

# Moving forwards: Healthy travel for all in Cardiff and the Vale of Glamorgan

---



Annual Report of the Director of Public Health  
for Cardiff and Vale of Glamorgan 2017

# Moving forwards: Healthy travel for all in Cardiff and the Vale of Glamorgan

Annual Report of the Director of Public Health  
for Cardiff and Vale of Glamorgan 2017

## Acknowledgements

Many thanks to everyone who has helped in putting this report together with ideas, suggestions and evidence, including:

Hester Adams, Dr Simon Barry, Huw Brunt, Paul Carter, James Clemence, Jason Dixon, Councillor Susan Elsmore, Dr Margaret Eni-Olotu, Marcus Goldsworthy, Andrew Gregory, Dr Siân Griffiths, Joshua Hart, Fiona Kinghorn, Brian Marsh, Colin McMillan, Helen Moses, Gareth Newell, Professor Graham Parkhurst, Anne Phillips, Emma Reed, Rob Thomas, Sue Toner, Councillor Caro Wild, Dr Suzanne Wood, and Dr Thom Waite

My thanks to Dr Tom Porter as the chief author of the report.

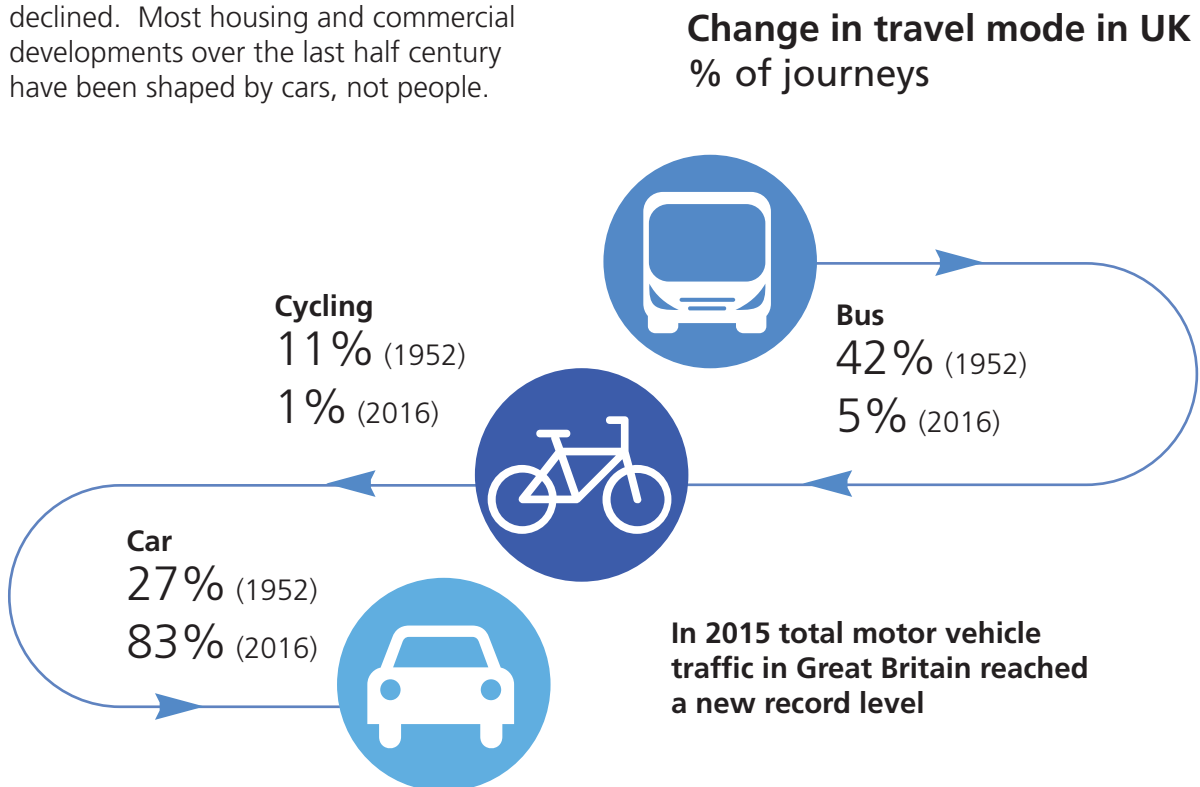
# Executive summary

Declining levels of physical activity, increasing levels of obesity and diabetes, widespread air pollution, social isolation, and worsening health inequalities are all pressing public health issues in our area. Climate change is a severe threat which is already being felt in the UK and across the world.

Changing patterns in the way we travel and how we design our environments for travel have played a significant role in these issues. Bold action is required locally if we are to reverse these trends in population and global health, and create a healthier more sustainable future for our residents.

## How did we get here?

While car use has sharply increased over the last 50 years, walking and cycling levels, and public transport use, have declined. Most housing and commercial developments over the last half century have been shaped by cars, not people.





## The effects on health and well-being

This shift in travel mode has contributed to a significant decrease in physical activity, which in turn is associated with an increased risk of ill health, including cardiovascular disease, cancer and diabetes.

Road transport is a major contributor to harmful air pollution, and is responsible for nearly 1000 accidents causing injury or death each year in Wales. As our environments have been shaped around the car, interactions within and between communities have dropped. Many of the adverse impacts of road transport are felt more in more deprived communities, contributing to worsening health inequalities.

Climate change increases the risk of severe weather events including flooding which will increasingly affect our communities and our infrastructure.

- Over half (54%) of adults in Cardiff and Vale are overweight or obese, and are classed as 'inactive' because they do less than half an hour of physical activity in an entire week
- An estimated 5% of deaths in Cardiff and Vale are due to particulate matter air pollution
- Nearly 1 in 4 vulnerable people in Cardiff and Vale report being lonely some or all of the time
- A man living in one of our most deprived communities in Cardiff can expect to live 11 years fewer than someone in the least deprived areas
- Flood-related displacement of communities has been found in the UK to cause significant and enduring mental health issues



## We could do things differently

Health and well-being in our communities could be significantly improved if active travel becomes the norm for short journeys, public transport is used for longer journeys, and air quality improves.

- Daytime journeys of less than 2km should be walkable for individuals aged 5 to 74 without a disability
- For many people the trigger to take up active travel is a significant life event
- People who walk and cycle in a neighbourhood are more likely to spend money in local shops
- Public transport use is facilitated by affordable ticket prices, flexibility in stops, high quality travel information and regular services
- Clean Air Zones deliver benefits worth £29 for every £1 spent
- The NHS should set the benchmark for clean air and safe workplaces
- The London congestion charge resulted in an 80% increase in cycling



## The time is right for change

A number of opportunities exist through legislation, national and local policy, and a gradually changing culture around the use of cars, which make now the time to act.

- Four recent major pieces of legislation support active travel in Wales
- Driving a car has become less popular among young people
- Examples of good practice in Cardiff and the Vale of Glamorgan include support to residents to encourage children's street play, helping Vale Council staff travel sustainably, and the UHW Park and Ride scheme.



## Seizing the day: a vision for Cardiff and the Vale

This report sets out a vision based on five key themes, showing what we could achieve in Cardiff and Vale.

- Active travel is the default for short journeys
- There is a well used, fully integrated transport system
- We have well connected, active and social communities
- Transport emissions are significantly reduced
- Cardiff and Vale are leaders in this field

If we get this right, potential benefits include reduced rates of cardiovascular disease, cancer, obesity and diabetes; improvements in mental well-being; and reduced sickness absence.

- Reduced illness and deaths from cancer (20-30% lower risk of colon and breast cancer)
- Reduced illness and deaths from cardiovascular disease and stroke (20-35% fewer cases)
- Reduced type 2 diabetes (30-40% fewer cases)
- Reduced risk of depression and dementia (20-30% lower risk)

- Reduced inequality in life expectancy between most and least deprived areas
- More cohesive communities and reduced loneliness
- Reduced air pollution and lower carbon emissions contributing to global warming
- Reduce demand for health and social care services



## Everyone playing their part: what we need to do together

To make a significant and sustained improvement in our health and well-being we need to take decisive action now and over the next 5-10 years, in four main areas.

- Accelerate improvements to infrastructure to support active travel and low emission transport
- Support staff to choose active travel
- Engage with the local communities and businesses on the benefits of active travel
- Discourage unhealthy and polluting travel

# Foreword



We all want the best health and well-being we can have for our population. To achieve that the inequalities gap between our most and least deprived communities has to narrow. To achieve that we need to take every

opportunity we can, working together as individuals and communities with all of our partners in public health.

Frequently, taking opportunities will mean embracing change, doing things differently, driving continuous improvement as hard as we can and telling the story about why health and well-being should be important for each and every one of us. Opportunities to improve health and well-being will always involve behavioural change at population, individual and organisational levels. This is tricky as most of us will say 'I support change but I don't want to change,' but we, each of us, have to become the change we need to see if we are to achieve sustainable improvement in our health and well-being.

Some of the opportunities we have open to us today have not been fully exploited by us as individuals, collectively as leaders or as organisations. This probably isn't surprising as change and continuous improvement are challenging and often question our current beliefs, practices and systems. Yet today across our public sector and third sector organisations we are better placed than ever before to take up those opportunities. In Cardiff and Vale excellent partnership working has led to a common understanding of the needs of the population we serve and what we need to do, to enable better health and well-being. This has been hugely strengthened by the recent Well-being of Future Generations (Wales) Act

2015,<sup>134</sup> the Social Services and Well-being (Wales) Act 2014<sup>24</sup> and the Public Health (Wales) Act 2017.<sup>137</sup> These put our health and well-being firmly at the top of the agenda.

Added to this we know that as a Cardiff and Vale population, people want better health and well-being and the understanding that this will involve change, including behaviour change,<sup>168</sup> is evident. This was evidenced in the surveys and discussions which have taken place to inform our most recent needs assessments in Cardiff and Vale.<sup>11,48,161</sup> Added to that we have some emerging examples of positive change in two of our biggest causes of poor health and well-being. The numbers of people smoking tobacco in Cardiff and Vale is lower than it has ever been and is continuing to decrease and the rate of obesity in our children is slowly decreasing.

This report looks at one of the opportunities that we haven't yet fully exploited, active travel. It is an issue that affects every single person in our population as well as every single organisation operating within our communities. It is an issue which demands an understanding of the past, an understanding of the disruptive technologies which our younger generations are rapidly embracing, an understanding of what the evidence is telling us, and most importantly a willingness to seriously drive rapid continuous improvement which utilises the evidence and new technologies. Inevitably it demands that we ourselves begin to adopt and adapt to active travel as part of how we live each and every day.

I hope you will enjoy reading the report and that it will stimulate you to think about your role in making active travel a part of achieving sustainable improvements in our health and well-being.

**Dr Sharon Hopkins, Executive Director of Public Health**

# What is at stake?



## Our health and well-being: local and global

Declining levels of physical activity, increasing levels of obesity and diabetes, widespread air pollution, social isolation, and worsening health inequalities: these are all pressing public health issues in Cardiff and the Vale of Glamorgan.

Globally, climate change is a severe threat which is already being felt in the UK and across the world in extreme weather events such as flooding and heatwaves, with impacts increasing every year as the earth warms.

These issues all have something in common: changing patterns in the way we travel over the last half century, along with how we design our environments for travel, have played a significant role.



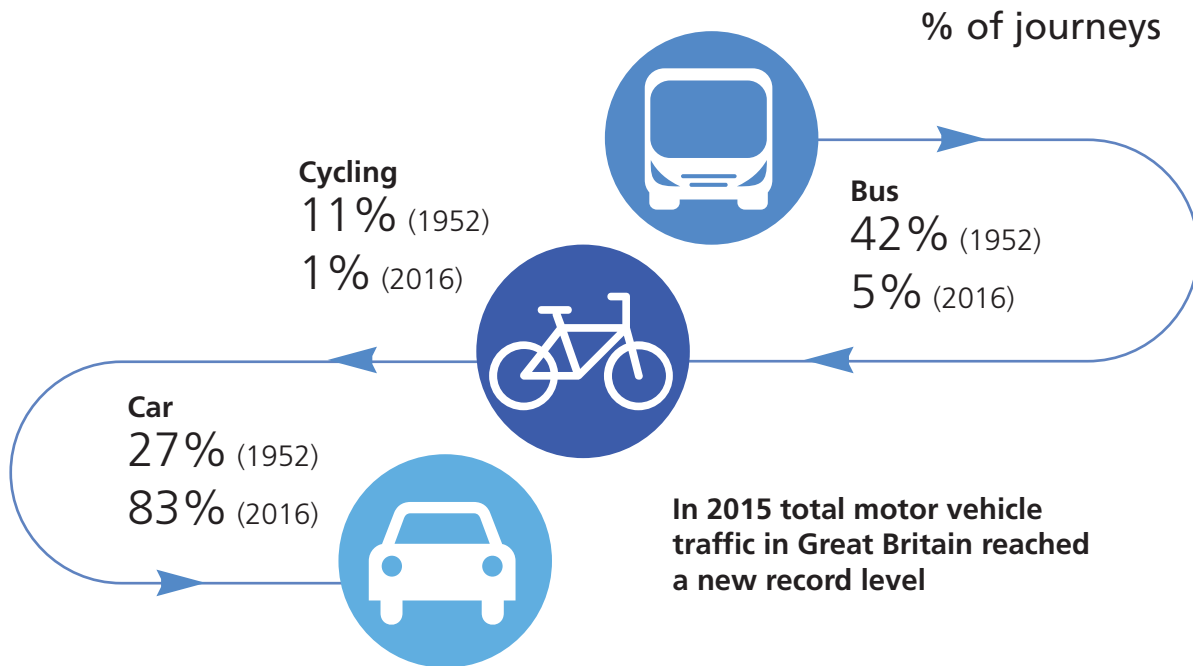
## We need to take positive action now

Bold action is required locally if we are to reverse these trends in population and global health, and create a healthier more sustainable future for our residents.

A slew of evidence available now suggests a brighter future is possible, with positive impacts on health, well-being and community cohesion, as well as reducing our reliance on fossil fuels and their impact on climate change.

The intention of this report is to stimulate thinking and discussion locally about the issues described and encourage co-ordinated and decisive action to address them.

# How did we get here?



## Changing patterns of travel

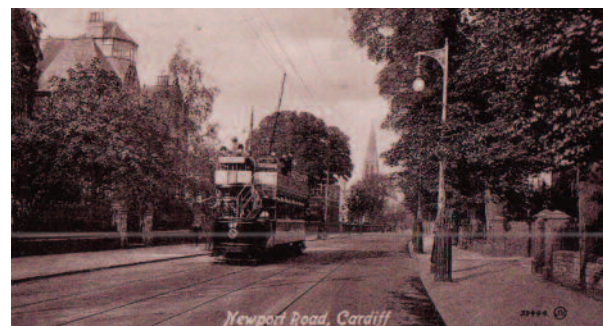
A dramatic transformation has taken place over the last century in how people in the UK travel for work and leisure.

Until the 1950s, most people got around on foot or by public transport. Since then car ownership has increased rapidly, and the last fifty years has seen a huge shift to journeys by car, with public transport use dropping precipitously. For example, in 1952, 42% of journeys in the UK were by bus, but by 2016 this figure had dropped to just 5%. Car journeys rocketed from 27% to 83% over the same period.<sup>1</sup>

Locally we don't have to go far back to see this stark transition. In the 1920s trams were at their peak in Cardiff, with an extensive network throughout the city and a staggering

42 million passenger journeys taken in the city each year, or around 180 journeys per resident each year.<sup>2</sup> The tram system closed in Cardiff in 1950, but trolleybuses – a form of electric bus – were a common sight after this, until the network closed in 1970.<sup>3</sup>

**Figure 1. A tram running along Newport Road in Cardiff<sup>2</sup>**



42 million journeys were taken by tram in Cardiff in 1928. The tram closed in 1950



The railway line in the Vale between Barry and Bridgend was closed with the Beeching programme in the 1960s, and only re-opened in 2005. However, over the previous century there had been a much more extensive rail network in the Vale including a Cowbridge Railway line, which opened in 1865.

**Figure 2. Cowbridge railway station<sup>13</sup>**



Initially the car brought with it a sense of new-found freedom, and the ability for people to keep in touch more easily with friends and family, facilitating further geographic spread of these important social networks.

But this transformation in transportation came with a price: a steep decline in physical activity levels, with many adults now routinely spending their waking life sitting in the car, at the office desk, or on the sofa, with little meaningful physical activity in between. Indeed a quarter of adults in Cardiff and the Vale of Glamorgan are now classed as 'inactive' because they do less than half an hour of physical activity in an entire week.<sup>4</sup>

Effects on health are not limited to changes in physical activity: air pollution, social isolation, noise pollution, access to green space and health inequalities have also been impacted on by car use.

The surge in car use has reduced demand for public transport, resulting in a decline in frequency and routes. Fewer services has made public transport a less viable option for some journeys, further reducing demand. Between 2007 and 2014, bus use declined by 4% in Cardiff,<sup>5</sup> and yet a third of residents (35%) in Cardiff cite frequency and availability of public transport as a major issue.<sup>5</sup> Although 90% of residents say they are satisfied with public transport in the Vale, rates of use are much lower.<sup>6</sup>

Over the last five years the cost of rail fares have increased by 15%, and bus/taxi costs have increased by 14%, while the cost of running a car has decreased by 5%.<sup>7</sup> Over 1 in 10 (11%) journeys in the UK in the 1950s were made by bicycle, but that figure now stands at just 1%. Increasing motorised transport on the roads, both rural and urban, has also had an impact on how safe people feel cycling.



Over the last five years  
the cost of running a car  
has decreased by 5%



while the cost of the bus  
has increased by 14%

The UK still loves its cars. In 2015, total motor vehicle traffic in Great Britain reached a new record, of 317 billion miles travelled in one year, the majority travelled by cars and taxis.<sup>8</sup> Growth in traffic levels over the last 10 years has been higher in Wales (5.9%) than the other home countries.<sup>9</sup> There are currently 206,000 licensed cars in Cardiff and Vale.<sup>10</sup> Population growth in the region, particularly in Cardiff, will put an increasing strain on the road network without a change in approach.<sup>5</sup>

## In 2015 total motor vehicle traffic in Great Britain reached a new record level

Commuting into Cardiff is a snapshot of this: each day over 80,000 people travel to Cardiff for work from neighbouring local authorities, including 20,000 from the Vale.<sup>5</sup> This makes up around a third of people working in Cardiff. The vast majority (about 80%) of those travelling in from neighbouring local authority areas currently do so by car.<sup>5</sup> There are around 59,000 working residents in the Vale, of whom around half (28,500) work in the area and half (30,300) commute out of the area; around 14,000 people commute into the Vale. The majority commuting out work in Cardiff, with smaller numbers commuting to Bridgend and Rhondda Cynon Taf.<sup>11</sup>

Among staff working in the Cardiff and Vale UHB, over 1 in 6 (17%) report walking or cycling to work, 8% take public transport, and 8% share their car journey with a colleague, with the remainder travelling alone by car.<sup>12</sup>

One bright spot is that while overall rail use remains lower than the 1950s (10% of journeys now compared with 17% previously) this has been steadily increasing following a low of 5% in the mid-1990s.<sup>1</sup>

## Our built environment

As our transport modes have changed over the past century, our built environment has followed. As well as a decline in the previously extensive public transport infrastructure for trams, buses and railways, our rural and urban

environments have been indelibly shaped by the car. Reversing this long-standing trend will take significant effort.<sup>14</sup>

Unused, parked vehicles take up a significant part of our urban space - on roads and outside houses, shops and work. Despite encouraging efforts to reverse the trend in recent years, our road network is designed to facilitate the movement of cars, rather than meeting the needs of pedestrians or cyclists. Road junctions frequently prioritise cars over cyclists and pedestrians.

While there are some examples of excellent cycling infrastructure locally, there are still too many examples of cycle lanes which start and stop inconsistently, with little in the way of continuity of flow car drivers have come to expect.

Most housing and commercial developments over the last 50 years have been shaped by cars, not people



Most housing and commercial developments over the last 50 years have been shaped by cars, not people. The rise in out-of-town shopping centres and offices has necessitated car travel (and ownership) for many people.

At the same time, increasing traffic on the road has led to a progressive reduction in urban green space, and in uninterrupted peaceful green spaces in rural areas.

# The effects on health and well-being

The profound shift in how people get around, and the built environment changes which accompanied this, are exposing us to a combination of risk factors which we now know lead directly to serious illness and reduced life expectancy.



## Physical inactivity and sedentary lifestyles

**Health impacts:** increased risk of death from any cause; increase in risk of cardiovascular disease, cancer, and type 2 diabetes; adverse impacts on mental well-being



## Over half (54%) of adults in Cardiff and Vale are overweight or obese

Over half (54%) of adults, and a fifth (21.5%) of 4-5 year olds in Cardiff and Vale are overweight or obese,<sup>4</sup> with the rates higher in more deprived areas. Obesity is a complex issue which has been discussed in previous annual reports, but we know that changes in physical activity levels are a key driver of the current epidemic.<sup>15</sup> Physical activity levels for many people are insufficient to maintain good health: two in five (41%) of adults in our area don't do sufficient physical activity, with over a quarter (27%) classed as being inactive (less than 30 minutes physical activity in a week).<sup>4</sup>

While physical activity levels across Wales are broadly static, this masks a recent increase in activity among the least deprived communities.

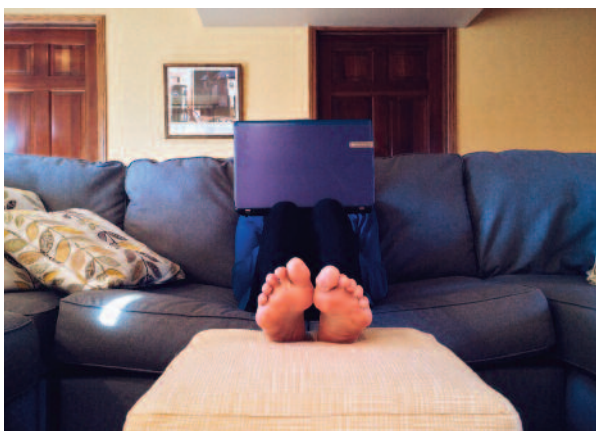
This hasn't been seen among the most deprived, leading to worsening health inequalities.<sup>16</sup> Teenage girls have the lowest physical activity levels out of the UK countries, with only 8% of Welsh teenage girls meeting the physical activity guidelines.<sup>16</sup>

## Fewer than 1 in 10 (8%) of teenage girls in Wales meet the physical activity guidelines.

Car ownership is linked to how much walking and cycling people do, with a perception that car journeys are invariably quicker and easier than active travel. You are much less likely to undertake active travel if you have a car (37% with a car, compared to 71% without).<sup>17</sup> Use of a car is associated with an increased risk of obesity, while walking and use of public transport is associated with not being overweight or obese.<sup>18</sup> Active travel is less common in rural compared with urban environments in the UK, and becomes less common as people age.<sup>17</sup>

## You are much less likely to undertake active travel if you have a car

We now know that insufficient physical activity and being sedentary are dangerous to our health.<sup>19,20</sup> Being sedentary is associated with an increase in death from any cause of over a fifth (22%), and an increase of around one in seven in the risk of death from cardiovascular disease (15%) and cancer (13%). There is a staggering near doubling (91%) of the risk of acquiring type 2 diabetes. These effects are even more pronounced if sedentary activity is not offset by regular physical activity.<sup>19</sup> Over 24,000 people are currently recorded as having diabetes in Cardiff and Vale.<sup>21</sup>



The Academy of Medical Royal Colleges has recommended that “a change in culture is needed so that it is no longer considered ‘normal’ to spend a large amount of time sitting in cars.”<sup>22</sup>

Sedentary lifestyles are associated with a 91% increase in risk of type 2 diabetes



## Air pollution

**Health impacts:** associated with cardiovascular and respiratory disease, stroke, cancer, diabetes, low birth weight, dementia

### The nature of air pollution

Great progress was made in environmental protection in the 1950s with the introduction of the Clean Air Act, which enforced smoke control areas in some cities to reduce smog and air pollution from sulphur dioxide.<sup>23</sup>

The main pollutants of concern today are nitrogen dioxide (NO<sub>2</sub>), and particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>). The primary source of both pollutants are vehicle emissions, especially those from diesel vehicles, although there are industrial, agricultural and domestic sources too. Exhaust emissions continue to be produced when diesel or petrol vehicles are stationary and the engine is on, and traffic congestion tends to worsen emissions.

