_Electricity_Generation_and_Supply.pdf [Accessed: 02.12.21]
[186] Welsh Government (2020) Energy Generation in Wales 2019. Available at: https://gov.wales/sites/default/files/publications/2020-11/energy-generation-in-wales-2019.pdf [Accessed: 02.12.21]

areas like Cardiff and Newport. Western coast authority areas of Wales have lower levels of transport energy use [187.]

The SAP is a methodology used by Government for assessing the energy performance of dwellings. The SAP rating is expressed on a scale of 1 to 100 – the higher the number, the lower the running costs. The score is then converted into an energy efficiency rating, widely referred to as the Energy Performance Certificate (EPC), which uses bands A-G to classify energy performances. The average SAP rating for dwellings in Wales was 61, equivalent to a Band D. In Wales, the percentage of dwellings in band D or above increased between 2008 and 2018, and the percentage of dwellings in band E or below decreased. 28% of dwellings in Wales have an EPC rating of band C or above. This is roughly in line with the proportion for England (30%) but is significantly below the proportion in Scotland and Northern Ireland (42% and 49% respectively). This could, in part, be attributed to the age and type of housing stock, as Wales has the oldest stock in the UK[188].

Greenhouse Gas Emissions

Total greenhouse gas emissions in Wales in 2018 amounted to $38.9MtCO_{2e}$. This translates to a 31% decrease on 1990 levels, although that figure has fluctuated over the period showing a gradual decreasing trend overall. These emission reductions are mainly due to efficiencies in energy generation and business sector heating, the use of natural gas to replace some coal and other fuels as well as abatement in some chemical industries, and variations in manufacturing output (e.g. in iron and steel, bulk chemical production)[189].

Wales is moving in the right direction to help combat some of the most serious causes of climate change. The increase of renewable energy production is an example of this. A reduction of overall CO_2 emissions is helping Wales and the whole of the UK meet its reduction targets. However, although moving in the right direction, change needs to happen in Wales and across the UK to ensure reduction targets are met.

Figure B-33 illustrates the split of emissions between different sources in Wales between 1990 and 2019. This shows that the largest contributor remains the energy supply industry. Since 1990, the sector that has decreased its proportion of emissions the most is the business sector.

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[187] Welsh Government (2018) Energy Use in Wales. Available at: https://gov.wales/energy-use-wales-2018-report [Accessed: 02.12.21]

[188] Welsh Government (2019) Welsh Housing Conditions Survey 2017-2018: Energy Efficiency of Dwellings. Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-10/welsh-housing-conditions-survey-energy-efficiency-dwellings-april-2017-march-2018-795.pdf [Accessed: 29.11.21]

[189] National Atmospheric Emissions Inventory (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019. Available at: https://naei.beis.gov.uk/reports/reports?report_id=1019 [Accessed: 02.12.21]

Figure B-33: Total Greenhouse Gas Emissions per Sector in Wales (ktCO2e)
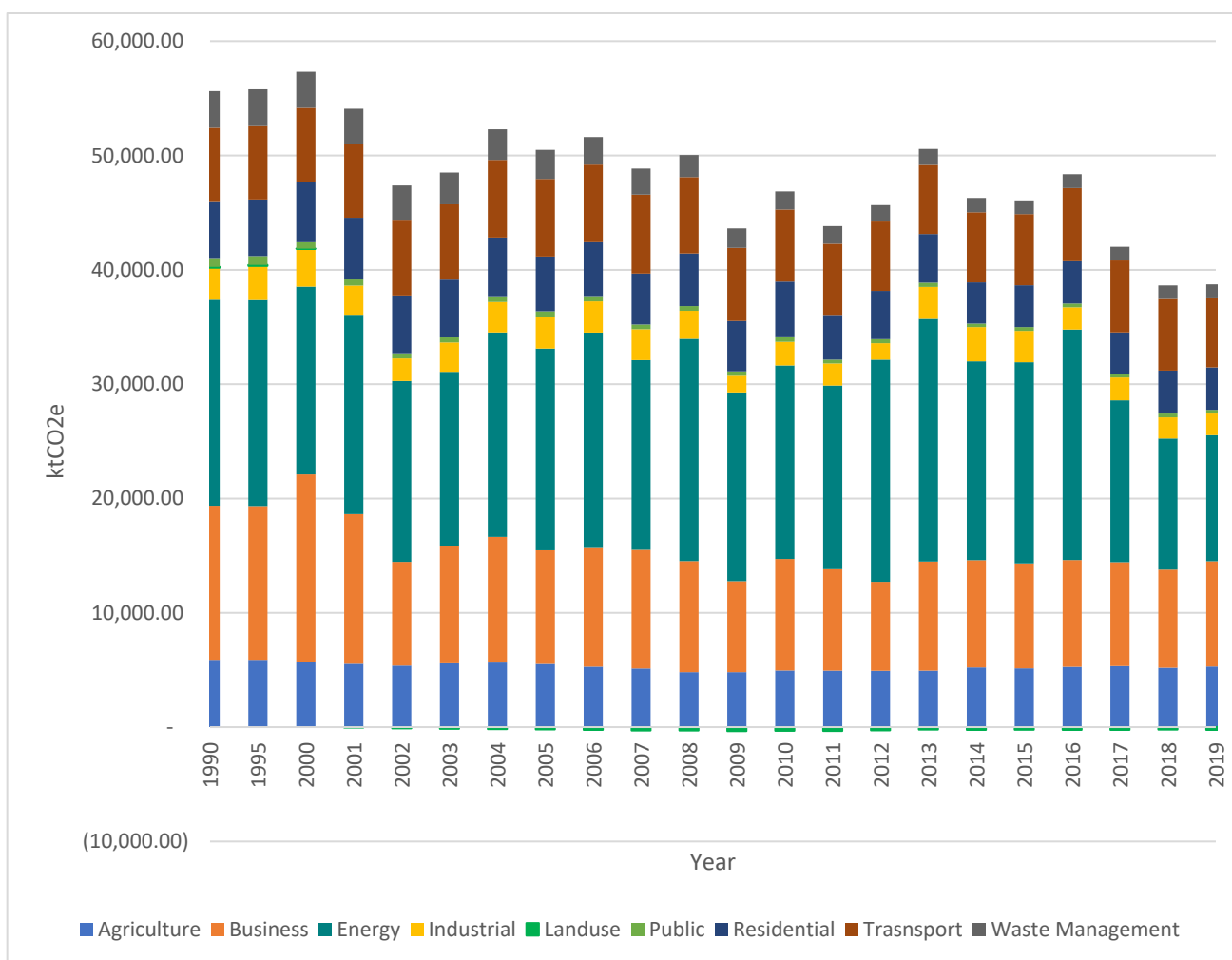

Changes in traffic volume

To 2019, road traffic volume in Wales increased by 1.5% on the previous year, reflecting the highest total volume of motorised traffic on record at 32.1 billion vehicle kilometers, or 10,186 km per person.

Change in greenhouse gas emissions from the transport sector

According to the National Atmospheric Emissions Inventory there is a declining rate of CO_2 emissions from the transport sector in Wales[190]. Figure B-34 sets out the total CO_2 emissions from the transport sector in Wales.

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[190] Available at: https://statswales.gov.wales/Catalogue/Environment-and-Countryside/Greenhouse-Gas/emissionsofgreenhousegases-by-year [Accessed: 02.12.21]