Deaths from particulates increase steadily with exposure for over 65s, even at concentrations below the current WHO guidelines and EU legal levels, for both short-term and long-term exposure.<sup>25</sup>

Benzo(a)pyrene (BaP) is a component of PM10 generated by diesels; maternal exposure to BaP has been linked to mental health problems in childhood and neurocognitive delay.<sup>26</sup> BaP emissions rose by 52% in the EU between 2000 and 2014, with 80% of the urban population exposed to levels above WHO limits.<sup>26</sup>

Roadside concentrations of NO<sub>2</sub>, which are mainly emitted by diesel vehicles, has been above the legal limit in nearly 90% of urban areas of the UK since 2010.<sup>27</sup> HGVs, LGVs and buses make up just over half of the emissions, with private cars and taxis the remainder.<sup>28</sup> Levels of NO<sub>2</sub> in Cardiff and Vale residential areas are the highest in Wales.<sup>29</sup>

### Levels of NO<sub>2</sub> in Cardiff and Vale residential areas are the highest in Wales.

Particulate matter (PM<sub>2.5</sub>) pollution is also higher in Cardiff and Vale than all other LHB areas in Wales. Cardiff has the highest annual average concentration, weighted for population, among local authority areas, at 9.5 µg m<sup>-3</sup>. This is slightly below the mean for England (9.9 µg m<sup>-3</sup>), but above the average concentrations in Scotland (6.8) and Northern Ireland (6.6). Due to the levels of air pollution, there are currently four statutory air quality management areas (AQMA) designated in Cardiff, and one in the Vale (see Box 1). Because of the characteristics of particulate pollution, evidence suggests there is no 'safe' threshold, so it is likely that many more people are affected by air pollution exposure beyond these localised 'hotspots'.

#### Box 1. Air quality management areas in Cardiff and the Vale<sup>30</sup>

Cardiff City Centre, Cardiff  
Llandaff, Cardiff  
Stephenson Court, Cardiff  
Ely Bridge, Cardiff  
Cogan, Penarth

Transport pollution isn't just from cars: diesel buses and trains can also be significant contributors and any plan to reduce air

pollution needs to address this as well.<sup>31,32</sup> A recent study found air pollution levels in a large railway station in London exceeded those on a busy road outside.<sup>31</sup>

The general trend for air pollution from transport is a reduction over the last two decades,<sup>8</sup> but it remains much higher than it should be for good health.



#### Exposure to air pollution

The relationship between exposure to air pollution and mode of transport is complex.<sup>27,33-35</sup>

Exposure to air pollution is generally higher sitting inside a vehicle than outside on the road itself, because vehicle ventilation systems suck in polluted air from the vehicle in front and recirculate and concentrate it in a small area. However, because active travel increases the breathing rate, the amount of inhaled pollutant is generally higher for active travel modes. In spite of this, because of the overwhelming benefits of physical activity on cardiovascular and general health, people who travel in motorised transport still reduce their life expectancy by a year on average compared with people who actively travel.<sup>36</sup> When active travel routes are built away from busy roads, and less polluting vehicles become more common, the benefits of active travel increase further.





“Children sitting in the backseat of vehicles are likely to be exposed to dangerous levels of air pollution. If more drivers knew the damage they could be doing to their children, they’d think twice about getting in the car.”

Prof Sir David King, former government Chief Scientific Adviser<sup>27</sup>

High levels of air pollution aren’t confined to main roads. A recent study of estimated air pollution around health facilities in London found that over half of the NHS sites in the capital exceeded legal limits.<sup>37</sup> The authors recommend that organisations across the UK review air pollution levels around health facilities as a matter of urgency.



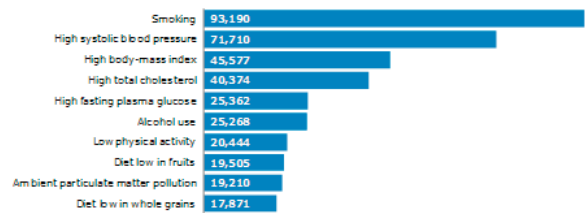
### Health impacts of air pollution

Using international modelling, it has been estimated that across the UK around 40,000 deaths each year are due to air pollution (PM<sub>2.5</sub> and NO<sub>2</sub>).<sup>38</sup> In Wales, an equivalent of around 1,600 avoidable deaths are estimated each year due to particulate matter, and 1,100 due to NO<sub>2</sub> exposure.<sup>29</sup>

It is estimated 143 deaths each year in Cardiff and 53 each year in the Vale among over 25s are due to air pollution caused by particulate matter, and 2,100 life years are lost each year.<sup>39</sup> Long-term exposure to particulates is

estimated to be responsible for 5.1% of all deaths in Cardiff and Vale.<sup>29,39</sup> Across Wales, the years of life lost due to air pollution puts it ninth out of the top 10 modifiable risk factors, but three other risk factors associated with a car-dependent environment, namely high blood pressure, high body mass index, and low physical activity are also in the top 10 (see Figure).<sup>16</sup>

**Figure 3. Top 10 risk factors for years of life lost (YLL) in Wales (2015). Four of the top ten are impacted by car use.<sup>16</sup>**




### An estimated 5% of deaths in Cardiff and Vale are due to particulate matter air pollution

Air pollution has been linked to cancer, asthma, COPD, pneumonia, stroke and heart disease, diabetes, obesity and changes linked to dementia.<sup>38,40</sup> Long-term exposure reduces life expectancy, principally due to increases in cardiovascular disease, respiratory disease and lung cancer.<sup>40,41</sup>

Children are four times more likely to have significantly reduced lung function in adulthood if they live in highly polluted areas.<sup>40</sup> The risk of adults developing type 2 diabetes has been found in large prospective studies to increase by up to 10% for every 10µgm<sup>-3</sup> increase in exposure to pollutants.<sup>40</sup>

Dirty air has also been associated with premature birth, and low birth weight. It is estimated that one fifth of cases of low birth weight are due to traffic-related air pollution, with the greatest harm occurring with exposure in early pregnancy.<sup>40</sup> NO<sub>2</sub> exposure has been linked to neurodevelopmental impairment, and increased risk of attention deficit hyperactivity disorder (ADHD) in children.<sup>40</sup>



It is estimated that one fifth of cases of low birth weight are due to traffic-related air pollution.

Short-term exposure to air pollution can lead to negative effects on lung function, exacerbation of conditions such as asthma, and increases in hospital admissions and deaths.<sup>41</sup>

Health problems from air pollution in the UK have been estimated to cost society, businesses and the NHS over £20bn per year (Box 2).<sup>40</sup>



## Box 2. The health impacts of air pollution

“Damage [caused by air pollution] occurs across a lifetime, from a baby’s first weeks in the womb all the way through to the years of old age.... Harm to babies and children will have an impact that lasts far into the future. For the same reason, any air quality improvements we make now will have long-lasting benefits. Older people, and adults with long-term conditions are also vulnerable to the effects of air pollution. Improving air quality will help them to stay independent and well, benefiting individuals and easing the pressure on our NHS and social services.” Every breath we take: the lifelong impact of air pollution. Royal College of Physicians and Royal College of Paediatrics and Child Health (2016)<sup>40</sup>



## Road traffic injuries and deaths

**Health impacts:** serious injuries and deaths due to physical trauma; knock-on impact on active travel levels in population; reduced outdoor play by children

Even with significant improvements in road safety over the last 30 years, with progressive advances in car safety equipment, a change in drink-driving culture, and speed limit enforcement, deaths and injuries associated with cars remain common.

There are 20 road accidents causing death or serious injury each week in Wales

In Wales there were 975 road accidents which caused death or serious injury in 2016, or nearly 20 serious accidents each week. 103 people died last year in road accidents in Wales, or two people each week. Such statistics are unfortunately so common and an accepted part of driving that they no longer cause public concern – but if there were that number of incidents or deaths on the railways in Wales each year there would be a public outcry.



### Half of car drivers in 30mph zones routinely exceed the speed limit

Enforcement of speed limits is important, with half (52%) of car drivers in 30mph zones routinely exceeding the speed limit.<sup>8</sup> Figures for Great Britain found that a quarter (24%) of road fatalities were pedestrians.<sup>42</sup> The number of incidents and casualties is highly sensitive to speed. A drop of just 1mph in average speed is estimated to reduce incidents by 5-6% on urban roads.<sup>43</sup>

The most common cause of death for children aged 5-14 years is being hit by a vehicle.<sup>44</sup> Those aged over 60 are seven times more likely to die from being hit by a car at 30mph compared with other age groups; 44 over a third (35%) of all pedestrian fatalities are people aged 70 or over.

### The most common cause of death for children aged 5-14 years is being hit by a vehicle.

The perception of road safety has also had a significant impact on people's willingness to cycle for work and leisure, as well as parents'

willingness to let their children play outdoors in the street. This coincides with an increase in children's 'screen time', the amount of time spent by children and young people on electronic devices.<sup>45</sup> Play, including outdoor play, is incredibly important to children's physical development and mental well-being.<sup>46</sup>



### Increase in loneliness and social isolation

**Health impacts:** Reduced mental well-being and lower life expectancy

Seventeen percent of people in Wales report being lonely,<sup>47</sup> with results from a recent local survey in Cardiff and Vale putting the figure at nearly 1 in 4 (23.3%) among people in more vulnerable groups.<sup>48</sup> As car use has become more prevalent, people's social and support networks have also become more geographically dispersed.



### Nearly 1 in 4 vulnerable people in Cardiff and Vale report being lonely some or all of the time

How well people are connected to their neighbours, and how many they count as friends, has been found to be directly associated in the UK and internationally with the traffic volume in their street.

Replicating a classic US study from the 1960s, a study in Bristol in 2008 found that the number of friends and acquaintances reported by residents was significantly lower on streets with higher volumes of motorised vehicles.<sup>49</sup> The study asked residents on quiet, medium

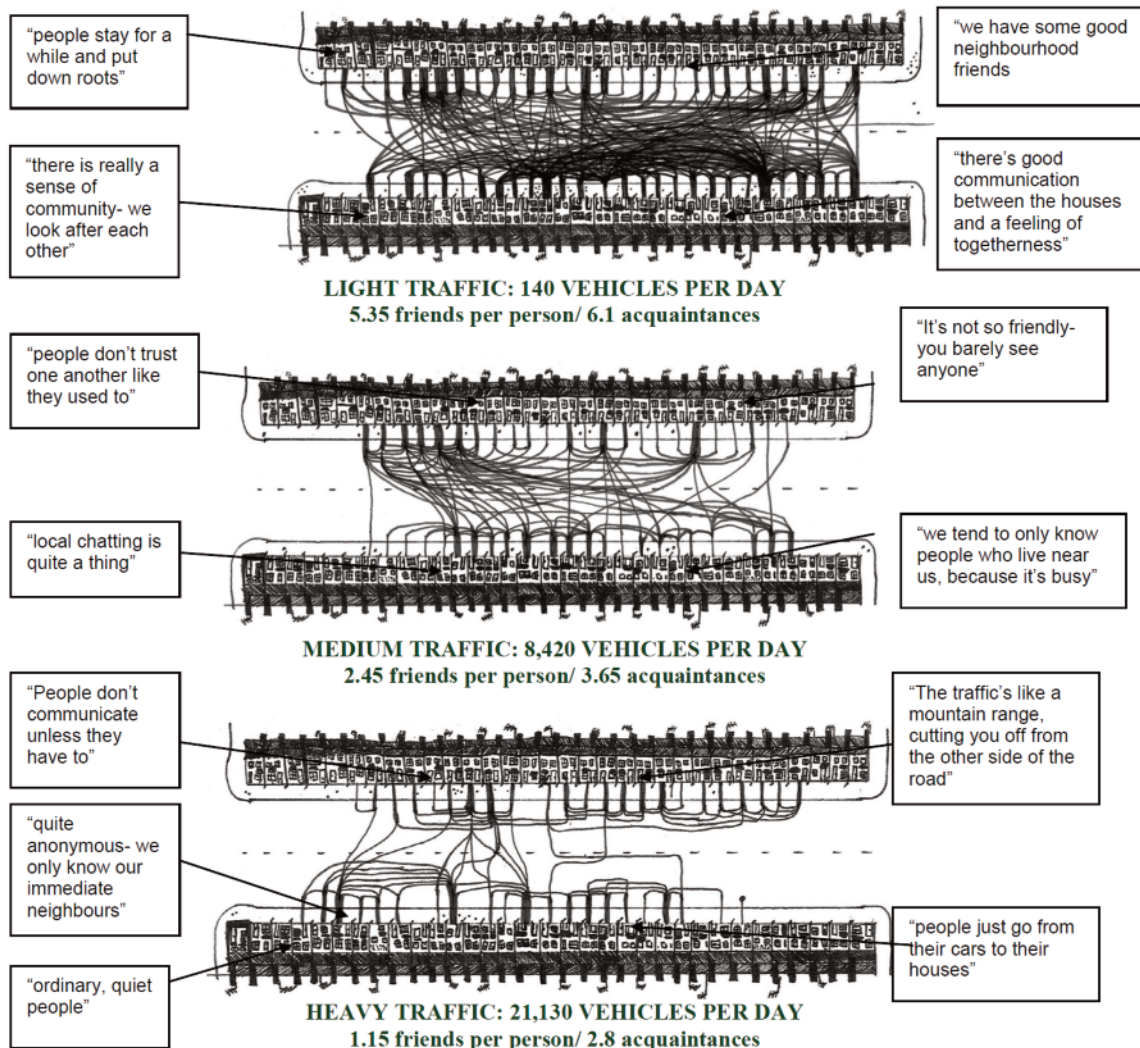


and busy traffic streets to draw lines on a map of their street representing where their friends and acquaintances were on the street (see Figure 4). The average number of friends of each resident on the light traffic street was 5.35, compared to 2.45 on the medium traffic street and 1.15 on the heavy traffic street. Residents on the light traffic street also reported more of a sense of community and togetherness.

Residents on the light traffic street reported more of a sense of community and togetherness

The increasing reliance on the use of a car to reach shops, banks and community facilities has had a particular impact in rural

**Figure 4. How community interactions vary by traffic volume.<sup>49</sup>**



communities. While a minor inconvenience for people with a car, those without become reliant on easily accessible and frequent public transport to access facilities and maintain their social networks and independence.

Increased car use has been associated with 'severance', the isolation of individuals and communities for example where a wide, busy road makes short local walks difficult.<sup>18</sup>

Loneliness and social isolation has a direct impact on length, as well as quality, of life. Studies have found that low levels of social integration, and isolation, significantly increase mortality. One study found social isolation increased the risk of death by a quarter (26%), partly but not wholly mediated by long-term illness and social deprivation.<sup>50</sup> Social participation acts as a protective factor against dementia and cognitive decline in the over 65s.<sup>51</sup>

Reducing car use and traffic speeds, and increasing access to public transport and active travel have been highlighted as priorities in an international report looking at healthy ageing in cities.<sup>52</sup>

Reducing car use and increasing access to public transport support healthy ageing in urban environments



## Transport noise

**Health impacts:** associated with high blood pressure

There is evidence that road transport produces noise pollution resulting in noise levels in excess of WHO guidelines for over 200,000 people in Wales.<sup>53</sup> The majority of these are in South Wales; in our area they are focused around key trunk roads including the M4, A4232, A48 and key routes in Cardiff.<sup>54</sup> Although transport noise may be seen as an inevitable consequence of living in an urban area, or near a large road, it has a long-term adverse impact on cardiovascular health, being associated with a small but significant increase in blood pressure.<sup>55</sup> In addition it has been associated with impaired intellectual development in children, sleep disturbance and reduced well-being.<sup>18,56</sup>

Traffic noise is associated with high blood pressure, impaired intellectual development in children, and sleep disturbance

Traffic noise should not be inevitable: it is possible to reduce the volume of traffic by encouraging healthier forms of travel. Reducing speeds, and moving away from petrol and diesel powered trains and motor vehicles, also have the potential to reduce noise pollution.



## Reduction in green space

**Health impacts:** associated with reduced physical activity, reduced mental well-being, increased mortality

Across the UK there has been a historic and ongoing steady decline in green spaces, due to net deforestation and urbanisation.<sup>57</sup> At the same time there is a growing evidence base on the positive effect on mental health and well-being of living near and visiting green spaces.<sup>51,58,59</sup>



The rise in cars has led to increasing areas of our rural and urban landscape being concreted over, including the trend of paving over gardens to allow cars to be parked outside homes.<sup>60</sup> As well as reducing the space for nature to thrive, this impacts on the ability of urban areas to soak up rain and reduce flooding naturally.

A recent World Health Organisation (WHO) review of the health benefits of urban green spaces found multiple impacts,<sup>61</sup> including improved social interactions and social capital, positive effects on the immune system, enhanced physical activity and reduced obesity, reduced exposure to air pollution, noise buffering, improved cardiovascular health,

reduced prevalence of type 2 diabetes, improved cognitive functioning, and reduced mortality.

Green spaces are associated with improved social interactions, increased physical activity and cardiovascular health, and reduced mortality



## Exacerbating health inequalities

**Health impacts:** gap in life expectancy of around 11 years (Cardiff) and 8 years (Vale) between least and most deprived areas; pollution tends to be worse in more deprived areas; higher incidence and poorer outcomes across a wide range of health conditions

There are significant and persistent health inequalities in Cardiff and the Vale of Glamorgan. This is most clearly illustrated by the dramatic difference in life expectancy depending on where people live. A man living in one of our most deprived communities in Cardiff can expect to live 11 years fewer than someone in the least deprived areas. A similar gradient exists for women and for people in the Vale.

A man living in one of our most deprived communities in Cardiff can expect to live 11 years fewer than someone in the least deprived areas.

The rise in car use has exacerbated health inequalities. On the one hand, people in the least deprived communities are more likely to have a car than those in the most deprived areas. On the other, the impact of pollution (particularly NO<sub>2</sub>)<sup>62</sup> is felt more in deprived areas, which tend to be located closer to main highways, have a higher proportion of 'imported' traffic (from less deprived areas), and have a higher proportion of people with chronic illness which makes them more vulnerable to air pollution exposure.<sup>51,63</sup>

Carbon dioxide (CO<sub>2</sub>) emissions due to transport are significantly higher from the 10% least deprived households than the 10% most deprived, with the least deprived contributing to 17% of CO<sub>2</sub> emissions and the most deprived 2%.<sup>64</sup>

Road traffic injuries and deaths are also higher in more deprived areas. Children in more deprived wards are four times more likely to be hit by a car compared with the least deprived wards.<sup>51</sup> Fatal accidents on the road are also particularly high among children of unemployed parents.<sup>51</sup>

Children in more deprived wards are four times more likely to be hit by a car compared with the least deprived wards



good public transport networks. Young people, and older people who can't drive, are particularly affected.

UK public spending to support transportation is nearly four times higher for the richest 10% (who primarily use a car or the train) than for the most deprived 10% (who primarily use the bus).<sup>44</sup>

Access and visits to green space, often curtailed by highway expansion and an important contributor to physical activity, obesity and well-being levels, are also lower in more deprived areas.<sup>51</sup>

Thus there is a double-whammy on health inequalities: cars are owned and used more by the least deprived, but the negative consequences from car use impact most on the most deprived.

Cars are owned and used more by the least deprived, but adverse impacts are felt most by the most deprived

Car-dependent environments isolate people without a car, making it difficult for them to access employment and education opportunities, further exacerbating and embedding inequalities.<sup>65,66</sup> This is a particular issue in rural areas which are more reliant on



# How the planet is responding

## Climate change

**Health impacts:** mental health impacts of severe weather events; food insecurity; impact on community cohesion from mass migration

There is incontrovertible evidence from the international scientific community that climate change is taking place due to man-made emissions of greenhouse gases. Burning fossil fuels is a major contributor to these emissions, and nine in ten adults in Wales identify man-made emissions as contributing to global warming.<sup>47</sup>

If existing commitments made by countries around the world are all implemented, global warming of 2.7°C is currently predicted, but there is a real danger of warming exceeding this.<sup>67</sup> The 'business as usual' modelling scenario, which assumes emissions continue unabated, projects increases of more than 4°C above the pre-industrial temperature by 2100.<sup>68,69</sup> Regional variation across the globe means some parts of the northern hemisphere will experience temperature increases of over 10°C.



Global temperatures are expected to increase by 4°C by 2100 if current trends continue, with some areas experiencing 10°C increases

Global warming is not something we should welcome. Projections suggest there will be real impacts on people, communities and infrastructure around the globe within the next generation.



A rise in global temperatures will bring with it more frequent extreme weather events (such as heatwaves and flooding), food insecurity (as the traditional areas of the world which produce food suffer from drought and less fertile land), and the likelihood of mass migration over many years, from areas of the world which are no longer habitable. Rising sea levels will increase the likelihood of coastal flooding – particularly relevant in our area.<sup>68</sup> There are also less predictable impacts, such as the potential for infectious diseases to spread more easily.<sup>67</sup> The most recent UK Climate Change risk assessment also highlights substantial risks to UK wildlife and natural ecosystems.

Increased flood events will affect our communities and core infrastructure such as hospitals, health centres and transportation networks

Each of these impacts will be felt in the UK, ranging from increased flood events affecting our communities and our core infrastructure such as hospitals, health centres and transportation networks;<sup>53,67</sup> pressure on water availability during the summer; through to increased food prices, likely to have the largest

impact on the most deprived groups in society; and increased migratory flows which, if large or unmanaged, may impact adversely on community cohesion. In Wales, rainfall during the summer is predicted to fall by 20% by the 2080s, and rise by a similar amount in the already wet winter months.<sup>70</sup> Effects on transport networks, energy and digital infrastructure are also predicted.<sup>71</sup> Climate change also poses a threat to coastlines and tourism reliant on the natural environment.

Flood-related displacement of communities has been found in the UK to cause significant and enduring mental health issues.<sup>72</sup> Across Western Europe, there will also be an estimated increase in heat-related deaths of around 14,000 per year if there is no adaptation and climate change continues at the current rate.<sup>73</sup> The threat of climate change to human health is increasingly being recognised within the UK public health arena.<sup>68,74,75</sup>

Flood-related displacement of communities has been found in the UK to cause significant and enduring mental health issues.



The impacts of climate change will be felt most heavily in the southern hemisphere and poorer countries. Globally, between 2030 and 2050, climate change is projected to cause approximately 250,000 additional deaths per year, from malnutrition, malaria, diarrhoea and heat stress.<sup>76</sup>

Two thirds (67%) of adults in Wales are concerned about climate change,<sup>47</sup> and in a

recent 'national conversation' involving 70,000 people across Wales for the Well-being of Future Generations Act, climate change was rated as the single most important issue for people in Wales.<sup>77</sup>

## One quarter of domestic greenhouse gas emissions are due to car transport

One quarter (23%) of UK domestic greenhouse gas emissions were from car transport in 2014,<sup>64</sup> up from 15% in 1990.<sup>8</sup> In contrast, just 3% of household emissions are due to public transport. Car CO<sub>2</sub> emissions are highest in the 45-55 age band, and lowest among under 25s and over 65s. In our area, it is estimated that 5 tonnes of CO<sub>2</sub> are emitted per person in Cardiff, and 4.9 tonnes per person in the Vale.<sup>78</sup> These have both shown a progressive decline over the last 10 years.

The issue of greenhouse gas emissions from transport is far from solved: for each of the last two years in the UK, emissions from road transport have actually increased.<sup>79,80</sup> Reducing the burning of fossil fuels for transport would not only have a beneficial impact on the climate, but would have geopolitical and sustainability benefits too, reducing the UK's reliance on gas and oil imports.

Yet reducing car use is low in the public's mind when it comes to addressing climate change. In the National Survey for Wales, a large annual survey of households, almost everyone reported recycling waste as a means to protect the environment (97%), with a much smaller proportion, 1 in 4 (25%), reporting they have reduced the amount they travel by car.<sup>47</sup>

# We could do things differently

## What we need to do

A growing body of evidence describes the positive impacts on health and well-being across society which are possible if we increase our active travel rates, reduce air pollution, and prioritise designing well-connected and attractive urban and rural communities. Recent technological advances may also help with this.



### Support active travel and public transport

#### Reduce car use

In order to increase physical activity it is necessary to reduce use of the car.<sup>66</sup> Many of the journeys which are currently made by car in Cardiff and the Vale could be made by walking, cycling or public transport. Daytime journeys of less than 2km, which do not involve carrying bulky loads, should generally be walkable for individuals aged 5 to 74 without a disability.<sup>81</sup> When combined with public transport as part of an integrated transport system, active travel can also be a sustainable and healthy alternative to car-based travel for longer journeys.<sup>65</sup>



Daytime journeys of less than 2km should be walkable for individuals aged 5 to 74 without a disability

Over half of residents in Toronto (54%) and Copenhagen (63%) cycle regularly.<sup>5</sup> A similar proportion in Cardiff (56%) say they would like to ride a bike more, and three quarters (74%) think it would be better if there was more

cycling.<sup>5</sup> Furthermore, over half of Cardiff residents (57%) travel less than 5km to work.<sup>5</sup> 84% of residents in the Vale use a car once a week or more, compared to 7% who cycle weekly.<sup>6</sup>

Because lifestyles have developed around near-universal car use, alternatives to the car must provide a level of accessibility similar to the car to be widely adopted.<sup>66</sup> In Cardiff, use of the car for commuting is only one quarter of journeys, with a similar proportion due to each of leisure, shopping, and other purposes.<sup>5</sup>

NICE recommends the use of car-free days to raise awareness and interest in active travel,<sup>41</sup> and has published evidence-based guidance on increasing walking and cycling levels.<sup>82</sup>

'Designed to move: Active Cities' cites an extensive evidence base on the economic, well-being and environmental benefits of cities becoming more active.<sup>83</sup> Examples include significant increases in employment and visitors and community involvement; and falls in crime (74%), pollution and stress.

### Improve infrastructure to support active travel

Well-designed infrastructure to support active travel, as well as frequent, reliable public

transport which covers all major local destinations, are essential elements in increasing take up of these travel modes.<sup>51</sup> Eight in ten Cardiff residents think that safety for cycling needs to improve.<sup>5</sup>

Historically, investment in infrastructure for cars has dwarfed that of walking and cycling routes. The UK Faculty of Public Health has called for 10% of transport budgets to be committed to walking and cycling.<sup>84</sup> NICE found that off-road cycle routes were good value for money, with every £1 investment in off-road routes returning around £14 in benefits.<sup>41</sup> They advise that cycle routes should ideally be on quiet streets or segregated, in order to minimise exposure to air pollution. Investments in walking infrastructure return £37 for every £1 invested.<sup>85</sup>



NICE found that off-road cycle routes were good value for money, with every £1 investment in off-road routes returning around £14 in benefits



Road space should be progressively reallocated to active travel modes as their share of journeys increases;<sup>22,66</sup> this prevents car use

from increasing again as congestion starts to fall, and is also highly efficient, especially for a growing population: 12 bicycles can be stored in a single car parking space.<sup>86</sup> Road crossings should be modelled around pedestrians and follow their 'desire' lines.<sup>51</sup>

## 12 bicycles can be stored in a single car parking space

In designing environments to encourage active travel, evaluation of success may include the use of data from smartphone apps, for example cycle app data which can reveal changing patterns of local travel.<sup>87</sup>

### Box 2. Road design in Europe

The Netherlands adopted five principles of **sustainable safety** in 1992, to prevent severe crashes and reduce the severity of injuries when crashes do occur.<sup>88</sup> The principles include clearly defined road categorisations which separate road users according to speed and purpose, and segregating traffic where speed differences cannot be eliminated. Motorized vehicles are considered as 'guests' in residential areas, with pedestrians and cyclists prioritised.<sup>89</sup> Predictable road layout is encouraged, with a 'forgiving' environment should errors occur (e.g. 45° rather than 90° pavement edges to reduce the likelihood of a cyclist falling if they hit the kerb edge). Sustainable safety has been found to contribute to a significant reduction in fatalities.<sup>90</sup> **Filtered permeability** is another concept common in European transport planning, with pedestrians and cyclists given an advantage, in terms of speed and convenience, compared to motor traffic – for example, a two-way cycle route but one-way car traffic.<sup>84</sup>



## Support people to take up active travel at trigger points in their life

Suitable active travel infrastructure is necessary to enable a modal shift, although not sufficient in itself.<sup>91</sup> In addition to investing in infrastructure, for many people the trigger to take up active travel is a significant life event.<sup>92</sup> For example, starting a new job or moving to a new workplace location, becoming a parent, people recovering from ill health, and people retiring, have all been found to be triggers which make people more likely to review their travel options and switch to active travel. Raising the topic of active travel at these critical points is something which could be done systematically throughout the public sector locally, which will be involved in these events for many people.

For many people the trigger to take up active travel is a significant life event

## Provide high quality, flexible public transport

Public transport use is facilitated by affordable ticket prices, flexibility in stops, high quality travel information and regular services.<sup>22,93</sup> Modelling in Australia found that there was significant potential to increase the number of adults physically active by encouraging people to take public transport.<sup>94</sup> The study reviewed international evidence and found that on average around 15 minutes' walking time was associated with public transport use each day. Mixed mode travel, especially important in rural areas where combined active travel and public transport is the most pragmatic approach for many journeys, can be enabled by allowing easy transport of bicycles on buses and trains.<sup>93</sup> In Germany a controlled study

which gave free public transport tickets and a personal schedule to people who had recently moved house resulted in a doubling of public transport use (18% to 36%) and a decline in car use (53% to 39%).<sup>66</sup>

Public transport use is facilitated by affordable ticket prices, flexibility in stops, high quality travel information and regular services



Reduce air pollution and carbon emissions

National Institute for Health and Care Excellence (NICE) recently issued detailed guidance on improving air quality and health. Recommendations include supporting active travel, providing infrastructure for electric vehicle charging, introducing clean air zones, and bringing in 'no idling' bylaws outside schools (see Box).<sup>41</sup>

NICE recommends the introduction of Clean Air Zones which support low-emission travel

NICE found that clean air zones cost around £2 per head annually (based on Amsterdam costs), but deliver benefits which far exceed this, of around £29 benefit for every £1 spent.<sup>41</sup> Low emissions zones should ideally cover all motor traffic, including cars and vans, to be effective at improving air quality.<sup>26</sup>

No idling zones outside schools were estimated to have a return on investment of up to £44 for every £1 spent.<sup>41</sup>



Clean Air Zones deliver benefits worth £29 for every £1 spent

### Box 3. Selected recommendations from NICE guidelines on improving air quality.<sup>41</sup>

Support active travel. There should be a choice of cycle routes, including routes avoiding highly polluted roads

Support car sharing schemes and car clubs

Provide electric vehicle (EV) charging points in workplaces, commercial developments and residential areas

Consider introducing a clean air zone that introduces restrictions or charges on certain classes of vehicle, and supports zero- and low-emission travel (including active travel)

Where traffic congestion is contributing to poor air quality, consider incorporating a congestion charging zone within the clean air zone

Introduce bylaws to support 'no idling' areas where vulnerable groups congregate such as outside schools, hospitals and care homes

Specify emission standards for private hire and other licensed vehicles

Address emissions from public sector transport

Introduce 20mph zones without physical measures, to avoid unnecessary accelerations and decelerations which contribute to air pollution

Many of the NICE guidelines are echoed by a major joint Royal College report into air pollution,<sup>95</sup> which also recommends promoting safer 'school runs' which avoid using the car, encouraging employers to support alternatives to commuting by car, promoting leisure cycling, and monitoring and displaying air pollution around schools. They also recommend local authorities should publish serious incident alerts when levels exceed WHO and EU limits.<sup>40</sup> The report calls on the NHS to lead by example and set the benchmark for clean air and safe workplaces.



The NHS should set the benchmark for clean air and safe workplaces

While electric vehicles are preferable to petrol and diesel-fuelled vehicles in terms of air pollution, it is important to note that EVs still produce particulate matter, albeit at lower levels than diesel vehicles especially. Therefore strategies to improve air quality and health should still focus primarily on active travel and low emission public transport. Where vehicles are still required, EVs (and other ultra low emission technologies) should be prioritised over internal combustion engine (ICE) vehicles.

Shifting the model of car ownership to a shared or rental model would change the cost profile of driving; instead of a large up-front investment (buying a car) with individual journeys relatively cheap to make after that (thus encouraging them), the costs would be more evenly distributed. This would not only lower the barrier to use of car when required (e.g. carrying bulky goods) but also discourage use of the car when public transport or active travel may be as easy. This would also potentially be cost-saving for more deprived households, reducing inequalities.<sup>66</sup>

Case studies demonstrating systematic approaches to improving air quality are available on Defra's website,<sup>96</sup> and guidance to local areas in Wales from Welsh Government and Public Health Wales is due shortly.

## Design well-connected and attractive communities

Street layout and proximity to other routes has been found to relate to active travel behaviour, with more active travel and less car use in more 'integrated' streets (those linking better to other streets).<sup>97,98</sup> Streets with lower traffic volumes have also been found to have stronger social networks between neighbours,<sup>49</sup> reducing social isolation.

Walking is encouraged by safe, traffic free walking routes and large public open spaces.<sup>51</sup> A UK survey on walkability in large cities found Cardiff had a lower score for accessing green spaces (50%) compared with the UK mean (54%), but did score well for safety of walking.<sup>99</sup> The Faculty of Public Health suggests transport and land use proposals with a negative impact on walking and cycling should routinely be rejected, and towns and cities should be 'people friendly' rather than car-friendly.<sup>84</sup> Higher density development should be encouraged near public transport hubs,<sup>22</sup> and commercial developments should have zero car parking except for blue-badge users.<sup>22</sup>

Reducing traffic speed with 20mph limits make streets more inviting for walking, socialising and cycling. Published modelling for Wales has estimated that if all 30mph roads were reduced to 20mph in Wales, between 1,200-2,000 casualties would be avoided each year, along with a net reduction in deaths and years of life

lost due to air pollution.<sup>100</sup> The Faculty of Public Health has called for 20mph limits to be the norm for residential streets, with higher limits only on strategic traffic routes.<sup>84</sup>

### Reducing traffic speed with 20mph limits make streets more inviting for walking, socialising and cycling

People who walk and cycle in a neighbourhood are more likely to spend money in local shops than people in cars who are more likely to drive through.<sup>51,65</sup> Retail sales have been found to increase by around 30% where walking and cycling projects have been undertaken.<sup>101</sup> It is therefore important to engage with local business communities to raise awareness of the financial benefits associated with prioritising walkability, active travel and public transport access.<sup>93</sup>



### People who walk and cycle in a neighbourhood are more likely to spend money in local shops

Tools to help people moving to an area identify neighbourhoods which are more walkable are becoming available, such as Walk Score in the US.<sup>102</sup> A newly devised walkability score for London was tested against walking behaviour in a large cohort study, and found that people in more walkable areas were – unsurprisingly – more likely to walk.<sup>103</sup> Understanding the key characteristics of walkable neighbourhoods and incorporating these into future developments and works is therefore important in improving physical activity.

In some areas of the UK residents are working with local authorities to allow children to safely play in the streets outside their houses, by temporarily closing the street.<sup>104</sup> Many examples are in England, but there have also been recent examples in Cardiff (see Good practice locally, below) which have been well received and demonstrate this approach can work in a local context.

## Protect and enhance our green space

Ensuring everyone has access to good quality open and green spaces is a key recommendation of the Marmot report on spatial planning and health inequalities.<sup>51</sup> Green space encourages physical activity and play, and should be accessible for those walking, cycling and using public transport, and have sufficient cycle parking.<sup>51</sup> In a rural context, outdoor recreation and activities are a key driver of the economy.<sup>53</sup>

Trees naturally absorb air pollution and improve air quality,<sup>60</sup> reducing particulate matter by up to a quarter (24%) in their vicinity.<sup>105</sup> Furthermore, trees sequester carbon (mitigating climate change), reduce summer air temperatures by 0.5 to 2.0°C (for example during heatwaves), and reduce noise pollution.<sup>105</sup>

## Provide leadership

Senior, visible leadership and role-modelling on these issues is essential, in order to raise awareness and knowledge and build a broad consensus on action required. Engagement with local residents and organisations is a key part of this.<sup>65</sup> Active travel should be prioritised

in urban planning and infrastructure development.<sup>65</sup>

A passionate call has been made in the British Medical Journal (BMJ) for healthcare professionals to lead by example on this, reducing their own car use and providing leadership to help others do so.<sup>106</sup>

Moves such as the introduction of the London congestion charge, which resulted in an 80% increase in cycling in central London since its inception in 2000,<sup>84</sup> and the UK government's timetable for phasing out fossil-fuelled cars by 2040,<sup>28</sup> have both reset expectations of what is possible, and the terms of public debate around travel and transport.

This is important: we are currently working from a 'norm' of routine petrol and diesel car use and this will only shift if leadership continues to be shown in this area.



The London congestion charge resulted in an 80% increase in cycling

## Recent technological progress

The evidence of how we could make positive changes is supported by, and in some cases being overtaken by, significant progress in a number of different technologies over the last decade.

Being able to understand and respond to disruptive technologies will be an essential part of future strategy.



## Bicycles

### Dockless bike hire

Bike hire schemes have been around for a long time, and have increased in popularity and visibility in the last decade with schemes such as 'Boris bikes' in London. However, the cost to set up such schemes are high, and they rely on people finding docks near the start and end of their journey.

More recently 'dockless' bike schemes have started to appear, firstly in South East Asia and now in Europe.<sup>107,108</sup> These schemes do not require docks, with users finding the nearest available bicycle through a smartphone app, and leaving the bike at any convenient location near their destination. The schemes are run directly by the bicycle hire company, with no investment required by the host city. While promising increased convenience for residents with no startup cost for the city, there have been concerns voiced by city authorities, principally where large numbers of bicycles have been discarded or left in inappropriate locations. Working with scheme operators to agree an approach which benefits local residents and addresses concerns would be a win-win for local authorities and the private firms.

**Bicycle sharing schemes including bike hire and pooled bicycles increase the availability of bicycles**

More broadly, other bicycle schemes such as pooled bicycles at workplaces, peer-to-peer sharing of bicycles, and workplace bicycle purchase schemes also offer ways to increase the availability of bicycles.<sup>109</sup>

### E-bikes

One of the barriers for people taking up cycling, especially in more rural areas where journeys may be longer and hilly, is the physical effort required to cycle. E-bikes offer power assisted cycling with power provided by a rechargeable battery integrated into the bike. Pedalling is still required to move the bicycle, but the motor assists when there is significant resistance such as a hill.

E-bike technology is improving and coming down in price rapidly, and is a price-competitive option for personal ownership, bicycle hire or shared bike schemes.

### Car pooling and sharing

Car pooling, where individuals use a shared car (e.g. operated at their workplace, or with other residents in a local area), aims to reduce the number of journeys made by car while maintaining access when required. For example, if staff in an office need to make house visits or journeys for meetings during the day by car, a car pool would enable them to commute to work by public transport, then use a pooled car when required during the day.

Pool car systems can be locally organised, or large providers including some car hire firms offer this service. Prioritising parking for pooled cars encourages their use. Smartphones have enabled car pool systems to be used in residential areas, with residents locating the nearest pool car through an app when they make a journey for which they need a car.

Car sharing schemes aim to put co-workers in touch who live near each other, to help them save fuel and reduce emissions by sharing journeys on the same route.<sup>22</sup>

## Real-time pollution monitoring

Technology to monitor pollution is becoming cheaper and more portable. A personal monitoring device is already available which costs less than £50, CleanSpace.<sup>110</sup> An accompanying app tracks your exposure to carbon monoxide during your daily journeys (a measure of vehicle exhaust exposure), presenting you with a summary of your journey on a map. This allows people travelling by foot or bicycle to avoid particularly polluted areas for future journeys.

Although delayed in its development and implementation, a system is due to start imminently in Swansea (Nowcaster) which will monitor air quality and divert drivers via electronic signs when pollution is above a certain level.<sup>111</sup>



## Ultra low emissions vehicles

### Cars

Reducing emissions from vehicles is important to improve air quality and reduce harmful greenhouse gas production.

The most developed ultra low emission technology currently available is the battery electric vehicle (EV), with charging infrastructure and vehicle ranges improving rapidly. The car industry is undergoing rapid change, with the number of manufacturers launching pure EVs rapidly increasing, and Volvo recently committing to all new models being hybrid or pure electric from 2019.<sup>112</sup>

## The car industry is undergoing rapid change, with the number of manufacturers launching pure EVs rapidly increasing

To further stimulate a transition to EVs, the rollout of charging facilities needs to continue, and particularly address charging where off-road parking isn't available. For example, there are now trials in London and elsewhere in the UK of EV charging from streetlamps.<sup>113</sup> For transitional uses where current driving range and charging infrastructure is insufficient, plug-in hybrid models offer significantly lower emissions and fuel consumption than pure ICE vehicles.

### Did you know...?

Electric vehicles aren't new. The first production electric vehicle was built in 1884, over 20 years before the Ford Model T started production in 1908

A number of cities across the UK are now incentivising or mandating taxis to be plug-in hybrids or pure electric vehicles, including London where all new taxis presented for licensing from 1 January 2018 will need to be able to travel at least 30 miles with zero emissions.<sup>114</sup> A UK Government plug-in taxi grant has also been introduced to incentivise electric taxis, and taxi charging infrastructure is being subsidised in 10 cities.<sup>115</sup> Fleet-owned vehicles are another opportunity for



introducing ultra low emission vehicles. A number of NHS organisations in the UK including acute trusts and ambulance services have already started introducing electric vehicles to their fleets,<sup>116,117</sup> and Royal Mail has started trialling electric delivery vans.<sup>118</sup>

#### Box 4. Moving to cleaner energy sources

Switching to zero emissions vehicles is an important contribution to reducing local air pollution. Electric vehicles are inherently 3-5 times more efficient in their use of energy than internal combustion engine (ICE) vehicles.<sup>120</sup> However, to reduce wider air pollution and carbon emissions, it is important that the transition to EVs is accompanied by the continuing decarbonisation of the UK electricity grid, through increasing use of renewable energy sources.<sup>53,95</sup>

There is an opportunity to marry some new demands for energy with generation at the point of use, such as through solar car parks,<sup>121</sup> or e-bike charging stations. Wales is currently generating around 9,000 gigawatt hours of energy from renewable resources, with this figure rising.<sup>60</sup>



### A number of cities across the UK are now incentivising or mandating new taxis to be electric

While EVs certainly help in reducing local air pollution, they do not eliminate it altogether (due to particulates produced from tyre wear), and do nothing to improve physical activity rates, so measures to move people to active travel and public transport are still essential.<sup>119</sup>

#### Buses

Buses are a major source of pollution, particularly older diesel vehicles. Newer technology (such as Euro VI diesels) have much lower NOx emissions than previous generations of engines. Cardiff Bus has recently purchased ten Euro VI models.<sup>122</sup> Bus fleets elsewhere in the UK have also introduced hybrid, plug-in hybrid and full electric buses into their fleets.<sup>32</sup> While converting an entire fleet may be expensive, this could be done over time, with the busiest routes converted first; and with costs of conversion being directly subsidised by levies on polluting vehicles.

Retrofit technology for buses has been taken up extensively across the UK, with around 3,000 older diesel buses retrofitted with selective catalytic reduction (SCR) to reduce NOx emissions by over 90%, reductions which have been confirmed in real-life testing by Transport for London (TfL).<sup>32</sup> TfL alone have retrofitted over 2,100 buses with SCR.

### Retrofitting buses can reduce NOx emissions by 90%

Another option in some cases would be to replace bus routes served by polluting buses with electrified light rail services.

## Box 5. Cardiff Capital Region Metro proposals

A £1.2bn City Deal was agreed in March 2016 covering ten South East Wales local authorities, including a substantial investment in a Cardiff Capital Region Metro integrated public transport system. The details of the Metro are still being worked through, but the proposal includes electrified rail; integrated transport hubs; park and ride facilities; light rail and/or bus rapid transit routes; better integration across modes and operators; and active travel interventions.<sup>123</sup> The City Deal also included a commitment to electrification of the Valley Lines rail network by 2023.<sup>5</sup>

### Trains

Diesel trains are also responsible for high levels of pollutants. Electrification of lines will reduce the use of diesel locomotives, but can be very expensive to roll out. This is planned already for the main line to Cardiff,<sup>124</sup> although a previous policy to extend electrification further west has recently been cancelled. Trials have suggested that battery-operated locomotives may be able to provide a solution for areas where electrification is too costly.<sup>31</sup>

### Home working and remote meeting technology

A further alternative to car-based travel to work or during work time is avoiding travel altogether by making use of remote technologies. This includes home working but also a reduction in travelling during work hours by substituting face-to-face meetings with teleconferences or videoconferences.