Figure B-34: Total CO_2 emissions from the transport sector in Wales (kT)
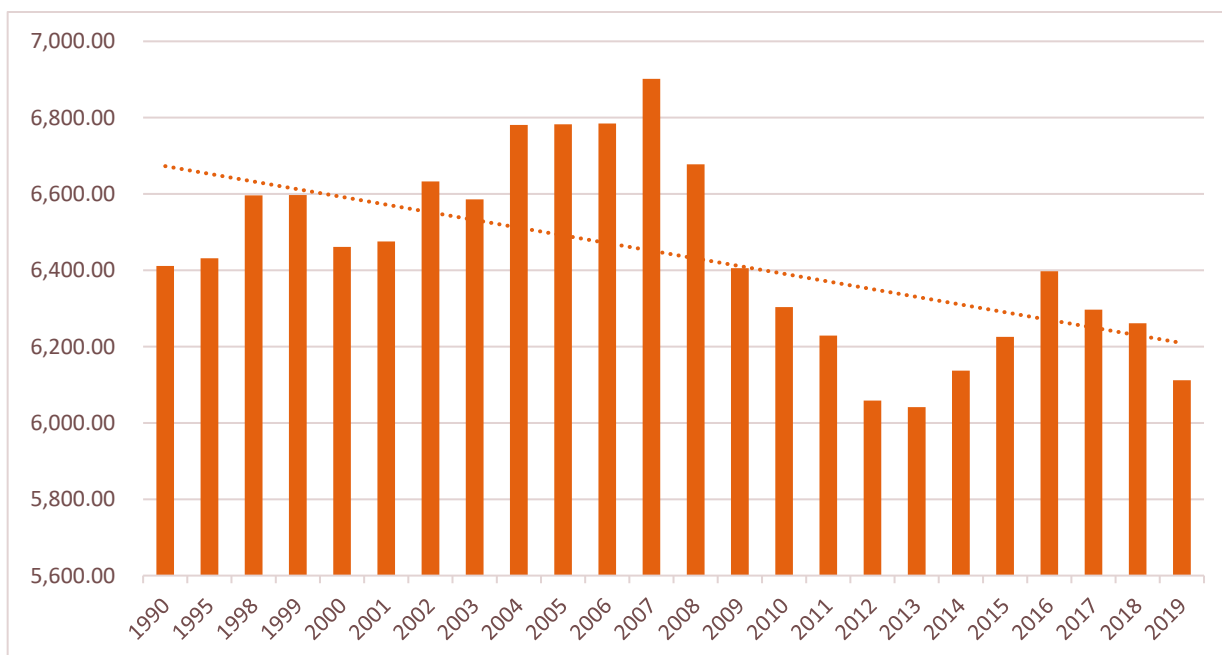
Energy from renewable sources used by public transport

According to a report on energy generation in Wales[191], around 91 TWh of energy per year is consumed in the country. 76.1 TWh of this is associated with transport, heating and industry. 7.4 out of 30.2 TWh of electricity generated in Wales is generated by renewable resources in 2018.

Ultra Low Emission Vehicles (ULEV)

There were 125% more licensed ULEVs at the end of 2020 compared to the previous year, this figure representing 179,000 more ULEVs across the UK. This is despite an overall reduction in new car registrations of 27% in 2020. ULEV's accounted for 8.5% of all new licensed vehicles in the UK. Regionally, Wales had the lowest rate of ULEVs out of all licensed vehicles, at 0.4%[192].

Journeys made by sustainable travel modes

The number of rail passenger journeys in Wales reached the highest level on record in 2017-18[193], there were 31 million rail passenger journeys which either started or ended in Wales, an increase of 1.9 per cent compared with the previous year. Between April 2019 -

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[191] Welsh Government (2018) Energy Generation in Wales, https://gov.wales/sites/default/files/publications/2019-10/energy-generation-in-wales-2018.pdf [Accessed: 02.12.21]

[192] Department of Transport (2021) Vehicle Licensing Statistics: Annual 2020. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/985555/vehicle-licensing-statistics-2020.pdf [Accessed: 02.12.21]

[193] Welsh Government (2019) Rail Transport, April 2017 to March 2018. Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-04/rail-transport-april-2017-to-march-2018-824.pdf [Accessed: 02.12.21]

and March 2020 this decreased by 3.8% to 29.9 million passengers. This data incorporates a small period at the start of the COVID-19 pandemic, which may be reflected in the data[194].

Rail passenger journeys within Wales increased to 21.5 million in 2017-18, a 1.3 per cent increase compared to the previous year. Cardiff was the most common destination for within-Wales journeys, accounting for 41% of all journeys. In 2019-2020, journeys to Cardiff accounted for 42.9% of rail travel within Wales.

A total of 99.9 million passenger journeys were undertaken on local buses in Wales in 2017-18. These services covered a total 99.1 million vehicle kilometres[195]. Similarly with rail travel, the number of bus journeys taken between April 2019 and March 2020 may have been affected by the pandemic, as 88.8 million passenger journeys were taken within this period[196].

Active travel

In a Statistical Bulletin on the use of active travel in Wales (2019-2020)[197], it was found that:

- 4% of adults cycled at least once a week for active travel purposes. This is down 2% on the same period between 2018 and 2019.
- 60% of adults walked at least once a week for active travel purposes. This is up 3% on recent years.
- 74% of people in urban areas walked for more than 10 minutes as a means of transport at least once a month, compared with 59% of people in rural areas. Both urban and rural walking rates are up on 2018-2019.
- Men, younger people, and those without limiting illnesses were more likely than others to cycle.
- 44% of children actively travel to primary school, and 34% to secondary school.
- 226 seriously injured pedal cyclists were admitted to hospital in 2019-2020. This is roughly in line with previous years, and a 16% decrease on 2014 numbers.