While homeworking and remote meetings are only suitable for some roles, some of the time,

they are nonetheless important options as part of an overall solution. Homeworking one day a week, for example, is likely to reduce transported-related air pollution and carbon emissions for an employee by one fifth.

### Using data to analyse gaps in public transport

There is now a huge amount of anonymised data collected at a population level on people's movements, using information from smartphones. This data can be used to improve public transport. The makers of a popular transport app, CityMapper, used data in London to identify gaps in existing routes and have now set up a night bus route to meet this need.<sup>125</sup>

### Technology on the horizon

#### Improvements in electric vehicle technology

The range and affordability of electric vehicles is increasing rapidly, with most major manufacturers now planning to release EVs within the next 1-2 years. Prices of EVs are expected to fall progressively.

Increases in EV uptake rates will require the introduction of smart charging technology to avoid overloading the electricity grid, for example by scheduling charging at various points overnight to even out demand.

Technology to allow on-the-go charging of vehicles ('dynamic charging') through the road surface, is already being trialled in South Korea and the US.<sup>126</sup> This has the potential to allow public transport vehicles to stay in service while charging.



## Autonomous and connected vehicles

While some vehicles already available connect to the internet, the scope and nature of this connectivity has the potential to evolve further over the coming years, with cars communicating with traffic lights or other cars, to better understand local traffic conditions, pollution levels, and to avoid collisions.<sup>127</sup>

Self-driving cars are on the verge of becoming a reality due to improvements in sensors and advances in artificial intelligence. Cars are already on the market which can brake by themselves to avoid collisions, park themselves, and drive autonomously on motorways. Major manufacturers plan to have almost fully autonomous cars on the road within the next 4 years.<sup>128</sup> Autonomous freight vehicles are also planned.

## Major manufacturers plan to have high automation cars on the road in the next 4 years

The potential impact of autonomous or driverless vehicles within the next 10-15 years is noted in the Welsh Government Future Trends report.<sup>71</sup>

Within the context of an integrated transport system, perhaps the biggest potential for autonomous vehicles is a role in 'mobility as a service'. This would see autonomous vehicles running a fixed route, or being summoned on demand (essentially a driverless taxi), and could help plug holes in public transport coverage. Driverless pods have been used at London Heathrow airport for over 5 years now, and are now being trialled in Greenwich.<sup>129</sup> Car-sharing technology firms such as Uber, which are already having a disruptive impact on the transport sector, are also trialling autonomous technology.<sup>130</sup>

As the technology matures, autonomous vehicles have the potential to have a broad range of impacts, from improvements in road safety, to reducing personal car ownership, and impacts on jobs in the transport industry.



## How health and well-being could improve

Encouraging walking and cycling, and reducing air pollution, should result in significant improvements in cardiovascular health, rates of diabetes, overweight and obesity, falls, cancer and mental health, as well as overall increases in life expectancy.

For example, increases in physical activity result in a reduction in the overall death rate by up to 30%, a 20% to 35% lower risk of cardiovascular disease and stroke, a 30% to 40% reduction in type 2 diabetes, a 30% lower risk of falling among older adults, a 30% lower risk of colon cancer and 20% lower risk of breast cancer, and a 20-30% lower risk of depression and dementia among adults.<sup>93,131-133</sup>

Other benefits include reductions in low birth weight babies, reduced staff sickness absence and improved productivity, and increased time children spend playing outdoors.



# The time is right for change

A number of opportunities exist through legislation, national and local policy, and a gradually changing culture around the use of cars, which make now the time to act. This chapter describes the main opportunities we need to seize.

Bringing about cultural change in our communities and large organisations will not take place overnight. Using existing tried and tested approaches to change such as continuous improvement methodology, and making the most of the opportunities posed by disruptive technologies, will need to be fundamental to our approach.

## Legislation

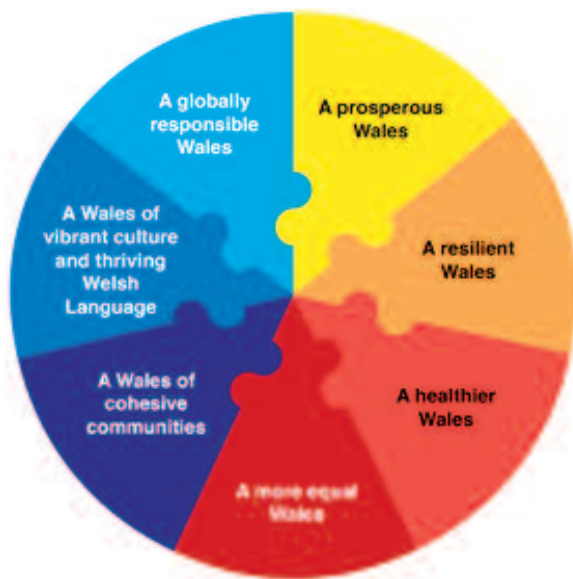
### National

Four key pieces of legislation have recently been passed in Wales which pertain to improving health, well-being and environmental sustainability (see Box 6).

#### Box 6. Recent Welsh legislation relevant to sustainable travel, health and well-being

Well-being of Future Generations (WFG) (Wales) Act 2015 <sup>134</sup>	Introduces duties on public sector organisations in Wales to take into account future generations when planning services and making decisions
Active Travel (Wales) Act 2013 <sup>135</sup>	Makes it a legal requirement for local authorities in Wales to map and plan for suitable routes for active travel, and to build and improve their infrastructure for walking and cycling every year.
Environment (Wales) Act 2016 <sup>136</sup>	Places a duty on Welsh Ministers to ensure that the net Welsh emissions account in 2050 is at least 80% lower than the baseline. <sup>a55</sup>
Public Health (Wales) Act 2017 <sup>137</sup>	Introduces a duty to carry out Health Impact Assessments

**Figure 5. Well-being goals established under the Well-being of Future Generations Act**



The WFG Act set up public services boards (PSBs) in each local authority area with a duty for members to act together and individually to meet challenges in the area identified through a well-being assessment. The WFG Act, and its implementation presents a significant opportunity in addressing the issues highlighted in this report.

The Future Generations Commissioner (FGC) role is to act as an advocate for future generations and guide implementation of the WFG Act. Of the top seven priorities listed by the Commissioner in office, five are directly related to the issues discussed here: City Region Deals, integrated transport systems including South Wales Metro, prevention, early years, and climate change.<sup>138</sup> Separately, the FGC has reiterated the requirement for urgent action on climate change.<sup>139,140</sup>

## International

Internationally, the UK is a signatory to the 2015 Paris Agreement on climate change. This legally binding agreement commits the UK to take significant steps to reduce greenhouse gas emissions to restrict global warming to less than 2°C, with an aim of 1.5°C maximum warming.<sup>141</sup> For the UK to meet its obligations under the Paris Agreement a significant reduction in emissions from road transport will be required.

## Strategy and policy

There are a number of strategies and policies relevant to the issues described here. International and national strategies are listed in Box 7, and local strategies in Box 8. A description and reference for each is given in the Appendix.

In addition to the local strategies shown, each public sector organisation has an active travel strategy; and an air quality strategy is currently being developed for Cardiff.

### Box 7. Key international and national strategy and policy

UK plan for tackling roadside nitrogen dioxide concentrations
Real Driving Emissions (RDE) regulations
Office for Low Emission Vehicles (OLEV) grants
Town & Country Planning Association (TCPA) guidance: Planning for better health and well-being in Wales
Royal Town Planning Institute (RTPI) policy
Local air quality management (LAQM) Wales guidance 2017
Manual for Streets
UN Convention on the Rights of the Child (UNCRC) and Rights of Children and Young Persons (Wales) Measure 2011
Public Health Wales (PHW) Well-being Objectives
Future Generations Commissioner for Wales – Draft strategic plan 2017-23

### Box 8. Key local and regional strategy

Public Services Boards – Well-being objectives and plans
Regional Partnership Board – Area plan (in development)
Local Development Plans (LDPs)
Local Transport Plans (LTPs)
Shaping our Future Well-being
Cardiff Transport Strategy
Cardiff Cycling Strategy
City Region Deal

## Culture change

The green shoots of a shift away from cars are starting to be seen. Residents in our area are keen to cycle more, take more physical activity, and want to see improvements in public transport.

Driving a car has become less popular among young people over the last few years, partly as a result of large increases in insurance costs, as well as the availability of ride-sharing apps such as Uber.<sup>8</sup> There has also been an increase in shoppers visiting high streets rather than out of town sites in Wales.<sup>142</sup>

### Driving a car has become less popular among young people

While the car used to be an essential means to keep in touch with friends and relatives, the recent explosion in the use of social media, video calls and instant messaging, has made many of these journeys unnecessary.

Public transport accessibility for people with mobility difficulties has increased significantly over the last 10 years, with nearly all (94%) of buses now accessible in England, up 65% since 2005.<sup>8</sup> (comparative figures for Wales are not available).

Although petrol and diesel cars still dominate sales, ultra low emission vehicle sales are rising rapidly in our area, from below 20 vehicles sold in Cardiff and Vale each quarter three years ago, to over 300 now.<sup>143</sup>

## Good practice locally

There are already some fantastic examples of projects which are paving the way for a brighter future in our area.

### Cardiff and Vale University Health Board

There are a number of examples of good practice across the Health Board, including a new Park and Ride scheme for the Heath site (see Box 9); development of the Orchard at University Hospital Llandough, to encourage physical activity in a nearby green space; a bicycle purchase scheme; the establishment of a 'Park and Stride' scheme at Severn Road Primary School in North Cardiff, to reduce car emissions and hazards outside school gates; plans for an integrated bus hub at the UHW site, working with the local authorities; including ease of access by public transport and active travel in decisions around developing new health and well-being centres across the area; and the establishment of a group to review air quality data for schools to help promote active travel.

#### Box 9. Park and ride service for University Hospital of Wales

### Park and Ride Service for UHW



A new Park and Ride bus service has been introduced for the University Hospital of Wales, in conjunction with Cardiff Bus and the City of Cardiff Council. The regular bus service reduces traffic-related congestion and emissions on-site, helping to make the environment more conducive over time for active travel and pedestrians. Using the Park and Ride is cheaper for staff and visitors than parking on site.

## Vale of Glamorgan Council

Vale of Glamorgan Council are keen to see their staff travel sustainably (see Box 10). The Greenlinks scheme in the Vale is a form of on-demand transport, enabling people without regular access to a car to make ad hoc journeys which are not served by the public transport network.<sup>144</sup>

### Box 10. Helping staff travel sustainably

Vale of Glamorgan Council are taking the lead in encouraging their staff to travel sustainably. Their approach includes provision of pool bikes to get between nearby offices; pool cars; and a travel expenses policy which encourages short journeys to be made actively.



## City of Cardiff Council

In addition to the ambitious Cardiff Transport Strategy,<sup>5</sup> there are a number of projects encouraging people to ditch their cars in Cardiff. These include street play (see Box 11); a programme to encourage active travel among staff who work at County Hall; Cardiff shared car scheme; and the ongoing development of a local air quality strategy.

### Box 11. Encouraging street play

Ely and Whitchurch in Cardiff saw streets closed on 2 August 2017 to allow safe play for children in a residential area. The events, organised by Play Wales and following the 'Playing Out' model, with the support of the City of Cardiff Council, are hoped to be the first of many such examples, allowing children to get outdoors and get active, reducing screen time and increasing physical activity. Children were encouraged to come together to play on the street along with their families and bring their scooters, footballs, chalk and skipping ropes.

Cardiff resident and mother of two, Toni Morgan said 'I wanted to kick start the project in my street as I was aware of the many families living in the street, however I had never actually encountered any children at any time playing outside in the three years of living here.'

## Other examples



Public Health Wales Environmental Health is working closely with public health teams and councils across Wales to foster closer collaboration between local specialists to improve local air quality, and has played a key role in raising the profile and awareness of air pollution as a health issue in Wales. Information on air pollution for primary and secondary schools in Wales is being developed,<sup>145</sup> based on experiences in Scotland and Northern Ireland.



# Seizing the day: a vision for Cardiff and the Vale

What future do we want for ourselves and our communities? A vision is presented here around five key themes, showing what we could achieve in Cardiff and Vale.

 <p>Active travel is the default for short journeys</p>	Built infrastructure consistently enables and promotes walking and cycling as the default for short journeys
	Residents including schoolchildren routinely travel by active means for short journeys
	Active travel is routinely raised and promoted at key life points for residents and staff in Cardiff and Vale
	Employers positively encourage active travel, recognising benefits in staff well-being, sickness absence, and productivity
	Infrastructure developments for active and sustainable travel are funded through ring-fenced charges on polluting transport
	Local businesses support active travel by customers
	There are one or more annual car-free days co-ordinated across Cardiff city centre and Vale towns
	Some journeys for work are avoided by using remote technologies
 <p>There is a well used, fully integrated transport system</p>	There is a comprehensive public transport system with timetables and ticketing integrated across travel modes
	Residents routinely travel by public transport (and/or active travel) for journeys over 2km within the region
	There is a steady decline in private car use for commuting and leisure
 <p>Well connected, active and social communities</p>	20mph town and city-wide speed limits are introduced throughout the region
	The planning system and people moving into the area recognise the importance of walkability of residential and mixed use areas
	Children regularly play safely in residential streets
	Green space (including trees) is protected and enhanced, with good access to areas by active travel and public transport
	Communities are more cohesive, with increased social networks on streets
	Improvements in active travel and air pollution are seen first in our most deprived communities
	There is an ongoing re-vitalisation of local high streets for shopping and leisure, with these locations chosen by local shops and national chains in preference to 'out of town' areas

 <b>Transport emissions are significantly reduced</b>	Low emission buses, trains, taxis and public sector fleets
	There are one or more low emission zone(s) in Cardiff
	There is a comprehensive charging infrastructure for electric vehicles
	Public awareness of local air pollution is high
	'No idling' zones are introduced around all schools and health facilities in Cardiff and Vale
	Local planning principles include expectations around reducing private vehicle use and ownership, and promoting ultra low emission vehicles
	Decarbonising transport is accompanied by an increase in locally generated renewable energy
 <b>Cardiff and Vale are leaders in this field</b>	Cardiff and Vale is recognised as an exemplar for active travel and reducing car use within the UK and internationally

This is a summary of a more detailed vision which has been prepared for this report.

## The potential impact...

The impact of achieving our vision	What this could mean for us...
Reduced illness and deaths from cancer	30% lower risk of colon cancer & 20% lower risk of breast cancer
Reduced illness and deaths from cardiovascular disease and stroke	20-35% fewer cases
Reduced rates of overweight and obesity	Decrease in BMI of 0.3-0.45kg/m <sup>2</sup>
Reduced type 2 diabetes	30-40% fewer cases
Improved mental well-being	20-30% lower risk of depression and dementia
Reduced rates of falls among older adults	30% less risk
Reduced sickness absence	46% reduction if people cycle to work
Improved employee productivity	15% increase in concentration, reductions in stress
Increased retail sales	30% increase in retail sales
Other benefits...	Reduced inequality in life expectancy between most and least deprived areas
	More cohesive communities and reduced loneliness
	Reduced air pollution and lower carbon emissions contributing to global warming
	Reduce demand for health and social care services



# Everyone playing their part: what we need to do together

We have set out a bold vision of the future locally. This vision is entirely achievable; indeed many aspects of it are already a reality in cities such as Amsterdam; and other European cities including Hamburg and Madrid have set out plans to drastically reduce the number of cars in them in the next 20 years.<sup>149</sup>

To make a significant and sustained improvement in our health and well-being we need to take decisive action now and over the next 5-10 years. Doing so will mark out Cardiff and the Vale of Glamorgan as leaders in this field in Wales and across the UK. The public sector has a vital role to play in leading and modelling behaviours.

Throughout the chapters we have suggested many actions which will make a lasting difference in improving health, by making active and healthy travel the norm in our communities. The most important and achievable actions are highlighted below.

Who	What should be done
City of Cardiff Council and Vale of Glamorgan Council	<p><b>(a) Accelerate improvements to infrastructure to support active travel and low emission transport</b></p> <ul style="list-style-type: none"> <li>• continue improvements and ongoing development of dedicated walking and cycling infrastructure, prioritising deprived areas first</li> <li>• provide access to local green spaces by active travel</li> <li>• maximise opportunities presented by Metro programme, including in rural areas</li> <li>• introduce bike hire schemes (including e-bikes)</li> <li>• consider widespread introduction of 20mph zones</li> <li>• increase electric vehicle charging infrastructure, particularly for areas without off-street parking</li> <li>• reject planning proposals which have an adverse impact on walking or cycling</li> <li>• support local renewable energy generation</li> </ul> <p><b>b) Support staff to choose active travel</b></p> <ul style="list-style-type: none"> <li>• encourage all staff to travel actively, to reduce sickness absence and increase productivity</li> <li>• visible senior leadership and role-modelling</li> <li>• assess opportunities at times of workplace moves</li> <li>• support employees preparing for retirement</li> </ul>

	<p><b>(c) Engage with the local community and businesses on the benefits of active travel</b></p> <ul style="list-style-type: none"> <li>• agree consistent communication across local public sector</li> <li>• emphasise increased customer spend in walkable areas</li> <li>• organise and promote co-ordinated car free days across the region</li> </ul> <p><b>(d) Discourage unhealthy and polluting travel</b></p> <ul style="list-style-type: none"> <li>• introduce 'no idling' zones outside all schools</li> <li>• consider gradual increases in public car parking charges to fund and accelerate improvements in active travel facilities and public transport</li> <li>• scope the introduction of a low emission zone in Cardiff, with any charges levied used to fund active travel and public transport improvements</li> <li>• introduce low emission pool cars for major sites where they are not already in place</li> </ul>
Cardiff and Vale UHB	<p><b>(a) Accelerate improvements to infrastructure to support active travel and low emission transport</b></p> <ul style="list-style-type: none"> <li>• work closely with local authorities to maximise opportunities for active travel to current and future sites, including links with new strategic cycle routes</li> <li>• introduce electric vehicle charging infrastructure</li> <li>• introduce pool bikes on UHW campus, and further improve off-road cycle routes through UHW site</li> </ul> <p><b>b) Support staff and students to choose active travel</b></p> <ul style="list-style-type: none"> <li>• visible senior leadership and role-modelling</li> <li>• encourage all staff to travel actively, to reduce sickness absence and increase productivity</li> <li>• assess opportunities at times of workplace moves</li> <li>• encourage healthcare students to travel sustainably, as future health leaders</li> <li>• support employees preparing for retirement</li> </ul> <p><b>(c) Engage with our local communities on the benefits of active travel</b></p> <ul style="list-style-type: none"> <li>• increase communications encouraging visitors to sites to use active travel and public transport</li> <li>• agree consistent communication across local public sector</li> <li>• promote and participate in co-ordinated car free days across the region</li> <li>• additional messages at key transitions, including new parents</li> </ul>

	<p><b>(d) Discourage unhealthy and polluting travel</b></p> <ul style="list-style-type: none"> <li>• introduce low emission pool cars for major sites</li> <li>• scope introduction of ultra low emission vehicles to fleet</li> <li>• review prices of staff car parking at congested sites. Changes in charging could directly fund improvements in active travel facilities and public transport</li> </ul>
Cardiff and Vale Local Public Health team	<p><b>(a) Prioritise promoting healthy travel in the public health work plan</b></p> <ul style="list-style-type: none"> <li>• identify promotion of active travel and addressing air pollution as cross-cutting themes in workplan</li> <li>• include active travel and air pollution references and actions in Making Every Contact Count</li> <li>• agree suitable performance indicators to measure progress and impact</li> </ul> <p><b>(b) Work with partners to promote healthy travel</b></p> <ul style="list-style-type: none"> <li>• work with PHW Environmental Health to produce local geographic maps of air pollution exposure, including exposure at schools and health sites</li> <li>• take action in response to forthcoming guidance from Welsh Government and PHW on addressing local air quality</li> <li>• work with Cardiff and Vale Healthy Schools Schemes to review air pollution levels around schools, to engage in conversations with staff and parents around active travel and impact of bringing cars to school gates</li> <li>• consolidate and strengthen links between Local Public Health team and local authority planning and transport departments, including in developing LDPs and the Health Board IMTP, to support action on active travel and air pollution</li> </ul> <p><b>(c) Engage with our local communities and businesses on the benefits of active travel</b></p> <ul style="list-style-type: none"> <li>• engage with Employers' Network</li> <li>• support the development and promotion of co-ordinated car-free days across our region</li> </ul>
Public Services Boards	<p>Identify actions relating to active travel and air pollution which would benefit from a co-ordinated approach across the partnership, e.g. active travel support for staff, car-free days, joint procurement of low emission vehicles</p> <p>Agree key public messaging across the public sector in Cardiff and the Vale on the rationale and health benefits associated with increased active travel, reducing car use, and low emission transport</p>

	Provide visible senior leadership and role modelling at a PSB and organisational level to promote active travel
Current and future bus and train operators in Cardiff and the Vale	<ul style="list-style-type: none"> <li>• Provide clean, frequent and reliable services across the network</li> <li>• Transition to low emission buses / electric trains</li> <li>• Provide routine space for carrying bicycles on buses/trains, including key routes at busy times and in rural areas</li> <li>• Support the introduction of integrated ticketing across travel modes</li> <li>• Make data available to support real-time travel information</li> </ul>
Public Health Wales (national)	<p>Support local campaigns to increase active travel and reduce air pollution through</p> <ul style="list-style-type: none"> <li>• standard promotion materials</li> <li>• support to produce local air pollution profiles with map of area highlighting schools and health facilities</li> <li>• continuing national leadership on active travel and air pollution as health issues</li> </ul>
Welsh Government	<p><b>(a) Consider policy changes to support healthy travel</b></p> <ul style="list-style-type: none"> <li>• make it easier for residents and local authorities to make temporary street closures to encourage children's outdoor play</li> <li>• prohibit secondary schools from offering car parking places for pupils who live within 2km of the school, except if they are disabled</li> <li>• consider allowing Local Health Boards to introduce proportionate parking fees for staff where alternative modes of transport are available, in order to incentivise appropriate active travel and public transport use</li> <li>• review NHS travel expenses policies to ensure they promote active travel where appropriate, for example by not routinely reimbursing for distances &lt;2km</li> </ul> <p><b>(b) Consider further legislative changes to support healthy travel</b></p> <ul style="list-style-type: none"> <li>• introduce legal requirements for public transport operators to participate in region-wide integrated ticket programmes</li> <li>• introduce legal requirements for large public sector organisations to have sufficient cycle parking spaces (e.g. a minimum specified ratio of spaces per employee)</li> </ul> <p><b>(c) Engage with citizens across Wales to encourage healthy travel</b></p> <ul style="list-style-type: none"> <li>• undertake a national communications campaign to improve the image of active travel</li> </ul>

# Appendix

## Summary of relevant strategies and policies

### International and national strategies and policies

UK plan for tackling roadside nitrogen dioxide concentrations <sup>28</sup>	Defra and DfT plan to reduce NO <sub>2</sub> emissions. Includes proposal for a Clean Air Zone framework for Wales, suggesting Cardiff may be one of the first areas to implement, by 2021; also guidance to be issued to Directors of Public Health and Local Authorities to support delivery of LAQM plans; and schemes to encourage bus retrofitting and electric taxis. Also commits that UK Government will 'end the sale of all new conventional petrol and diesel cars and vans by 2040'
Real Driving Emissions (RDE) regulations	Requirement for vehicle manufacturers to ensure real world NO <sub>x</sub> emissions are controlled across a range of driving conditions, from September 2017. <sup>28</sup>
Office for Low Emission Vehicles (OLEV) grants	Grants available from UK Government for local authorities to support on-street charging, <sup>150</sup> and for employers, including the public sector, to support workplace charging <sup>151</sup> for staff and fleet vehicles
Town & Country Planning Association (TCPA) guidance: Planning for better health and well-being in Wales <sup>98</sup>	This guidance was developed in conjunction with Public Health Wales and the Wales Health Impact Assessment Support Unit. It sets out opportunities for public health to work with planning, for each to positively influence the others' work programme using their area of expertise. <sup>98</sup> It also recommends using the Director of Public Health Annual report to tackle unhealthy environments.
Royal Town Planning Institute (RTPI) policy <sup>152,153</sup>	Policy paper on transport infrastructure investment, including challenge to integrate schemes to encourage inter-modal transport
Local air quality management (LAQM) Wales guidance 2017 <sup>154</sup>	Guidance for LAQM in Wales in light of the WFG Act. Specifically, LAQM should not be carried out to seek short-term solutions; and should be carried out in an integrated way to find solutions to related outcomes including reduced carbon emissions and healthier lifestyles. Also recommends LA and public health should work together to reduce health risks and inequalities; and special consideration should be given to long-term risks of exposure by babies and children, including in homes, schools and nurseries, and travel between these locations

Manual for Streets <sup>155</sup>	UK Department for Transport guidance on designing streets. Recognises a user hierarchy which places pedestrians and cyclists above cars, explained more in Making Space for Cycling. <sup>156</sup>
UN Convention on the Rights of the Child (UNCRC) <sup>157</sup> and Rights of Children and Young Persons (Wales) Measure 2011 <sup>158</sup>	Rights of children applicable under international law and domestic law in Wales. Article 31: Children have the right to relax and play, and to join in a wide range of cultural, artistic and other recreational activities. Article 24 includes the right to a safe environment
Public Health Wales (PHW) Well-being Objectives <sup>159</sup>	Objectives required under the WFG Act. One of the 7 well-being objectives is to 'maximise the potential of our natural and cultural resources to promote physical and mental health and well-being and contribute to a low carbon, environmentally resilient Wales'. Giving children opportunities to play and learn in a healthy and safe environment is another objective.
Future Generations Commissioner for Wales - Draft strategic plan 2017-23 <sup>140</sup>	Sets out four key purposes for the plan period. Includes highlighting the big issues facing future generations – the first of four being climate change, for which the focus should be reducing emissions and tackling impacts.

## Local and regional strategies

Public Services Boards – Well-being objectives and plans	Well-being assessments and plans are required for each local authority area under the WFG Act, overseen by the local PSB. In the Vale, the objectives in the draft well-being plan focuses on four priority areas, including giving children the best start in life, and protecting, enhancing and valuing the environment, and tackling inequalities. <sup>160</sup> In Cardiff, the draft objectives include resilient growth, giving children the best start in life, tackling poverty, and caring for older people (including tackling social isolation). <sup>161</sup>
Regional Partnership Board – Area plan	An assessment identified needs including social isolation and loneliness; insufficient physical activity; and accessibility to green space. An Area Plan is being developed to respond to the assessment.



<p><b>Local Development Plans (LDPs)</b></p>	<p>Cardiff's LDP was adopted in 2016 and includes a commitment to over 40,000 new homes and a similar number of new jobs; 162 specific aims include to reduce reliance on the car, by improving travel choices for communities, integrated travel, orbital rather than radial bus networks, and improved traveller safety. Achieving a 50/50 modal split is described as a necessity for the transport network to cope with growth. It also sets out plans to retain and protect trees and green infrastructure in the city.</p> <p>The Vale LDP was adopted in June 2017 and includes improvements to walking, cycling and public transport infrastructure (including a proposed coastal cycle route, NCN 88, running east/west through the Vale), modernising the Valley rail line as part of the Cardiff Metro, and identifying areas for potential renewable energy regeneration.<sup>163</sup></p>
<p><b>Local Transport Plans (LTPs)</b></p>	<p>The Vale LTP promotes a shift from car use to sustainable travel, including increasing the number of cycle routes and encouraging integrated transport as the Vale of Glamorgan railway line is electrified. Where active travel is difficult due to the rural nature of the Vale, public transport accessibility will be enhanced.<sup>164</sup></p> <p>The Cardiff LTP promotes a shift away from hub and spoke bus lines to a grid system, which links communities better and prevents all traffic having to go through the centre of the City.<sup>165</sup></p> <p>The supporting masterplanning principles laid out by Cardiff Council recommend high density residential and mixed-use development along public transport corridors; and providing strategic walking and cycling corridors.<sup>166</sup> Streets will give priority to pedestrians and cyclists, and infrastructure should enable easy interchange between and active travel and public transport. All residents will be within easy access of off road paths. Varied green space open corridors will be provided.</p>
<p><b>Shaping our Future Well-being</b></p>	<p>Cardiff and Vale UHB's 10 year strategy prioritises prevention as a key theme, keeping people well for longer.<sup>81</sup> It also aims to support people to choose healthy behaviours and reduce health inequalities; and also be an excellent employer to work for. Air pollution, obesity and physical activity are recognised as key issues in the population profile in the Health Board's integrated medium term plan.<sup>167</sup></p>

<p>Cardiff Transport Strategy Cardiff Cycling</p>	<p>The Cardiff Transport Strategy sets out an ambitious aim to create a modal shift to a 60/40 split of sustainable travel compared with car use by 2026, preceded by a 50/50 split in 2021.<sup>5</sup> The strategy includes commitments to a city-wide cycling network, central cycle parking hub, transport interchanges at strategic points throughout the city, green bus technologies, integrated ticketing, and support for car clubs. This follows on from a laudable decline in city centre traffic of one quarter (26%) between 2004 and 2014</p>
<p>Strategy</p>	<p>The draft strategy sets out a vision of a city where cycling is normal, practical and safe for short trips, for people of all cycling abilities, and to double the number of cycle trips by 2026. Sets out plans for two primary route corridors in Cardiff – North/South and East/West; and promoting cycling in schools, workplaces, for shopping.</p>
<p>City Region Deal</p>	<p>A £1.2bn City Deal was agreed in March 2016 for 10 South East Wales local authorities, including a substantial investment in a Cardiff Capital Region Metro integrated public transport system. The City Deal also included a commitment to electrification of the Valley Lines rail network by 2023.<sup>5</sup> The details of the Metro are still being worked through, but the proposal includes electrified rail; integrated transport hubs; park and ride facilities; light rail and/or bus rapid transit routes; better integration across modes and operators; and active travel interventions.<sup>123</sup></p>

# References

All URLs referenced here were last accessed on 7 September 2017.

1. Department for Transport (2017). TSGB0101 statistics. From: <https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons>
2. Wikipedia (2017). Cardiff Corporation Tramways. From: [https://en.wikipedia.org/wiki/Cardiff\\_Corporation\\_Tramways](https://en.wikipedia.org/wiki/Cardiff_Corporation_Tramways)
3. Wikipedia (2017). Trolleybuses in Cardiff. From: [https://en.wikipedia.org/wiki/Trolleybuses\\_in\\_Cardiff](https://en.wikipedia.org/wiki/Trolleybuses_in_Cardiff)
4. Welsh Government (2017). National Survey for Wales 2016-17: population health – lifestyle. From: <http://gov.wales/statistics-and-research/national-survey/?tab=current&lang=en>
5. City of Cardiff Council (2016). Cardiff Transport Strategy – draft. From: <https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/travel/Transport-Strategy/Pages/default.aspx>
6. Vale of Glamorgan Council (2017). Public opinion survey 2016/17
7. Department for Transport (2017). Transport expenditure TSGB1308. From: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/602214/tsgb1308.ods](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/602214/tsgb1308.ods)
8. Department for Transport (2017). Transport statistics Great Britain 2016. From: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/576095/tsgb-2016-report-summaries.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/576095/tsgb-2016-report-summaries.pdf)
9. Department for Transport (2017). TRA0105 statistics. From: <https://www.gov.uk/government/statistical-data-sets/tra01-traffic-by-road-class-and-region-miles>
10. Department for Transport (2017). VEH0105 statistics. From: <https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>
11. Vale of Glamorgan Council (2017). Wellbeing assessment. From: <http://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Public-Services-Board/Well-being-Assessment/FINAL-ENGLISH-VERSIONS/Maximising-Opportunities-and-Attainment-Evidence-Report-Version-at-April-2017.pdf>
12. Cardiff and Vale UHB (2017). Travel to work survey
13. Six Bells Junction (2016). From: <http://www.sixbellsjunction.co.uk/50s/570713sl.html>
14. Wikipedia (2017). Path dependence. From: [https://en.wikipedia.org/wiki/Path\\_dependence](https://en.wikipedia.org/wiki/Path_dependence)
15. Cardiff and Vale UHB (2016). Annual DPH report: Obesity – the bigger picture. From: <http://www.cardiffandvaleuhb.wales.nhs.uk/sitesplus/documents/1143/Annual%20Report%202014%202nd%20copy.pdf>
16. Public Health Wales Observatory (2017). Health and its determinants in Wales: Informing strategic planning in Wales
17. Hutchinson, J et al (2014). Differences in the social patterning of active travel between urban and rural populations: findings from a large UK household survey. *Int J Pub Health* 59: 993-998.
18. Greater London Authority (2015). Health impact of cars in London. From: <https://www.london.gov.uk/what-we-do/health/health-publications/health-impacts-cars-london>

19. Institute of Health Policy, Management and Evaluation, University of Toronto, et al (2015). Sedentary Time and Its Association With Risk for Disease Incidence, Mortality, and Hospitalization in Adults: A Systematic Review and Meta-analysis. *Ann Int Med* 162(2):123-132
20. World Health Organization (2013). What are the health consequences of being overweight? From: <http://www.who.int/features/qa/49/en/>
21. QOF database (2017). QOF indicators for Cardiff and Vale UHB, 2016. From: <https://www.gpcontract.co.uk/browse/262/Diabetes%20Mellitus/16>
22. Faculty of Public Health et al (2016) Local action to mitigate the health impacts of cars: a briefing statement. From: [http://www.fph.org.uk/more\\_cycling\\_and\\_walking%3B\\_less\\_driving%2C\\_needed\\_for\\_our\\_health\\_and\\_economy%2C\\_says\\_new\\_fph\\_report](http://www.fph.org.uk/more_cycling_and_walking%3B_less_driving%2C_needed_for_our_health_and_economy%2C_says_new_fph_report)
23. Wikipedia (2017). Clean Air Act 1956. From: [https://en.wikipedia.org/wiki/Clean\\_Air\\_Act\\_1956](https://en.wikipedia.org/wiki/Clean_Air_Act_1956)
24. Welsh Government (2015). Social Services and Well-being (Wales) Act 2014. From: <http://gov.wales/topics/health/socialcare/act/?lang=en>
25. Torjesen, I (2015). Even low levels of air pollution are linked to more deaths in over 65s, study finds. *BMJ* 2015;350:h3043
26. Russell-Jones, R (2017). Air pollution in the UK: better ways to solve the problem. *BMJ* 2017;357:j2713
27. The Guardian (2017). Air pollution more harmful to children in cars than outside, warns top scientist. From: <https://www.theguardian.com/environment/2017/jun/12/children-risk-air-pollution-cars-former-uk-chief-scientist-warns>
28. UK Government (2017). Air quality plan for nitrogen dioxide (NO<sub>2</sub>) in the UK (2017). From: <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>
29. Welsh Air Quality Forum (2015). Air pollution in Wales 2015. From: [http://www.welshairquality.co.uk/documents/reports/507161019\\_AQ\\_wales\\_2015\\_v12\\_Press.pdf](http://www.welshairquality.co.uk/documents/reports/507161019_AQ_wales_2015_v12_Press.pdf)
30. Defra (2017). Air quality management areas. From: [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=394](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=394)
31. Grey, E (2016). The big stink: how much do trains really emit? From: <http://www.railway-technology.com/features/featurethe-big-stink-how-much-do-trains-really-emit-4807131/>
32. Low Carbon Vehicle Partnership (2016). The low emission bus guide. From: <http://www.lowcvc.org.uk/projects/bus-working-group/lowemissionbusguide.htm>
33. Good, N et al. (2016). The Fort Collins Commuter Study: impact of route type and transport mode on personal exposure to multiple air pollutants. *J Expo Sci Environ Epidemiol* (2016). 26(4):397-404
34. The Guardian (2017). London air pollution: which mode of transport has the highest exposure? From: <https://www.theguardian.com/environment/video/2014/aug/12/london-air-pollution-public-transport-video>
35. de Nazelle, A (2017). Comparison of air pollution exposures in active vs. passive travel modes in European cities: A quantitative review. *Environ Int* 99:151-160

36. Cepeda, M et al (2017). Levels of ambient air pollution according to mode of transport: a systematic review. *Lancet Pub Health* 2:e23-e24
37. Castres, P et al (2017). Most London hospitals and clinics exceed air pollution limits. *BMJ* 2017; 357:j2855
38. Holgate, S et al. (2017). Air pollution – a wicked problem. *BMJ* 2017;357:j2814
39. Public Health England (2014). Estimating local mortality burdens associated with particulate air pollution. From: <https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>
40. Royal College of Physicians and Royal College of Paediatrics and Child Health (2016). Every breath we take: the lifelong impact of air pollution. From: <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>
41. NICE (2017). Air pollution: outdoor air quality and health. NICE Guideline NG70. From: [nice.org.uk/guidance/ng70](https://www.nice.org.uk/guidance/ng70)
42. Faculty of Public Health (2017). Road Accidents in Britain 2015. From: Public Health Today – summer 2017  
[http://www.fph.org.uk/uploads/PHT%20Summer%202017\\_PHT%20Summer%202017.pdf](http://www.fph.org.uk/uploads/PHT%20Summer%202017_PHT%20Summer%202017.pdf)
43. Taylor MC et al (2000). The effects of drivers' speed on the frequency of road accidents. From: <https://trl.co.uk/reports/TRL421>
44. Sustainable Development Commission (2011). Fairness in a car-dependent society. From: <http://www.sd-commission.org.uk/publications.php?id=1184>
45. Sampasa-Kanyinga, H et al (2017). Associations between meeting combinations of 24-h movement guidelines and health-related quality of life in children from 12 countries. *Public Health* 153:16-24.
46. Play Wales (2012). Play: health and wellbeing. From: <http://www.playwales.org.uk/eng/playhealth>
47. Welsh Government (2017). National Survey for Wales: headline results April 2016-March 2017
48. Cardiff and Vale Integrated Health and Social Care Partnership (2017). Cardiff and Vale of Glamorgan population needs assessment. From: <http://www.cvihsc.co.uk/about/what-we-do/population-needs-assessment/>
49. Hart J et al (2008). Driven to excess: impacts of motor vehicles on the quality of life of residents of three streets in Bristol, UK
50. Steptoe, A et al (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proc Natl Acad Sci* 110:597-5801
51. The Marmot Review Team (2011). The Marmot Review: implications for spatial planning. From: <https://www.nice.org.uk/media/default/About/what-we-do/NICE-guidance/NICE-guidelines/Public-health-guidelines/Additional-publications/Spatial-planning/the-marmot-review-implications-for-spatial-planning.pdf>
52. HelpAge International (2016). Ageing and the city: making urban spaces work for older people. From: <http://www.helpage.org/what-we-do/ageing-cities/>
53. Welsh Government (2015). Natural Resources Policy Statement.
54. Welsh Government (2012). Wales noise mapping. From: <http://data.wales.gov.uk/apps/noise/#lat=51.4893&lon=-3.3646&zoom=11&time=den&theme=road>

55. Van Kempen E et al (2012). The quantitative relationship between road traffic noise and hypertension: a meta-analysis. *J Hypertens* (2012) 30(6): 1075-86
56. Health Protection Agency (2009). Environmental Noise and Health in the UK (draft for comment). From: [http://webarchive.nationalarchives.gov.uk/20100716121707/http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1246433634856](http://webarchive.nationalarchives.gov.uk/20100716121707/http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1246433634856)
57. University of Leicester (2015). State of our countryside: land use map of the UK reveals large-scale changes in environment. From: <https://www2.le.ac.uk/offices/press/press-releases/2015/june/state-of-our-countryside-land-use-map-of-the-united-kingdom-reveals-large-scale-changes-in-environment>
58. Gilbert, N. (2016). Green space: a natural high. *Nature* 531: S56-S57
59. Cox DT, et al (2017). Doses of Nearby Nature Simultaneously Associated with Multiple Health Benefits. *Int J Environ Res Public Health* 9;14(2). pii: E172
60. Natural Resources Wales (2016). A summary of the State of Natural Resources Report. From: <https://naturalresources.wales/evidence-and-data/research-and-reports/the-state-of-natural-resources-report-assessment-of-the-sustainable-management-of-natural-resources/?lang=en>
61. World Health Organization (2016). Urban green spaces and health: a review of evidence. From: <http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2016/urban-green-spaces-and-health-a-review-of-evidence-2016>
62. Public Health Wales (2017). Personal correspondence, Huw Brunt
63. Fecht, D et al (2015). Associations between air pollution and socioeconomic characteristics, ethnicity and age profile of neighbourhoods in England and the Netherlands. *Env Pollution* 198: 201-210
64. Centre for Sustainable Energy (2013). Distribution of Carbon Emissions in the UK: Implications for Domestic Energy Policy. From: <http://www.jrf.org.uk/publications/carbon-emissions>
65. Glasgow Centre for Population Health (2017). Active travel in Glasgow: what we've learned so far. From: [http://www.gcph.co.uk/publications/702\\_active\\_travel\\_in\\_glasgow\\_what\\_we\\_ve\\_learned\\_so\\_far](http://www.gcph.co.uk/publications/702_active_travel_in_glasgow_what_we_ve_learned_so_far)
66. Mackett, RL and Brown, B (2011). Transport, physical activity and health: present knowledge and the way forward. From: <https://www.ucl.ac.uk/news/pdf/transportactivityhealth.pdf>
67. Committee on Climate Change (2017). UK Climate Change Risk Assessment 2017. Synthesis report: priorities for the next five years
68. Godlee, F (2014). Climate change. *BMJ* 2014;349:g5945
69. Haines, A et al (2014). Health risks of climate change: act now or pay later *Lancet* 384: 1073-1074
70. Defra & Welsh Government (2012). A climate change risk assessment for Wales. From: <http://gov.wales/docs/desh/publications/120126climateriskassessen.pdf>
71. Welsh Government (2017). Future Trends. From: <http://gov.wales/statistics-and-research/future-trends/?lang=en>
72. Tong, S (2017). Flood-related displacement and mental health. *Lancet Plan Health* 1:e124-e125



73. World Health Organization (2014). Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. From: [http://apps.who.int/iris/bitstream/10665/134014/1/9789241507691\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/134014/1/9789241507691_eng.pdf)
74. Aneurin Bevan University Health Board (2015). Annual report of the Director of Public Health. Sustainable health for future generations
75. NHS Highland (2014). The annual report of the Director of Public Health.
76. World Health Organization (2017). Climate change and health. From: <http://www.who.int/mediacentre/factsheets/fs266/en/>
77. The Wales We Want (2015) The Wales We Want report. A report on behalf of future generations. From: <https://www.thewaleswewant.co.uk/sites/default/files/The%20Wales%20We%20Want%20Report%20ENG.pdf>
78. Welsh Government (2017). Welsh emissions. From: <http://gov.wales/topics/environmentcountryside/climatechange/welsh-emissions/?lang=en>
79. Office for National Statistics (2017). UK environmental accounts 2017. From: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2017>
80. Committee on Climate Change (2016). Meeting carbon budgets – 2016 progress report to parliament. From: <https://www.theccc.org.uk/publication/meeting-carbon-budgets-2016-progress-report-to-parliament/>
81. Cardiff and Vale UHB (2016). Shaping our future well-being. From: <http://www.cardiffandvaleuhb.wales.nhs.uk/sitesplus/documents/1143/10%20-%20UHB%20Shaping%20Our%20Future%20Wellbeing%20Strategy%20Final.pdf>
82. NICE (2012). Physical activity: walking and cycling. Public health guidance PH 41. From: <https://www.nice.org.uk/guidance/ph41/chapter/1-Recommendations>
83. Designed to Move (2015). Designed to Move: Active Cities report. From: <http://www.designedtomove.org/resources>
84. Sustrans, Faculty of Public Health et al. (2008). Take action on active travel: why a shift from car-dominated transport policy would benefit public health. From: [http://www.fph.org.uk/uploads/Take\\_action\\_on\\_active\\_travel.pdf](http://www.fph.org.uk/uploads/Take_action_on_active_travel.pdf)
85. Public Health Wales (2017). Making a difference: reducing health risks associated with road traffic air pollution in Wales (draft)
86. City of Cardiff Council (2016). Cardiff Cycling Strategy 2016-2026 draft.
87. Heesch, KC et al (2016). The usefulness of GPS bicycle tracking data for evaluating the impact of infrastructure change on cycling behaviour. Health Promot J Austr. doi: 10.1071/HE16032
88. Bicycle Dutch (2012). Sustainable safety. From: <https://bicycledutch.wordpress.com/2012/01/02/sustainable-safety/>
89. Institute for Road Safety Research, Netherlands (2012). SWOV Fact Sheet: background of the five sustainable safety principles. From: [https://www.swov.nl/sites/default/files/publicaties/gearchiveerde-factsheet/uk/fs\\_sustainable\\_safety\\_background\\_archived.pdf](https://www.swov.nl/sites/default/files/publicaties/gearchiveerde-factsheet/uk/fs_sustainable_safety_background_archived.pdf)