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[194] Welsh Government (2021) Rail transport: April 2019 to March 2020. Available at: https://gov.wales/rail-transport-april-2019-march-2020 [Accessed: 02.12.21]
[195] Welsh Government (2019) Public service vehicles (buses and taxis), 2017-18.Available at: https://gov.wales/sites/default/files/statistics-and-research/2019-03/public-service-vehicles-buses-and-taxis-april-2017-to-march-2018_0.pdf [Accessed: 02.12.21]
[196] Welsh Government (2021) Public service vehicles (buses and taxis): April 2019 to March 2020. Available at: https://gov.wales/public-service-vehicles-buses-and-taxis-april-2019-march-2020-html [Accessed: 02.12.21]
[197] Welsh Government (2020) Active travel (walking and cycling): April 2019 to March 2020. Available at: https://gov.wales/active-travel-walking-and-cycling-april-2019-march-2020-html [Accessed: 02.12.21]

Figure B-35: Active Travel by Walking, by Local Authority
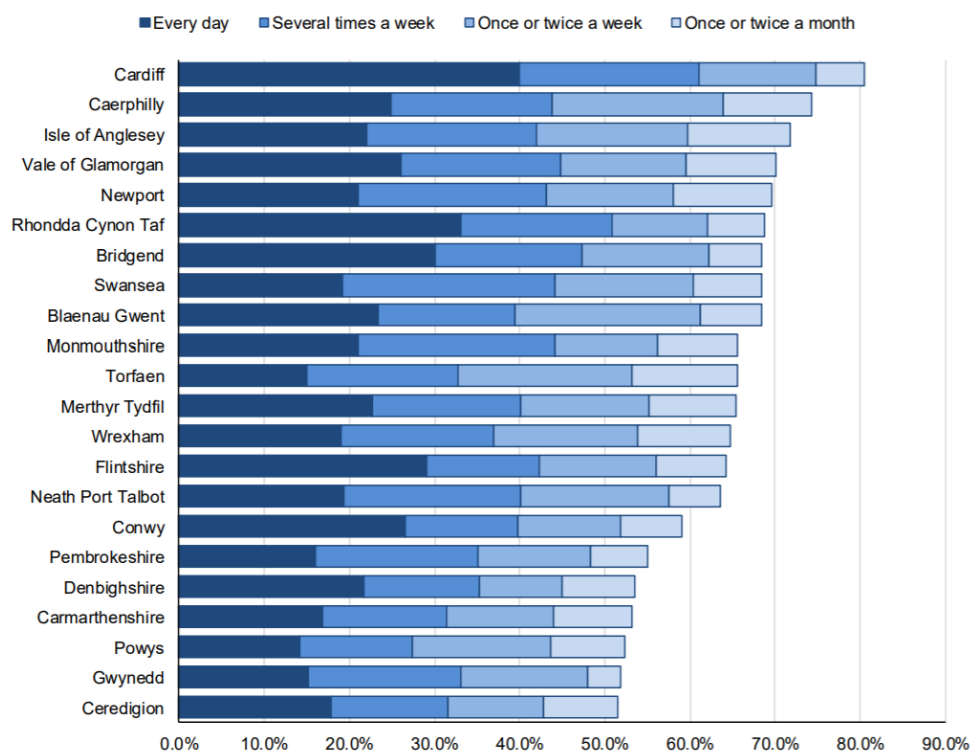
Source: Gov.Wales

Ecological footprint

A study in 2008 estimated that Wales's ecological footprint at 10.05 million global hectares (gha), which is roughly five times the size of Wales, or 3.28 global hectares per capita (gha/c). Wales' carbon footprint is estimated at 34 Mt CO_{2e}, or 11 t CO_{2e} per capita. In comparison with other developed countries, Wales's ecological footprint is significantly higher[198].

Hectares of healthy ecosystems that form part of the transport network

It states in the Welsh Transport Planning Appraisal Guidance (2008) that about 70% of the Welsh coastline is safeguarded in one way or another and 10% of all the land area in Wales is designated as a SSSI. There are over 1,500 protected sites across the country[199].