90. van der Knaap, P (2015). Sustainable safety: the Netherlands' vision and strategy for a safe traffic system: ambitions, results and new challenges. From: [http://www.vsv.be/sites/default/files/day\\_1\\_-\\_24-08\\_-\\_presentation\\_peter\\_van\\_der\\_knaap\\_-\\_part\\_1.pdf](http://www.vsv.be/sites/default/files/day_1_-_24-08_-_presentation_peter_van_der_knaap_-_part_1.pdf)
91. Song Y, et al (2017). New walking and cycling infrastructure and modal shift in the UK: A quasi-experimental panel study. *Transp Res Part A Policy Pract.* 95:320-333
92. Christensen, J, et al (2012). Evaluation of the cycling city and towns programme: qualitative research with residents. From: <http://eprints.uwe.ac.uk/30579>
93. Public Health England (2016). Working together to promote active travel. A briefing for local authorities. From: <https://www.gov.uk/government/publications/active-travel-a-briefing-for-local-authorities>
94. Rissel, C et al (2012). Physical activity associated with public transport use – a review and modelling of potential benefits. *Int J Environ Res Public Health* 9(7): 2454-2478
95. Russell-Jones, R (2017). Air pollution in the UK: better ways to solve the problem. *BMJ* 2017;357:j2713
96. Defra (2017). LAQM action planning: case studies. From: <https://laqm.defra.gov.uk/action-planning/case-studies.html>
97. Koohsari, MJ et al (2016). Built environmental factors and adults' travel behaviours: role of street layout and local destinations. *Prev med* 96: 124-128
98. TCPA (2016). Planning better health and well-being in Wales. From: <https://www.tcpa.org.uk/healthyplanning>
99. Living Streets (2017). The UK's top walking cities. From: <https://www.livingstreets.org.uk/what-you-can-do/the-uks-top-walking-cities>
100. Jones SJ and Brunt, H (2017). Twenty miles per hour speed limits: a sustainable solution to public health problems in Wales. *Epidemiol Community Health* doi:10.1136/jech-2016-208859
101. Living Streets (2013). The pedestrian pound. The business case for better streets and places. From: [https://www.livingstreets.org.uk/media/1391/pedestrianpound\\_fullreport\\_web.pdf](https://www.livingstreets.org.uk/media/1391/pedestrianpound_fullreport_web.pdf)
102. Walk Score (2017). From: [www.walkscore.com](http://www.walkscore.com)
103. Stockton, JC et al. (2016) Development of a novel walkability index for London, United Kingdom: cross-sectional application to the Whitehall II Study. *BMC Public Health* 16:416
104. Playing Out (2017). From: <http://playingout.net/>
105. The Nature Conservancy (2016). Planting Healthy Air. From: <https://global.nature.org/content/healthyair>
106. Coombes, R (2017). Every breath we take. *BMJ* 2017;357:j2892
107. CNN tech (2017). China's dockless bike sharing could be coming to a street near you. From: <http://money.cnn.com/2017/07/05/technology/startups/china-bike-sharing-global/index.html>
108. YoBike (2017). From: <https://yobike.co.uk/>
109. Carplus (2017). Bike sharing. From: <https://www.carplusbikeplus.org.uk/what-is-shared-mobility/bike-sharing/>
110. CleanSpace (2017). From: <https://store.cleanspace/>
111. Swansea Local Authority (2015). Swansea air quality action plan FAQs. From: <http://www.swansea.airqualitydata.com/cgi-bin/faqs.cgi?1014>

112. Volvo Cars (2017). Volvo Cars to go all electric. From:  
<https://www.media.volvocars.com/global/en-gb/media/pressreleases/210058/volvo-cars-to-go-all-electric>
113. Zap Map (2017). London street lights converted to EV charge points for trial. From:  
<https://www.zap-map.com/london-street-lights-converted-to-ev-charge-points-for-trial/>
114. Transport for London (2017). Cleaner greener taxis. From:  
<https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/cleaner-greener-taxis>
115. UK Government (2017). 1,000 jobs created at new £325m factory for electric taxis. From:  
<https://www.gov.uk/government/news/1000-jobs-created-at-new-300-million-factory-for-electric-taxis>
116. Northumbria Healthcare NHS Foundation Trust (2015). Northumbria's switch to Nissan electric vehicles enables thousands of pounds to be invested in patient care. From:  
<https://www.northumbria.nhs.uk/news/northumbria%E2%80%99s-switch-nissan-electric-vehicles-enables-thousands-pounds-be-invested-patient-care>
117. North West Ambulance Service (2017). Ambulance service set to save millions with introduction of electric vehicles. From: <http://www.nwas.nhs.uk/news/press-releases-and-statements-2017/24-february-2017-ambulance-service-set-to-save-millions-with-introduction-of-electric-vehicles>
118. Engadget (2017). Royal Mail is going greener with all-electric vans. From:  
<https://www.engadget.com/2017/08/23/royal-mail-arrival-electric-vans/>
119. The Guardian (2017). Electric cars are not the answer to air pollution, says top UK adviser. From: <https://www.theguardian.com/environment/2017/aug/04/fewer-cars-not-electric-cars-beat-air-pollution-says-top-uk-adviser-prof-frank-kelly>
120. MacKay, DJC (2009). Sustainable energy – without the hot air. UIT Cambridge.
121. BRE (2016). Solar car parks: a guide for owners and developers. From:  
[http://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/BRE\\_solar-carpark-guide.pdf](http://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/BRE_solar-carpark-guide.pdf)
122. Cardiff Bus (2017). Cardiff Bus launches 10 high-tech buses worth £1.7m. From:  
<http://www.cardiffbus.com/english/feature-article.shtml?articleid=7425>
123. Welsh Government (2015). Rolling out our Metro. From: [gov.wales/metro](http://gov.wales/metro)
124. Network Rail (2017). Cardiff and Valleys railway modernisation scheme. From:  
<https://www.networkrail.co.uk/running-the-railway/our-routes/wales/cardiff-and-valleys/>
125. CityMapper (2017). CM2 – Night Rider, our first commercial bus route. From:  
<https://medium.com/citymapper/cm2-night-rider-our-first-commercial-bus-route-d9d7918be899>
126. Highways Agency (2014). Preparing the strategic road network for electric vehicles: a research programme
127. Sustain Wales (2017). Future Car:diff conference, 11 July 2017
128. VentureBeat (2017). Self-driving car timeline for 11 top automakers. From:  
<https://venturebeat.com/2017/06/04/self-driving-car-timeline-for-11-top-automakers/>
129. The Guardian (2017). Driverless pods plot new course to overtake humans. From:  
<https://www.theguardian.com/technology/2017/apr/25/autonomous-car-projects-plot-course-uk-driverless-future>

130. Uber (2017). Self-driving Ubers: the world's first Self-Driving Ubers are on the road in the Steel City. From: <https://www.uber.com/cities/pittsburgh/self-driving-ubers/>
131. Celis-Morales, CA et al. (2017). Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *BMJ* 2017;357:j1456
132. Journal of Transport and Health (2016). The influence of the built environment on transport and health. *Journal of Transport and Health* 3:423-425
133. Reiner, M et al (2013). Long-term health benefits of physical activity – a systematic review of longitudinal studies. *BMC Public Health* 13:813.
134. Welsh Government (2015). Well-being of Future Generations (Wales) Act 2015. From: <http://gov.wales/topics/people-and-communities/people/future-generations-act/?lang=en>
135. Welsh Government (2013). Active Travel (Wales) Act 2013. From: <http://gov.wales/topics/transport/walking-cycling/activetravelact/?lang=en>
136. Welsh Government (2016). Environment (Wales) Act 2016. From: <http://gov.wales/topics/environmentcountryside/consmanagement/natural-resources-management/environment-act/?lang=en>
137. UK Parliament (2017). Public Health (Wales) Act 2017. From: <http://www.legislation.gov.uk/anaw/2017/2/contents/enacted>
138. Future Generations Commissioner for Wales (2016). Letter to Carwyn Jones
139. Future Generations Commissioner for Wales (2016). Press release: Urgent action needed to protect communities from climate change says Future Generations Commissioner
140. Future Generations Commissioner for Wales (2017). Draft strategic plan 2017-23. From: <https://futuregenerations.wales/wp-content/uploads/2017/02/Draft-Strategic-Plan-ENG-1.pdf>
141. European Commission (2016). The Paris Agreement. From: [https://ec.europa.eu/clima/policies/international/negotiations/paris\\_en](https://ec.europa.eu/clima/policies/international/negotiations/paris_en)
142. BBC News (2017). High Street shopping fighting back in Wales, figures show. From: <http://www.bbc.co.uk/news/uk-wales-39321828>
143. Department for Transport (2017). VEH0131 statistics. From: <https://www.gov.uk/government/collections/vehicles-statistics>
144. Vale of Glamorgan Council (2017). Greenlinks. From: <http://www.valeofglamorgan.gov.uk/en/living/transportation/greenlinks.aspx>
145. Cardiff and Vale local public health team (2017). Personal correspondence
146. Arden Pope, C et al (2009). Fine-particulate air pollution and life expectancy in the US *N Engl J Med* 360:376-386
147. University of Bristol (2016). Outdoors and active: delivering public health outcomes by increasing children's active travel and outdoor play. From: <http://playingout.net/wp-content/uploads/2015/04/Bristol-University-Outdoors-And-Active-Evidence-Briefing.pdf>
148. University of Bristol (2016). Playing out preliminary evaluation. From: [http://playingout.net/wp-content/uploads/2014/05/playing-out-evaluation\\_Angie-Page.pdf](http://playingout.net/wp-content/uploads/2014/05/playing-out-evaluation_Angie-Page.pdf)
149. Nieuwenhuijsen MJ et al (2016) Car free cities: Pathway to healthy urban living. *Environ Int* 94:251-62
150. Office for Low Emission Vehicles (2016). Grants to provide residential on-street chargepoints for plug-in electric vehicles: guidance for local authorities
151. Office for Low Emission Vehicles (2016). Workplace Charging Scheme – Guidance Document for Applicants, Chargepoint Installers and Manufacturers

152. RTPI (2014). Transport infrastructure investment: capturing the wider benefits of investment in transport infrastructure. From:  
[http://www.rtpi.org.uk/media/816110/capturing\\_the\\_wider\\_benefits.pdf](http://www.rtpi.org.uk/media/816110/capturing_the_wider_benefits.pdf)
153. RTPI (2014). Planning Horizons: promoting healthy cities. From:  
[http://www.rtpi.org.uk/media/1119674/rtpi\\_promoting\\_healthy\\_cities.pdf](http://www.rtpi.org.uk/media/1119674/rtpi_promoting_healthy_cities.pdf)
154. Welsh Government (2017). Local air quality management in Wales: policy guidance. From:  
<http://gov.wales/topics/environmentcountryside/epq/airqualitypollution/airquality/guidance/?lang=en>
155. Department for Transport, Welsh Government (2007). Manual for Streets. From:  
<https://www.gov.uk/government/publications/manual-for-streets>
156. Making Space for Cycling (2017). A guide for new developments and street renewals. From:  
<http://www.makingspaceforcycling.org/>
157. Unicef (2017). A summary of the rights under the Convention of the Rights of the Child. From:  
[https://www.unicef.org/crc/files/Rights\\_overview.pdf](https://www.unicef.org/crc/files/Rights_overview.pdf)
158. UK Parliament (2011). Rights of Children and Young Persons (Wales) Measure 2011. From:  
<http://www.legislation.gov.uk/mwa/2011/2/contents>
159. Public Health Wales (2017). Wellbeing objectives. From:  
<http://www.wales.nhs.uk/sitesplus/888/page/92105>
160. Vale of Glamorgan Council (2017). Well-being Plan (draft)
161. City of Cardiff Council (2017). Cardiff assessment of local well-being and local well-being plan
162. City of Cardiff Council (2016). Adopted Local Development Plan (LDP). From:  
<https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Pages/default.aspx>
163. Vale of Glamorgan Council (2017). Local Development Plan (LDP). From:  
[http://www.valeofglamorgan.gov.uk/en/living/planning\\_and\\_building\\_control/planning\\_policy/local\\_development\\_plan/Local-Development-Plan.aspx](http://www.valeofglamorgan.gov.uk/en/living/planning_and_building_control/planning_policy/local_development_plan/Local-Development-Plan.aspx)
164. Vale of Glamorgan Council (2015). Local Transport Plan 2015-2030
165. City of Cardiff Council (2015). Cardiff Local Transport Plan 2015-2020
166. City of Cardiff Council (2013). Cardiff Local Development Plan Masterplanning Framework
167. Cardiff and Vale UHB (2017). Integrated Medium Term Plan. From:  
<http://www.cardiffandvaleuhb.wales.nhs.uk/page/78840>
168. NICE (2007). Behaviour change: general approaches. Public health guidance 6 (PH6). From:  
<https://www.nice.org.uk/Guidance/ph6>

Image credit Barry Docks Office used under Creative Commons (CC BY-SA 2.0) © Copyright Gareth James

# Symud ymlaen: Teithio iach i bawb yng Nghaerdydd a Bro Morgannwg

---



Adroddiad Blynyddol Cyfarwyddwr Iechyd  
Cyhoeddus Caerdydd a Bro Morgannwg 2017



# Symud ymlaen: Teithio iach i bawb yng Nghaerdydd a Bro Morgannwg

Adroddiad Blynyddol Cyfarwyddwr Iechyd  
Cyhoeddus Caerdydd a Bro Morgannwg 2017

## Diolchiadau

Diolch yn fawr i bawb sydd wedi helpu i lunio'r adroddiad hwn gyda syniadau, awgrymiadau a thystiolaeth, yn cynnwys:

Hester Adams, Dr Simon Barry, Huw Brunt, Paul Carter, James Clemence, Jason Dixon, Cynghorydd Susan Elsmore, Dr Margaret Eni-Olotu, Marcus Goldsworthy, Andrew Gregory, Dr Siân Griffiths, Joshua Hart, Fiona Kinghorn, Brian Marsh, Colin McMillan, Helen Moses, Gareth Newell, Athro Graham Parkhurst, Anne Phillips, Emma Reed, Rob Thomas, Sue Toner, Cynghorydd Caro Wild, Dr Suzanne Wood, a Dr Thom Waite

Hoffwn ddiolch i Dr Tom Porter, prif awdur yr adroddiad.

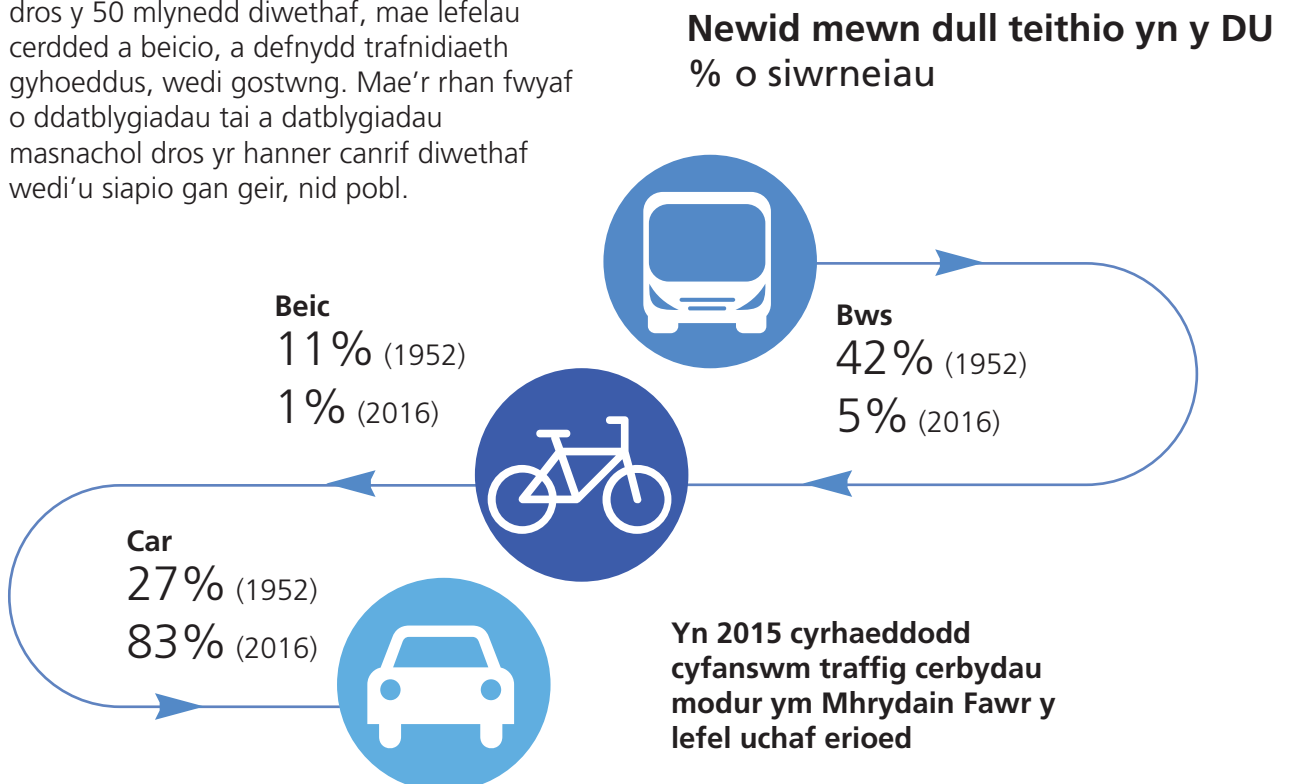
# Crynodeb gweithredol

Mae dirywiad mewn lefelau gweithgarwch corfforol, cynnydd mewn lefelau gordewdra a diabetes, llygredd aer eang, arwahanrwydd cymdeithasol ac anghydraddoldebau iechyd sy'n gwaethygu i gyd yn broblemau iechyd cyhoeddus enbyd yn ein hardal. Mae newid hinsawdd yn fygythiad difrifol a deimlir eisoes yn y DU ac ar draws y byd.

Mae patrymau newidiol yn y modd yr ydym yn teithio a sut yr ydym yn cynllunio amgylchoedd ar gyfer teithio wedi chwarae rôl arwyddocaol yn y materion hyn. Mae angen gweithredu dewr yn lleol os ydym am wyrdroi'r tueddiadau hyn mewn iechyd poblogaeth a byd-eang, a chreu dyfodol iachach a mwy cynaliadwy ar gyfer ein preswylwyr.

## Sut gwnaethom gyrraedd y sefyllfa hon?

Tra bod defnydd car wedi cynyddu'n gyflym dros y 50 mlynedd diwethaf, mae lefelau cerdded a beicio, a defnydd trafniadaeth gyhoeddus, wedi gostwng. Mae'r rhan fwyaf o ddatblygiadau tai a datblygiadau masnachol dros yr hanner canrif diwethaf wedi'u siapio gan geir, nid pobl.





## Yr effeithiau ar iechyd a lles

Mae'r newid mewn dull teithio wedi cyfrannu at leihad sylweddol mewn gweithgarwch corfforol, sydd yn ei dro yn gysylltiedig â risg gynyddol o iechyd gwael, yn cynnwys clefyd cardiofasgwlaidd, canser a diabetes.

Mae trafndiaeth ffordd yn gyfrannwr mawr llygredd aer niweidiol, ac mae'n gyfrifol am bron i 1,000 o ddamweiniau gan achosi anafiadau neu farwolaethau yng Nghymru bob blwyddyn. Wrth i'n hamgylchoedd gael eu siapio o amgylch y car, mae rhyngweithio oddi mewn i gymunedau a rhwng cymunedau wedi lleihau. Teimlir llawer o'r effeithiau anffafriol trafndiaeth ffordd mewn cymunedau mwy amddifadus, gan gyfrannu at anghydraddoldebau iechyd sy'n gwaethygu.

Mae newid hinsawdd yn cynyddu'r perygl o ddiwyddiadau tywydd difriol, yn cynnwys llifogydd a fydd yn effeithio'n fwyfwy ar ein cymunedau a'n seilwaith.

- Mae dros hanner (54%) yr oedolion yng Nghaerdydd a'r Fro dros bwysau neu'n ordeu, ac fe'u dosbarthir fel 'anegniol' oherwydd eu bod yn gwneud llai na hanner awr o weithgarwch corfforol mewn wythnos gyfan
- Amcangyfrifir bod 5% o farwolaethau yng Nghaerdydd a'r Fro o ganlyniad i lygredd aer gan ddeunydd gronynnol
- Dywed bron i 1 o bob 4 o bobl agored i niwed yng Nghaerdydd a'r Fro eu bod yn unig am beth o'r amser neu trwy'r amser
- Gall dyn sy'n byw yn un o'n cymunedau mwyaf amddifadus yng Nghaerdydd ddisgwyl byw 11 mlynedd yn llai na rhywun yn yr ardaloedd lleiaf amddifadus
- Canfuwyd bod dadleoli cymunedau cysylltiedig â llifogydd yn y DU yn achosi problemau iechyd meddwl sylweddol a pharhaus



## Gallm wneud pethau'n wahanol

Gellid gwella'n sylweddol iechyd a lles yn ein cymunedau pe bai teithio llesol yn dod yn norm ar gyfer siwrneiau byr, bod trafndiaeth gyhoeddus yn cael ei ddefnyddio ar gyfer siwrneiau hwy, a bod ansawdd aer yn gwella.

- Dylai siwrneiau byrrach na 2km allu cael eu cerdded mewn golau dydd gan unigolion rhwng 5 a 74 oed sydd heb anabledd
- I lawer o bobl, digwyddiad arwyddocaol yn eu bywydau yw'r sbardun i ddechrau teithio'n llesol
- Mae pobl sy'n cerdded a beicio yn y gymdogaeth yn fwy tebygol o wario arian mewn siopau lleol
- Hwylusir defnydd trafndiaeth gyhoeddus gan brisiau tocynnau fforddiadwy, hyblygrwydd mewn arosfannau, gwybodaeth teithio o ansawdd da a gwasanaethau rheolaidd
- Mae Parthau Aer Glân yn rhoi manteision gwerth £29 am bob £1 a warir
- Dylai'r GIG osod y meincnod ar gyfer aer glân a gweithleoedd diogel
- Canlyniad tâl atal tagfeydd Llundain oedd cynnydd gan 80% mewn beicio



## Mae'r amser yn iawn ar gyfer newid

Mae nifer o gyfleoedd yn bodoli drwy ddeddfwriaeth, polisi cenedlaethol a lleol, a diwylliant sy'n newid yn raddol o ran defnydd ceir, sy'n golygu mai nawr yw'r amser i weithredu.

- Mae pedwar darn mawr o ddeddfwriaeth ddiweddar yn cefnogi teithio llesol yng Nghymru
- Mae gyrru car wedi dod yn llai poblogaidd ymhlith pobl ifanc
- Mae enghreifftiau o arfer da yng Nghaerdydd a Bro Morgannwg yn cynnwys cefnogaeth i breswylwyr i annog plant i chwarae yn y stryd, cynorthwyo staff Cyngor Bro Morgannwg i deithio'n gynaliadwy, a chynllun Parcio a Theithio YAC.



## Achub ar y cyfle: gweledigaeth ar gyfer Caerdydd a'r Fro

Mae'r adroddiad hwn yn nodi gweledigaeth sy'n seiliedig ar bum thema allweddol, gan ddangos beth allem ei gyflawni yng Nghaerdydd a'r Fro.