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[198] Stockholm Environment Institute and GHD (2015) Ecological and Carbon Footprint Report: Wales. Available at: https://gov.wales/ecological-and-carbon-footprint-report [Accessed: 02.12.21]

[199] Welsh Government (2008) Welsh Transport Planning and Appraisal Guidance. Available at: https://gov.wales/sites/default/files/publications/2017-09/welsh-transport-appraisal-guidance-weltag.pdf [Accessed: 02.12.21]

Freight

Freight traffic at Welsh ports was 51.3 million tonnes in 2020, a decrease of 3.2% from the previous year[200]. Figure B-36 below shows the total freight through major ports within Wales to 2019[201].

Figure B-36: Total Freight through Wales Major Ports
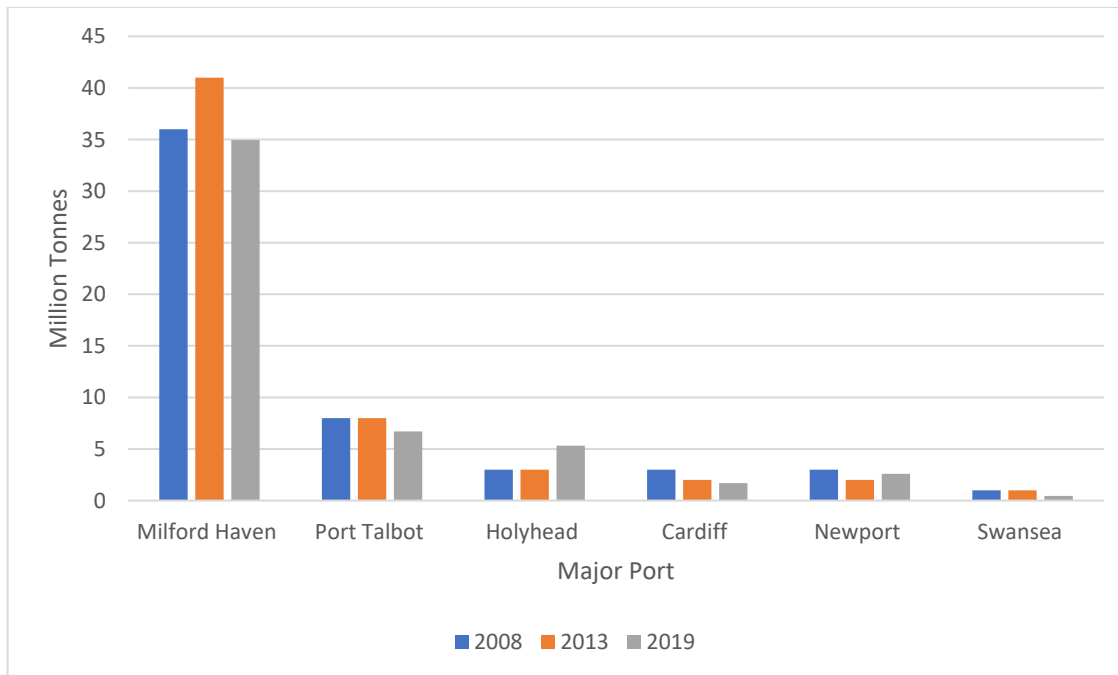

Source: Welsh Government

Milford Haven handles the 3rd highest traffic tonnage in the UK, accounting for 6.4% of UK traffic. The decrease in Wales's port traffic can be seen in Figure B-37 which compares it to other UK countries and their change in port traffic[202].

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[200] Welsh Government (2021) Statistical Bulletin: Sea Transport 2020. Available at: https://gov.wales/sites/default/files/statistics-and-research/2021-11/sea-transport-2020.pdf [Accessed 21.11.21]
[201] https://gov.wales/sites/default/files/statistics-and-research/2019-11/sea-transport-2018-624.pdf [Accessed: 02.12.21]
[202] Department for Transport (2021) Statistical data set: Port and domestic waterborne freight statistics: data tables (PORT0301). Available at: https://www.gov.uk/government/statistical-data-sets/port-and-domestic-waterborne-freight-statistics-port#port-level-statistics [Accessed: 02.12.21]