- Teithio llesol yw'r dewis diofyn ar gyfer siwrneiau byr
- Mae system drafnidiaeth gwbl integredig a ddefnyddir yn dda
- Mae gennym gymunedau sydd wedi'u cysylltu'n dda, sy'n egniol ac yn gymdeithasol
- Leiheir allyriadau trafndiaeth yn sylweddol
- Mae Caerdydd a'r Fro yn arweinwyr yn y maes hwn

Os byddwn yn cael hyn yn iawn, mae'r manteision posibl yn cynnwys cyfraddau is o glefyd cardiofasgwlaidd, canser, gordewdra a diabetes; gwelliannau mewn lles meddwl; a lleihad mewn absenoldeb oherwydd salwch.

- Lleihad mewn salwch a marwolaethau o ganlyniad i ganser (risg 20-30% yn is o ganser y coluddyn a chanser y fron)
- Lleihad mewn salwch a marwolaethau o ganlyniad i glefyd cardiofasgwlaidd a strôc (20-35% yn llai o achosion)
- Lleihad mewn diabetes math 2 (30-40% yn llai o achosion)

- Lleihad mewn risg o iselder a dementia (risg 20-30% yn is)
- Lleihad mewn anghydraddoldeb o ran disgwyliad oes rhwng yr ardaloedd mwyaf a lleiaf amddifadus
- Cymunedau mwy cydynol a lleihad mewn unigrwydd
- Lleihad mewn llygredd aer ac allyriadau carbon sy'n cyfrannu at gynhesu byd-eang
- Llai o alw am wasanaethau iechyd a gofal cymdeithasol



## Pawb yn chwarae eu rhan: beth sydd angen i ni ei wneud gyda'n gilydd

Er mwyn gwneud gwelliant sylweddol a chyson yn ein hiechyd a'n lles mae angen i ni gymryd camau pendant nawr a dros y 5-10 mlynedd nesaf mewn pedwar prif faes.

- Cyflymu gwelliannau mewn seilwaith i gefnogi teithio llesol a thrafnidiaeth allyriadau isel
- Cefnogi staff i ddewis teithio llesol
- Ymgysylltu â chymunedau a busnesau lleol ynglŷn â manteision teithio llesol
- Peidio ag annog teithio sydd ddim yn iach a theithio sy'n llygru

# Rhagair



Mae pawb ohonom am gael yr iechyd a'r lles gorau y gallwn ar gyfer ein poblogaeth. Er mwyn cyflawni hynny mae'n rhaid i'r bwlch anghydraddoldeb rhwng y cymunedau mwyaf a lleiaf amddifadus gulhau. I wneud hynny mae

angen i ni fanteisio ar bob cyfle y gallwn, gan gydweithio fel unigolion a chymunedau gyda'n holl bartneriaid ym maes iechyd cyhoeddus.

Yn aml, bydd manteisio ar gyfleodd yn golygu cofleidio newid, gwneud pethau'n wahanol, hyrwyddo gwelliannau parhaus cymaint ag y gallwn a dweud pam y dylai iechyd a lles fod yn bwysig ar gyfer pob un ohonom. Bydd cyfleoedd i wella iechyd a lles bob amser yn cynnwys newid mewn ymddygiad ar lefel poblogaeth, unigolyn a sefydliadol. Mae hyn yn anodd gan y byddai'r rhan fwyaf ohonom yn dweud 'Rydw i'n cefnogi newid ond dydw i ddim eisiau newid,' ond mae'n rhaid i ni, pob un ohonom, wneud y newid sydd angen i ni ei weld os ydym am sicrhau gwelliant cynaliadwy yn ein hiechyd a'n lles.

Nid ydym wedi gwneud defnydd llawn o rai o'r cyfleoedd sydd ar gael i ni heddiw fel unigolion, ar y cyd fel arweinwyr neu fel sefydliadau. Mae'n debyg nad yw hynny'n syndod gan fod newid a gwelliant parhaus yn herio ac yn aml yn cwestiynu ein cred, arferion a systemau presennol. Eto, heddiw, ar draws ein sefydliadau sector cyhoeddus a thrydydd sector rydym mewn sefyllfa well nag erioed i fanteisio ar y cyfleoedd hynny. Yng Nghaerdydd a'r Fro mae gweithio mewn partneriaeth rhagorol wedi arwain at ddealltwriaeth gyffredin o anghenion y boblogaeth a wasanaethir gennym a'r hyn sydd angen i ni ei wneud, er mwyn galluogi gwell iechyd a lles. Cryfhawyd hyn yn fawr gan ddeddfwriaethau newydd diweddar Ddeddf Llesiant Cenedlaethau'r Dyfodol (Cymru) 2015,134 Deddf Gwasanaethau Cymdeithasol a

Llesiant (Cymru) 201424 a Deddf Iechyd Cyhoeddus (Cymru) 2017.137 Mae'r rhain yn rhoi ein hiechyd a'n lles yn gadarn ar frig yr agenda.

Yn ogystal â hyn gwyddom fod pobl, fel rhan o boblogaeth Caerdydd a'r Fro, eisiau gwell iechyd a lles ac mae'r ddealltwriaeth y bydd hyn yn golygu newid, yn cynnwys newid ymddygiad,<sup>168</sup> yn amlwg. Roedd hyn i'w weld yn yr arolygon a'r trafodaethau sydd wedi digwydd i lywio ein hasesiadau mwyaf diweddar o anghenion yng Nghaerdydd a'r Fro.11,48,161 Yn ogystal â hynny, mae rhai enghreifftau yn dod i'r amlwg o newid cadarnhaol mewn dau o achosion mwyaf iechyd a lles gwael. Mae nifer y bobl sy'n ysmegu tybaco yng Nghaerdydd a'r Fro yn is nac y bu erioed ac mae'r nifer yn parhau i ostwng ac mae cyfradd gordewdra ymhlith ein plant yn lleihau'n araf.

Mae'r adroddiad hwn yn edrych ar un o'r cyfleoedd nad ydym wedi gwneud defnydd llawn ohono hyd yma, teithio llesol. Mae'n fater sy'n effeithio ar bob unigolyn yn ein poblogaeth yn ogystal â phob sefydliad sy'n gweithredu yn ein cymunedau. Mae'n fater sy'n gofyn am ddealltwriaeth o'r gorffennol, dealltwriaeth o dechnolegau aflonyddgar y mae ein cenedlaethau iau yn eu cofleidio'n gyflym, dealltwriaeth o'r hyn y mae'r dystiolaeth yn ei ddweud wrthym, ac yn fwyaf pwysig y parodrwydd i hybu o ddifrif welliant parhaus cyflym sy'n defnyddio'r dystiolaeth a thechnolegau newydd. Yn anochel mae'n gofyn ein bod ni ein hunain yn dechrau mabwysiadu ac addasu i deithio llesol fel rhan o sut yr ydym yn byw bob dydd.

Gobeithio y byddwch yn mwynhau darllen yr adroddiad ac y bydd yn eich ysgogi i feddwl am eich rôl mewn gwneud teithio llesol yn rhan o gyflawni gwelliannau cynaliadwy yn ein hiechyd a'n lles.

**Dr Sharon Hopkins, Cyfarwyddwr  
Gweithredol Iechyd Cyhoeddus**

# Beth sydd yn y fantol



## Ein iechyd a'n lles: yn lleol a byd-eang

Lefelau dirywiol o weithgarwch corfforol, lefelau cynyddol o ordewdra a diabetes, llygredd aer eang, arwahanrwydd cymdeithasol ac anghydraddoldebau iechyd sy'n gwaethygu: mae'r rhain i gyd yn faterion iechyd cyhoeddus pwysig yng Nghaerdydd a Bro Morgannwg.

Yn fyd-eang, mae newid hinsawdd yn fgythiad difrifol a deimlir eisoes yn y DU ac ar draws y byd mewn digwyddiadau tywydd difrifol megis llifogydd a thywydd poeth, gydag effeithiau'n cynyddu bob blwyddyn wrth i'r ddaear gynhesu.

Mae gan y materion hyn i gyd rywbeth yn gyffredin: mae newidiadau patrwm yn y modd yr ydym yn teithio dros yr hanner canrif diwethaf, a hefyd sut yr ydym yn cynllunio ein hamgylchoedd ar gyfer teithio, wedi chwarae rhan arwyddocaol.



## Mae angen i ni weithredu'n gadarnhaol nawr

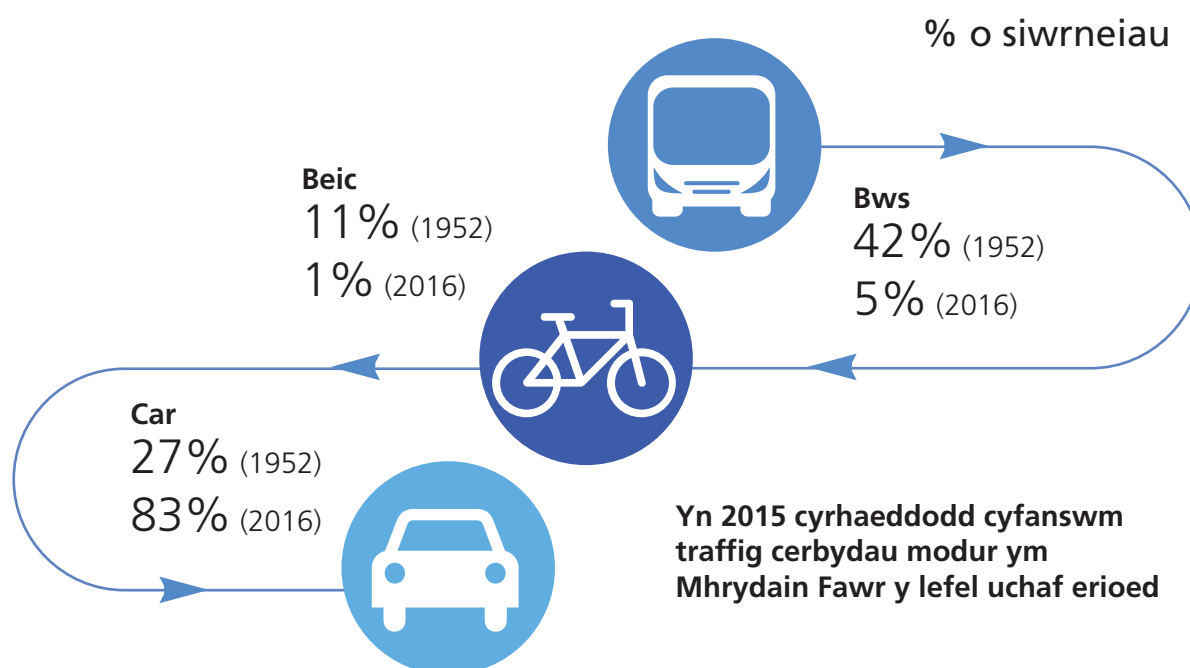
Mae angen gweithredu dewr yn lleol os ydym yn mynd i wyrddroi'r patrymau mewn iechyd poblogaeth a byd-eang, a chreu dyfodol iachach a mwy cynaliadwy i'n preswylwyr.

Mae llawer iawn o dystiolaeth sydd ar gael nawr yn awgrymu bod dyfodol gwell yn bosibl, gydag effeithiau cadarnhaol ar iechyd, lles a chydlynid cymdeithasol, yn ogystal â lleihau ein dibyniaeth ar danwyddau ffosil a'u heffaith ar newid hinsawdd.

Bwriad yr adroddiad hwn yw ysgogi meddwl am a thrafod yn lleol y materion a ddisgrifir ac annog gweithredu cydgysylltiedig a phendant er mwyn mynd i'r afael â hwy.



# Sut y cyrhaeddom y sefyllfa hon?



## Patrymau teithio sy'n newid

Dros y can mlynedd diwethaf gwelwyd trawsnewidiad dramatig yn sut y mae pobl yn y DU yn teithio ar gyfer gwaith a hamdden.

Hyd nes y 1950au byddai'r rhan fwyaf o bobl yn teithio o gwmpas ar droed neu ar drafnidiaeth gyhoeddus. Ers hynny mae perchnogaeth car wedi cynyddu'n gyflym, a dros yr hanner can mlynedd diwethaf gwelwyd symudiad enfawr i siwrneiau mewn car, gyda gostyngiad llym mewn defnydd o drafnidiaeth gyhoeddus. Er enghraifft, ym 1952 roedd 42% o siwrneiau yn y DU yn digwydd mewn bws, ond erbyn 2016 roedd y ffigur hwn wedi gostwng i 5% yn unig. Cynyddodd siwrneiau car yn gyflym iawn o 27% i 83% dros yr un cyfnod.<sup>1</sup>

Yn lleol nid oes yn rhaid i ni edrych yn rhy bell yn ôl i weld y trawsnewidiad sylweddol hwn. Yn y 1920au roedd tramiau yn eu hanterth yng Nghaerdydd, gyda rhwydwaith eang ledled y ddinas a theithiwyd swm rhyfeddol o 42 miliwn

siwrnai teithwyr yn y ddinas bob blwyddyn, neu tua 180 o siwrniau fesul preswlydd bob blwyddyn.<sup>2</sup> Ym 1950 caeodd y system tramiau yng Nghaerdydd, ond roedd trolibysiau - rhyw fath o fws trydan - i'w gweld yn gyffredin wedi hyn, hyd nes y caeodd y rhwydwaith hwnnw ym 1970.<sup>3</sup>

### Ffigur 1. Tram yn rhedeg ar hyd Heol Casnewydd yng Nghaerdydd<sup>2</sup>



Gwnaed 42 miliwn o siwrneiau ar y tram yng Nghaerdydd ym 1928. Caeodd y tram ym 1950.

Caeodd y llinell rheilffordd rhwng y Barri a Phen-y-bont ar Ogwr yn y Fro gyda rhaglen Beeching yn y 1960au, a dim ond yn 2005 y gwnaeth ailagor. Fodd bynnag, dros y ganrif flaenorol bu rhwydwaith reilffordd llawer mwy eang yn y Fro, yn cynnwys llinell Rheilffordd y Bont-faen, a agorodd ym 1865.

**Ffigur 2. Gorsaf Reilffordd y Bont-faen<sup>13</sup>**



Yn wreiddiol, rhoddodd y car deimlad o ryddid a'r gallu i bobl gadw mewn cysylltiad yn haws gyda ffrindiau a theulu, gan hwyluso lledaeniad daearyddol pellach o'r rhwydweithiau cymdeithasol pwysig hyn.

Fodd bynnag, roedd pris i'w dalu am drawsnewidiad mewn cludiant: dirywiad mawr mewn lefelau gweithgarwch corfforol, gyda nifer o oedolion nawr yn treulio eu bywydau effro yn eistedd mewn car, wrth ddesg yn y swyddfa neu ar y sofya, gyda fawr ddim gweithgarwch corfforol rhwng y cyfnodau hyn. Yn wir, erbyn hyn mae chwarter yr oedolion yng Nghaerdydd a Bro Morgannwg yn cael eu dosbarthu'n 'anegniol' gan eu bod yn gwneud llai na hanner awr o weithgarwch corfforol mewn wythnos gyfan.<sup>4</sup>

Nid yw effeithiau ar iechyd wedi'u cyfyngu i newidiadau mewn gweithgarwch corfforol: effeithiodd defnydd car hefyd ar lygredd aer, arwahanrwydd cymdeithasol, llygredd sŵn, mynediad at ofodau gwyrdd ac anghydraddoldebau iechyd.

Mae'r cynnydd cyflym mewn defnydd car wedi lleihau'r galw am drafnidiaeth gyhoeddus, gan arwain at leihad mewn amllder a nifer y

llwybrau. Oherwydd bod llai o wasanaethau mae trafndiaeth gyhoeddus wedi dod yn ddewis llai ymarferol ar gyfer rhai siwrneiau, gan leihau'r galw ymhellach. Rhwng 2007 a 2014, lleihaodd defnydd bysiau gan 4% yng Nghaerdydd,<sup>5</sup> ac eto dywed un rhan o dair o breswylwyr (35%) Caerdydd bod amllder ac argaeledd trafndiaeth gyhoeddus yn broblem fawr.<sup>5</sup> Er y dywed 90% o'r preswylwyr eu bod yn fodlon gyda thrafnidiaeth gyhoeddus yn y Fro, mae cyfraddau'r defnydd yn llawer is.<sup>6</sup>

Dros y pum mlynedd diwethaf mae cost tocynnau rheilffordd wedi cynyddu 15%, ac mae costau bws/taksi wedi cynyddu 14%, tro bod cost rhedeg car wedi gostwng 5%.<sup>7</sup> Yn y 1950au roedd dros 1 o bob 10 (11%) siwrnai yn y DU yn cael eu gwneud ar feic, ond 1% yw'r ffigur yma erbyn hyn. Mae cynnydd mewn trafndiaeth fodurol ar y ffyrdd, mewn ardaloedd gwledig a threfol, hefyd wedi cael effaith ar pa mor ddiogel y mae pobl yn teimlo wrth feicio.



Dros y pum mlynedd diwethaf mae cost rhedeg car wedi lleihau 5% tra bod cost bws wedi cynyddu 14%

Mae' DU yn dal i fod wrth ei bodd gyda'i cheir. Yn 2015, cyrhaeddodd cyfanswm traffig cerbydau ym Mhrydain Fawr y lefel uchaf erioed o 317 biliwn o filltiroedd yn cael eu teithio mewn blwyddyn, a theithiwyd y mwyafrif ohonynt mewn ceir a thacsis.<sup>8</sup> Mae twf mewn lefelau traffig dros y 10 mlynedd diwethaf wedi bod yn uwch yng Nghymru (5.9%) nac yng ngwledydd eraill y DU.<sup>9</sup> Ar hyn o bryd mae 206,000 o geir trwyddedig yng Nghaerdydd a'r Fro.<sup>10</sup> Bydd twf poblogaeth yn y rhanbarth, yn arbennig yng Nghaerdydd, yn rhoi straen gynyddol ar y rhwydwaith ffyrdd os na cheir newid mewn agwedd.<sup>5</sup>

## Yn 2015, cyrhaeddodd cyfanswm traffig cerbydau ym Mhrydain Fawr y lefel uchaf erioed

Mae cymudo i Gaerdydd yn giplun o hyn: bob dydd bydd dros 80,000 o bobl yn teithio i Gaerdydd o ardaloedd awdurdodau lleol cyfagos, yn cynnwys 20,000 o'r Fro, ar gyfer gwaith.<sup>5</sup> Mae hyn yn cyfateb i tua un rhan o dair o'r bobl sy'n gweithio yng Nghaerdydd. Mae'r mwyafrif helaeth (tua 80%) o'r rheini sy'n teithio i mewn o ardaloedd awdurdodau cyfagos ar hyn o bryd yn gwneud hynny mewn car.<sup>5</sup> Mae tua 59,000 o breswylwyr gweithiol ym Mro Morgannwg, ac mae tua hanner (28,500) ohonynt yn gweithio yn yr ardal a hanner (30,300) ohonynt yn cymundo allan o'r ardal; mae tua 14,000 o bobl yn cymudo i'r Fro. Mae'r mwyafrif sy'n cymudo allan yn gweithio yng Nghaerdydd, gyda niferoedd llai yn cymudo i Ben-y-bont ar Ogwr a Rhondda Cynon Taf.<sup>11</sup>

Ymhlith staff sy'n gweithio yn BIP Caerdydd a'r Fro, dywed dros 1 o bob 6 (17%) eu bod yn cerdded neu'n beicio i'r gwaith, mae 8% yn defnyddio trafndiaeth gyhoeddus ac 8% yn rhannu eu siwrnai mewn car gyda chydweithiwr, gyda'r gweddill yn teithio mewn car ar eu pen eu hunain.<sup>12</sup>

Un nodyn cadarnhaol yw er bod defnydd rheilffordd yn gyffredinol yn parhau'n is nag ydoedd yn y 1950au (10% o siwrneiau o gymharu â 17% yn flaenorol) mae hyn wedi bod yn cynyddu'n raddol yn dilyn y pwynt isaf o 5% yng nghanol y 1990au.<sup>1</sup>

## Ein hamgylchedd adeiledig

Wrth i'n dulliau teithio newid dros y can mlynedd diwethaf, mae ein hamgylchedd adeiledig wedi dilyn yr un patrwm. Yn ogystal

â dirywiad yn y seilwaith trafndiaeth gyhoeddus eang blaenorol ar gyfer tramiau, bysiau a rheilffyrdd, mae ein hamgylchoedd gwledig a threfol wedi cael eu siapio'n barhaol gan y car. Bydd angen ymdrech sylweddol i wyrdroi'r patrwm hirsefydledig hwn.<sup>14</sup>

Mae cerbydau nas defnyddir, sydd wedi'u parcio, yn llenwi rhan sylweddol o'n gofod trefol - ar ffyrdd a thu allan i dai, siopau a gwaith. Er gwaethaf ymdrechion calonogol i wyrdroi'r tuedd dros y blynyddoedd diwethaf, mae ein rhwydwaith ffyrdd wedi'i gynllunio i hwyluso symudiad ceir, yn hytrach na diwallu anghenion cerddwyr neu feicwyr. Bydd cyffyrdd yn aml yn rhoi blaenoriaeth i geir dros feicwyr a cherddwyr.

Er bod rhai enghreifftiau o seilwaith beicio rhagorol yn lleol, mae dal gormod o enghreifftiau o lonydd beiciau sy'n dechrau ac yn gorffen yn anghyson, gyda dim i atal llif parhaus ceir sy'n ddisgwylidig erbyn hyn gan yrwyr.

## Mae'r rhan fwyaf o ddatblygiadau tai a masnachol dros yr 50 mlynedd diwethaf



wedi cael eu siapio gan geir, nid pobl

Mae'r rhan fwyaf o ddatblygiadau tai a masnachol dros yr 50 mlynedd diwethaf wedi cael eu siapio gan geir, nid pobl. Mae'r cynnydd mewn canolfannau siopau a swyddfeydd ar gyrion trefi wedi golygu bod angen teithio mewn car (a pherchnogaeth car) ar lawer o bobl.

Ar yr un pryd, mae cynnydd mewn traffig ar y ffyrdd wedi arwain at leihad graddol mewn gofodau gwyrdd trefol, ac mewn gofodau gwyrdd heddychlon heb darfiad mewn ardaloedd gwledig.

# Yr effeithiau ar iechyd a lles

Mae'r newid mawr mewn sut mae pobl yn teithio o gwmpas, a'r newid mewn amgylchedd adeiledig a ddaeth yn sgil hyn, yn ein rhoi'n agored i gyfuniad o ffactorau risg y gwyddom sy'n arwain yn uniongyrchol at salwch difrifol a lleihad mewn disgwyliad oes.