Figure B-37: All port traffic inwards and outwards across the UK
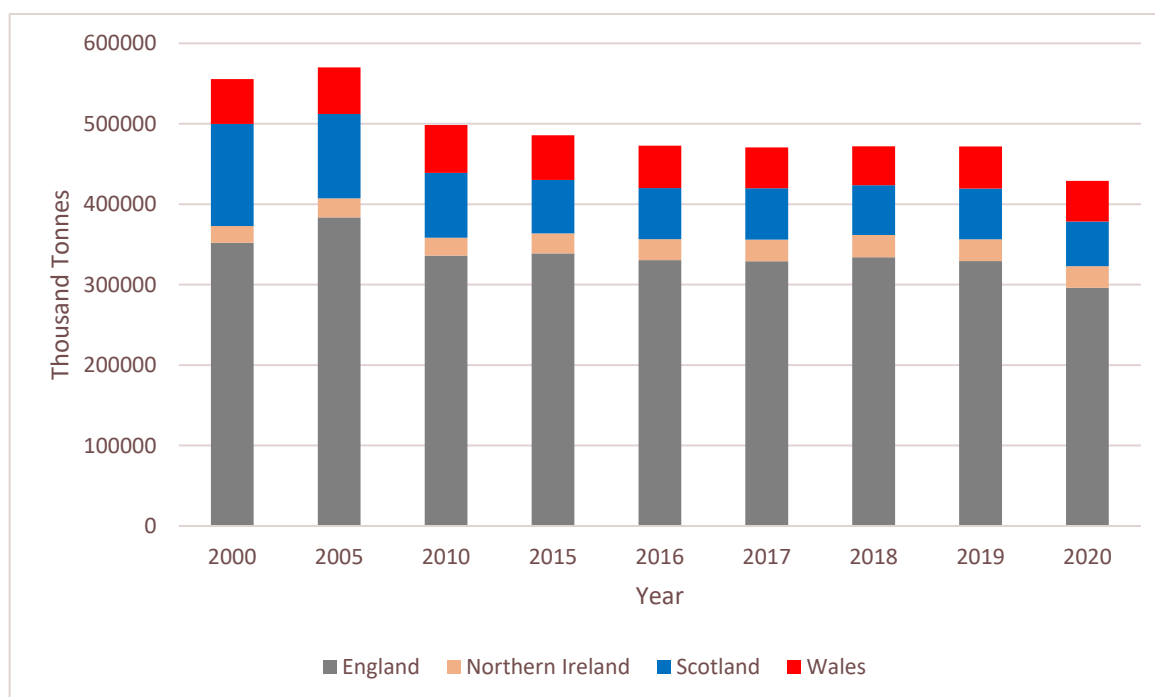
Source: Adapted from Department for Transport

The tonnes of goods transported by freight on the roads in Wales has decreased between 2004 and 2020[203]. Table B-11 sets out the total mass of freight transported by road in Wales since 2004.

Table B-11: Goods transported via road freight in Wales 2004-2019

Year	Million Tonnes
2004	86
2005	94
2006	89
2007	96
2008	89
2009	66
2010	73
2011	64
2012	71

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[203] Department for Transport (2021) Statistical data set: Domestic road freight activity (RFS01). RFS0121: Goods lifted and goods moved by region and country of origin. Available at: https://www.gov.uk/government/statistical-data-sets/rfs01-goods-lifted-and-distance-hauled#domestic-road-freight-by-region [Accessed: 02.12.21]

Year	Million Tonnes
2013	59
2014	59
2015	63
2016	67
2017	70
2018	62
2019	64
2020	57

7.1.3 Data Gaps

- Data relating to freight transported on railways in Wales.
- Data relating to gendered differences in data captured.
- Data related to energy use in domestic and commercial settings following the COVID-19 pandemic
- Data related to passenger numbers following the COVID-19 pandemic

7.1.4 Transport Budget Headline Figures

Figure B-38: Revenue and Capital of rail transport in Wales

	2020/21 (£m)
Capital	**610**
Approx 50% on public transport and active travel, including:	
Rail enhancements	47
South Wales Metro	142
North Wales Metro	23
Sustainable and AT	89
Revenue	**530**
But only around 10% of revenue budget could be considered as discretionary expenditure.	
Rail franchise	185
Bus services	58
Trunk road opex	71
Depreciation	188

Source: Economy, Skills and Natural Resources Group, Welsh Government

Figure B-39: Pounds sterling per kilometre travelled by different transport modes
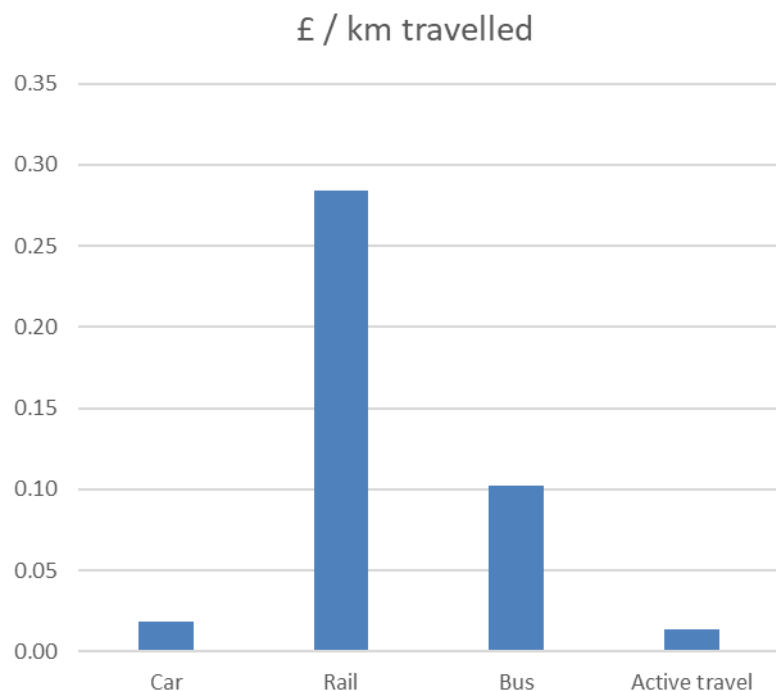

£ / km travelled

Figure B-40: Money spent across different transport modes in Wales

	£m spent	Journeys (millions)	Modal share	Distance (billion km)	£ / journey	£ / km travelled
Car	682	849	62%	36.6	0.80	0.02
Rail	397	34	2%	1.3	11.63	0.31
Bus	198	103	8%	0.9	1.92	0.22
Active travel	42	384	28%	1.6	0.11	0.03
Total	1319					

Caveats

1. Funding levels not linear with patronage
2. Latest available data from each source has been used to produce these figures, meaning they are not always from directly comparable time periods
3. Wales-specific data not available for all modes, in which case estimates have been made using data for England

Source: Economy, Skills and Natural Resources Group, Welsh Government

7.1.5 Data Gaps

- How specifically the transport network interacts with these factors e.g. how many hectares of healthy ecosystems does the transport network cross.
- How much energy used by the transport network is sourced from renewable resources.
- How many recycled materials are used in construction of transport infrastructure.

7.2 Key Issues relevant to the NTDP and opportunities for it to address them

7.2.1 Issues

Greenhouse gas emissions have been steadily falling in Wales; there is still a long way to go to meet the emissions targets. This reduction is partly as a result of a gradual shift in energy generation to renewable and cleaner fuels together with technological and efficiency improvements in industry. However, again there are challenges to maintain these positive trends.

Wales' high ecological footprint must be maintained and not compromised by transport developments.

Measures must be taken to provision the safety of pedestrians and cyclists on the road in order to promote it as a viable form of transport.

The estimated global footprint of Wales is high compared with other developed countries. There is a challenge to reduce this whilst also accommodating new development and economic growth.

7.2.2 Opportunities

The NTDP has an opportunity to help promote low carbon fuels and improved standards of energy efficiency in transport infrastructure.

The NTDP should aim to reduce the growth of motor traffic.

The NTDP must promote sustainable transport modes (including active travel and Ultra Low Emission Vehicles (ULEVs)).

The NTDP presents an opportunity to implement the sustainable transport hierarchy:

Firstly, by reducing the need to travel unsustainably:

- bring services closer to people, integrated planning (communities built around transport hubs)
- ICT, flexible working, homeworking

Secondly, by widening and promoting more sustainable travel choices:

- integration, modal shift.

Thirdly; by make better use of the existing transport network:

- managing demand, facilities, capacity.

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