## Anweithgarwch corfforol a ffordd o fyw eisteddog

**Effeithiau ar iechyd:** risg gynyddol o farwolaeth o ganlyniad i unrhyw achos; risg gynyddol o glefyd cardiofasgwlaidd, canser a diabetes math 2; effeithiau anffafriol ar les meddwl



Mae dros hanner (54%) yr oedolion yng Nghaerdydd a'r Fro dros bwysau neu'n ordew

Mae dros hanner (54%) yr oedolion, ac un rhan o bump (21.5%) o blant 4-5 oed, yng Nghaerdydd a'r Fro dros bwysau neu'n ordew,<sup>4</sup> gyda'r cyfraddau'n uwch mewn ardaloedd mwy amddifadus. Mae gordewdra yn fater cymhleth sydd wedi'i drafod mewn adroddiadau blynyddol blaenorol, ond gwyddom fod newidiadau mewn lefelau gweithgarwch corfforol yn ysgogwr allweddol yr epidemig presennol.<sup>15</sup> Mae lefelau gweithgarwch corfforol ar gyfer nifer o bobl yn annigonol er mwyn cynnal iechyd da: nid yw dau o bob pump (41%) oedolyn yn ein hardal yn gwneud digon o weithgarwch corfforol, gyda dros chwarter (27%) ohonynt yn cael eu dosbarthu'n anegniol (llai na 30 munud o weithgarwch corfforol mewn wythnos).<sup>4</sup>

Er bod lefelau gweithgarwch corfforol ar draws Cymru ar y cyfan yn sefydlog, mae hyn yn cuddio

cynnydd diweddar mewn gweithgarwch ymhlith y lleiaf amddifadus. Ni welwyd hyn ymhlith y mwyaf amddifadus, gan arwain at waeth anghydraddoldebau iechyd.<sup>16</sup> Merched yn eu harddegau sydd â'r lefelau gweithgarwch corfforol isaf yng ngwledydd y DU, gyda dim ond 8% o ferched yn eu harddegau yng Ngymru yn bodloni'r canllawiau gweithgarwch corfforol.<sup>16</sup>

Mae llai nac 1 o bob 10 (8%) o ferched yn eu harddegau yng Nghymru yn bodloni'r canllawiau gweithgarwch corfforol

Mae perchnogaeth car wedi'i gysylltu i faint o gerdded a beicio y mae pobl yn ei wneud, gyda chanfyddiad bod siwrneiau car yn ddiethriad yn gyflymach ac yn haws na theithio llesol. Rydych yn llawer llai tebygol i deithio'n llesol os oes gennych gar (37% gyda char, o gymharu â 71% heb un).<sup>17</sup> Cysylltir defnydd car gyda risg gynyddol o ordewdra, tra cysylltir cerdded a defnydd trafndiaeth gyhoeddus gyda pheidio â bod dros bwysau neu'n ordew.<sup>18</sup> Mae teithio llesol yn llai cyffredin mewn ardaloedd gwledig o gymharu ag amgylcheddau trefol yn y DU, a daw'n llai cyffredin wrth i bobl fynd yn hŷn.<sup>17</sup>

Rydych yn llawer llai tebygol o deithio'n llesol os oes gennych gar

Gwyddom nawr fod peidio â gwneud digon o weithgarwch corfforol a bod yn eisteddog yn beryglus i'n hiechyd.<sup>19,20</sup> Cysylltir bod yn eisteddog gyda chynnydd mewn marwolaeth o ganlyniad i unrhyw achos o dros un rhan o bump (22%), a chynnydd o tua un o bob saith yn y perygl o farwolaeth o ganlyniad i glefyd cardiofasgwlaidd (15%) a chanser (13%). Mae'r perygl o gael diabetes math 2 bron yn dyblu (91%), sy'n ysgytwol. Mae'r effeithiau hyn hyd yn oed yn fwy amlwg os na wrthbwysir gweithgaredd eisteddog gyda gweithgarwch corfforol rheolaidd.<sup>19</sup> Ar hyn o bryd mae dros 24,000 o bobl wedi'u cofnodi fel rhai sydd â diabetes yng Nghaerdydd a'r Fro.<sup>21</sup>



Mae'r Academi Colegau Meddygol Brenhinol wedi argymhell "bod angen newid mewn diwylliant fel na chaiff ei ystyried yn 'normal mwyach i dreulio cyfnod hir o amser yn eistedd mewn ceir."<sup>22</sup>

Cysylltir ffyrdd o fyw eisteddog gyda chynnydd o 91% yn y perygl o gael diabetes math 2



## Llygredd aer

**Effeithiau ar iechyd:** cysylltiedig â chlefydau cardiofasgwlaidd ac anadlol, strôc, canser, diabetes, pwysau geni isel, dementia

### Natur llygredd aer

Gwnaed datblygiadau da mewn diogelu'r amgylchedd yn y 1950au gyda chyflwyniad y Ddeddf Aer Glân, a orfododd ardaloedd rheoli mwg mewn rhai dinasoedd er mwyn lleihau mwrlwch a llygredd aer gan swlffwr deuocsid.<sup>23</sup>

Y prif lygryddion sy'n peri pryder heddiw yw nitrogen deuocsid (NO<sub>2</sub>) a deunydd gronynnol (PM<sub>2.5</sub> a PM<sub>10</sub>). Prif ffynhonnell y ddau lygrydd yw allyriadau cerbydau, yn arbennig y rheini o gerbydau disel, er bod ffynonellau diwydiannol, amaethyddol a domestig i'w cael hefyd. Mae allyriadau pibell fwg yn parhau i gael eu creu pan fydd cerbydau disel neu betrol yn llonydd a bod yr injan ymlaen, ac mae tagfeydd traffig yn dueddol o waethygu allyriadau.

Mae marwolaethau o ganlyniad i ddeunyddiau gronynnol yn cynyddu'n raddol gyda dod i gysylltiad ag ef ar gyfer pobl dros 65 oed, hyd yn oed ar grynodiadau is na chanllawiau presennol Sefydliad Iechyd y Byd a lefelau cyfreithlon yr UE, ar gyfer cysylltiad dros gyfnod byr ac yn yr hirdymor.<sup>25</sup>

Cyfansoddyn o PM<sub>10</sub> a gynhyrchir gan ddiselau yw Benzoapyrene (BaP); mae cysylltiad wedi'i wneud rhwng mamau sy'n dod i gysylltiad â BaP â phroblemau iechyd meddwl mewn plentyndod ac oedi niwrowybyddol.<sup>26</sup> Cynyddodd allyriadau BaP gan 52% yn yr UE rhwng 2000 a 2014, gydag 80% o'r boblogaeth drefol yn dod i gysylltiad â lefelau uwch na therfynau Sefydliad Iechyd y Byd.<sup>26</sup>



Mae crynodiadau NO<sub>2</sub> ochr ffordd, a allyrrir yn bennaf gan gerbydau disel, wedi bod yn uwch na'r terfyn cyfreithlon mewn bron i 90% o ardaloedd trefol yn y DU ers 2010.<sup>27</sup> Cerbydau HGV, LGV a bysiau sy'n gyfrifol am ychydig dros hanner yr allyriadau, gyda cheir preifat a thacsis yn gyfrifol am y gweddill.<sup>28</sup> Lefelau NO<sub>2</sub> yn ardaloedd preswyl Caerdydd a'r Fro yw'r uchaf yng Nghymru.<sup>29</sup>

## Lefelau NO<sub>2</sub> yn ardaloedd preswyl Caerdydd a'r Fro yw'r uchaf yng Nghymru.

Mae llygredd deunydd gronynnol (PM<sub>2.5</sub>) hefyd yn uwch yng Nghaerdydd a'r Fro nac yn holl ardaloedd Byrddau Iechyd Lleol eraill Cymu. Caerdydd sydd â'r crynodiad cyfartalog blynyddol uchaf, wedi'i bwysoli ar gyfer y boblogaeth, o blith ardaloedd awdurdod lleol, sef 9.5 µg m<sup>-3</sup>. Mae hyn ychydig yn is na'r cymedr ar gyfer Lloegr (9.9 µg m<sup>-3</sup>) ond yn uwch na'r crynodiadau cyfartalog yn yr Alban (6.8) a Gogledd Iwerddon (6.6). Oherwydd y lefelau llygredd aer, ar hyn o bryd mae pedair ardal rheoli ansawdd aer (AQMA) statudol wedi'u dynodi yng Nghaerdydd, ac un yn y Fro (gweler Blwch 1). Oherwydd priodweddau llygredd deunydd gronynnol, mae tystiolaeth yn awgrymu nad oes trothwy 'diogel', felly mae'n debygol bod llawer yn fwy o bobl yn cael eu heffeithio gan gysylltiad â llygredd aer y tu hwnt i'r 'llecynnau â phroblem' lleoledig hyn.

### Blwch 1. Ardaloedd rheoli ansawdd aer yng Nghaerdydd a'r Fro<sup>30</sup>

Canol Dinas Caerdydd, Caerdydd  
Llandaf, Caerdydd  
Stephenson Court, Caerdydd  
Pont Trelai, Caerdydd  
Cogan, Penarth

Nid dim ond o geir y daw llygredd trafndiaeth: gall bysiau a threnau disel hefyd fod yn

gyfranwyr sylweddol ac mae angen i unrhyw gynllun i leihau llygredd aer fynd i'r afael â hyn hefyd.<sup>31,32</sup> Canfu astudiaeth ddiweddar fod lefelau llygredd aer mewn gorsaf reilffordd fawr yn Llundain yn uwch na'r rheini ar ffordd brysur tu allan.<sup>31</sup>

Y duedd gyffredinol ar gyfer llygredd aer gan drafnidiaeth yw lleihad dros y ddau ddegawd diwethaf,<sup>8</sup> ond mae'n parhau'n llawer uwch nag y dylai fod ar gyfer iechyd da.



## Dod i gysylltiad â llygredd aer

Mae'r berthynas rhwng dod i gysylltiad â llygredd aer a'r dull trafndiaeth yn gymhleth.<sup>27,33-35</sup>

Mae cysylltiad â llygredd aer yn gyffredinol uwch pan fydd rhywun yn eistedd y tu mewn i gerbyd nag y tu allan ar y ffordd, oherwydd bod systemau awyru cerbyd yn sugno'r aer llygredig o'r cerbyd o'i flaen ac yn ei ail-gylchdroi a'i grynhoi mewn ardal fechan. Fodd bynnag, oherwydd bod teithio llesol yn cynyddu'r gyfradd anadlu, mae swm y llygrydd a fewnanadlir yn gyffredinol uwch ar gyfer dulliau teithio llesol. Er hyn, oherwydd manteision llethol gweithgarwch corfforol ar y broses gardiofasgwlaidd ac iechyd yn gyffredinol, mae pobl sy'n teithio mewn trafndiaeth moduro yn dal i leihau eu disgwyliad oes gan flwyddyn ar gyfartaledd o gymharu â phobl sy'n teithio'n llesol.<sup>36</sup> Pan grëir llwybrau teithio llesol oddi wrth ffyrdd prysur, ac wrth i gerbydau sy'n llygru llai ddod yn fwy cyffredin, mae manteision teithio llesol yn cynyddu ymhellach.





“Mae plant sy’n eistedd mewn sedd gefn cerbyd yn debygol o ddod i gysylltiad â lefelau peryglus o lygredd aer. Pe byddai mwy o yrwyr yn gwybod am y difrod y gallent fod yn ei wneud i’w plant, byddent yn meddwl eilwaith ynglŷn â mynd i mewn i’r car.”

Yr Athro Syr David King, cyn Brif Gynghorydd Gwyddonol i’r Llywodraeth<sup>27</sup>

Nid yw lefelau uchel o lygredd aer wedi’u cyfyngu i briffyrdd. Canfu astudiaeth ddiweddar i lygredd aer amcangyfrifedig o amgylch cyfleusterau iechyd yn Llundain bod dros hanner y safleoedd GIG ym mhrifddinas Lloegr yn uwch na’r terfynau cyfreithlon.<sup>37</sup> Argymhellodd yr awduron y dylai sefydliadau ledled y DU adolygu lefelau llygredd aer o amgylch cyfleusterau iechyd fel mater o frys.



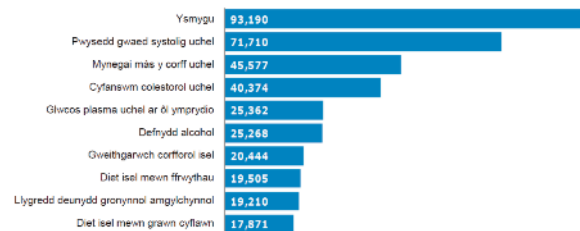
### Effeithiau llygredd aer ar iechyd

Gan ddefnyddio modelu rhyngwladol, amcangyfrifwyd bod tua 40,000 o farwolaethau ledled y DU o ganlyniad i lygredd aer (PM<sub>2.5</sub> a NO<sub>2</sub>) bob blwyddyn.<sup>38</sup> Yng Nghymru, amcangyfrifir bod nifer sy’n cyfateb i 1,600 o farwolaethau y gellir eu hosgoi bob blwyddyn o ganlyniad i ddeunydd gronynnol, a 1,100 o ganlyniad i gysylltiad ag NO<sub>2</sub>.<sup>29</sup>

Amcangyfrifir bod 143 o farwolaethau bob blwyddyn yng Nghaerdydd a 53 bob blwyddyn yn y Fro ymhlith rhai dros 25 oed o ganlyniad i lygredd aer a achoswyd gan ddeunydd

gronynnol, a bydd 2,100 o fywydau’n cael eu colli bob blwyddyn.<sup>39</sup> Amcangyfrifir bod cysylltiad hirdymor â deunydd gronynnol yn gyfrifol am 5.1% o’r holl farwolaethau yng Nghaerdydd a’r Fro.<sup>29,39</sup> Ar draws Cymru, mae’r blynyddoedd o fywyd a gollir o ganlyniad i lygredd aer yn ei roi yn nawfed allan o’r 10 ffactor uchaf o risg addasadwy, ond mae tri ffactor risg arall a gysylltir ag amgylchedd dibynnol ar y car, sef pwysedd gwaed uchel, Mynegai Màs y Corff uchel, a gweithgarwch corfforol isel hefyd yn y 10 uchaf (gweler Ffigur).<sup>16</sup>

**Ffigur 3. 10 ffactor risg uchaf ar gyfer blynyddoedd o golled bywyd yng Nghymru (2015). Mae pedwar o’r deg uchaf yn cael eu heffeithio gan ddefnydd car.<sup>16</sup>**

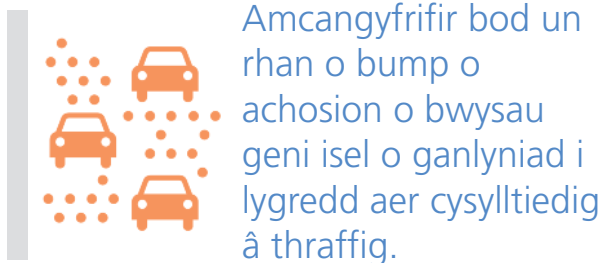


### Amcangyfrifir bod 5% o’r marwolaethau yng Nghaerdydd a’r Fro o ganlyniad i lygredd aer deunydd gronynnol

Mae llygredd aer wedi’i gysylltu i ganser, asthma, clefyd rhwystrol cronig yr ysgyfaint, niwmonia, strôc a chlefyd y galon, diabetes, gordewdra a newidiadau sydd wedi’u cysylltu â dementia.<sup>38,40</sup> Mae cysylltiad hirdymor yn lleihau disgwyliad oes, yn bennaf oherwydd cynnydd mewn clefyd cardiofasgwlaidd, clefyd anadlol a chanser yr ysgyfaint.<sup>40,41</sup>

Mae plant bedair gwaith yn fwy tebygol i fod â gweithrediad ysgyfaint wedi'i leihau'n sylweddol mewn bywyd fel oedolyn os ydynt yn byw mewn ardaloedd o lygredd uchel.<sup>40</sup> Canfu un astudiaeth arfaethedig fod y perygl bod oedolion yn datblygu diabetes math 2 yn cynyddu gan hyd at 10% ar gyfer pob cynnydd o  $10\mu\text{g}\text{m}^{-3}$  mewn dod i gysylltiad â llygryddion.<sup>40</sup>

Mae aer budr hefyd wedi'i gysylltu â genedigaethau cynamserol a phwysau geni isel. Amcangyfrifir bod un rhan o bump o achosion o bwysau geni isel o ganlyniad i lygredd aer cysylltiedig â thraffig, gyda'r niwed mwyaf yn digwydd pan ddeuir i gysylltiad mewn beichiogrwydd cynnar.<sup>40</sup> Cysylltwyd dod i gysylltiad ag  $\text{NO}_2$  ag amhariad niwrodablygiadol, a risg gynyddol o anhwylder diffyg canolbwyntio a gorfywiogrwydd (ADHD) mewn plant.<sup>40</sup>



Gall cysylltiad tymor byr â llygredd aer arwain at effeithiau negyddol ar weithrediad yr ysgyfaint, gwaethygiad cyflyrau megis asthma, a chynnydd mewn derbyniadau i'r ysbyty a marwolaethau.<sup>41</sup>

Amcangyfrifwyd bod problemau iechyd o ganlyniad i lygredd aer yn y DU yn costio dros £20 biliwn y flwyddyn i gymdeithas, busnesau a'r GIG (Blwch 2).<sup>40</sup>



## Blwch 2. Effeithiau llygredd aer ar iechyd

“Mae difrod [a achosir gan lygredd aer] yn digwydd dros hyd oes, o wythnosau cyntaf baban yn y groth yr holl ffordd i henaint.... Bydd niwed i fabanod a phlant yn cael effaith sy'n para ymhell i'r dyfodol. Am yr un rheswm, bydd unrhyw welliannau a wnawn nawr i ansawdd aer yn cael manteision a fydd yn para'n hir. Mae pobl hŷn, ac oedolion sydd â chyflyrau hirdymor hefyd yn agored i effeithiau llygredd aer. Bydd gwella ansawdd aer yn eu helpu i barhau'n annibynnol, gan roi budd i unigolion ac ysgafnhau'r pwysau ar ein GIG a'n gwasanaethau cymdeithasol.”  
Every breath we take: the lifelong impact of air pollution. Coleg Brenhinol y Ffisegwyr a Choleg Brenhinol Pediatreg ac Iechyd Plant (2016)<sup>40</sup>



## Anafiadau a marwolaethau traffig ar y ffordd

**Effeithiau ar iechyd:** anafiadau difrifol a marwolaethau o ganlyniad i drawma corfforol; effeithiau cynyddol ar lefelau teithio llesol ymhlith y boblogaeth; llai o blant yn chwarae allan yn yr awyr agored

Hyd yn oed gyda gwelliannau sylweddol mewn diogelwch ar y ffordd dros y 30 mlynedd diwethaf, datblygiadau mewn offer diogelwch ceir, newid yn y diwylliant yfed a gyrru a gorfodi terfynau cyflymder, mae marwolaethau ac anafiadau sy'n gysylltiedig â cheir yn parhau'n gyffredin.

Mae 20 o ddamweiniau ar y ffordd sy'n achosi marwolaeth neu anaf difrifol bob wythnos yng Nghymru

Roedd 975 o ddamweiniau ar y ffyrdd yng Nghymru a achosodd farwolaeth neu anaf difrifol yn 2016, neu bron i 20 o ddamweiniau difrifol bob wythnos. Bu farw 103 o bobl mewn damweiniau ar y ffyrdd yng Nghymru llynedd, sy'n cyfateb i ddau berson yr wythnos. Yn anffodus mae ystadegau o'r fath mor gyffredin ac yn elfen sy'n rhan o yrru a ystyrir yn dderbyniol fel nad ydynt mwyach yn peri pryder i'r cyhoedd - ond pe bai'r nifer hynny o ddigwyddiadau neu farwolaethau ar y rheilffyrdd yng Nghymru bob blwyddyn fe fyddai banllefau o brotest gan y cyhoedd.

**Mae hanner gyrrwyr ceir mewn parthau cyflymder 30mya yn gyrru'n gyflymach na'r terfyn cyflymder fel mater o arfer**



Mae gorfodi terfynau cyflymder yn bwysig, gyda hanner (52%) y gyrrwyr ceir mewn parthau cyflymder 30mya yn gyrru'n gyflymach na'r terfyn cyflymder fel mater o arfer.<sup>8</sup> Canfu ffigurau ar gyfer Prydain Fawr bod chwarter (24%) y rhai sy'n marw ar y ffyrdd yn gerddwyr.<sup>42</sup> Mae nifer y digwyddiadau a'r anafedigion yn sensitif iawn i gyflymder. Amcangyfrifir bod lleihad gan 1mya yn unig mewn cyflymder yn lleihau digwyddiadau gan 5-6% ar ffyrdd trefol.<sup>43</sup>

Achos mwyaf cyffredin marwolaeth ar gyfer plant 5-14 oed yw cael eu taro gan gerbyd.<sup>44</sup> Mae'r rheini sydd dros 60 oed saith gwaith yn fwy tebygol o farw drwy gael eu taro gan gar yn teithio ar 30mya o gymharu â grwpiau oedran eraill;<sup>44</sup> mae dros draean (35%) o'r holl gerddwyr sy'n marw yn bobl 70 oed a throsodd.

**Achos mwyaf cyffredin marwolaeth ar gyfer plant 5-14 oed yw cael eu taro gan gerbyd.**

Mae canfyddiad diogelwch ar y ffyrdd hefyd wedi cael effaith sylweddol ar barodrwydd pobl i feicio ar gyfer gwaith a hamdden, yn ogystal â pharodrwydd rhieni i adael i'w plant chwarae allan ar y stryd. Mae hyn yn cyd-fynd â chynnydd yn 'amser sgrin' plant - faint o amser y mae plant a phobl ifanc yn ei dreulio ar ddyfeisiau electronig.<sup>45</sup> Mae chwarae, yn cynnwys chwarae yn yr awyr agored, yn eithriadol o bwysig i ddatblygiad corfforol a lles meddyliol plant.<sup>46</sup>



**Cynnydd mewn unigrwydd ac arwahanrwydd cymdeithasol**

**Effeithiau ar iechyd:** Dirywiad mewn lles meddyliol a disgwyliad oes is

Dywed dau ar bymtheg y cant o bobl yng Nghymru eu bod yn unig,<sup>47</sup> gyda chanlyniadau o arolwg lleol diweddar yng Nghaerdydd a'r Fro yn gosod y ffigur ar bron i 1 o bob 4 (23.3%) ymhlith pobl mewn grwpiau mwy agored i niwed.<sup>48</sup> Wrth i ddefnydd car ddod yn fwy cyffredin, mae rhwydweithiau cymdeithasol a chefnogaeth pobl hefyd wedi dod yn fwy daearyddol wasgaredig.



**Dywed bron i 1 o bob 4 o'r bobl agored i niwed yng Nghaerdydd a'r Fro eu bod yn unig peth o'r amser neu trwy'r amser**

Canfuwyd bod pa mor dda y mae pobl wedi'u cysylltu i'w cymdogion, a faint ohonynt y maent yn eu hystyried yn ffrindiau, yn uniongyrchol gysylltiedig yn y DU ac yn rhyngwladol â swm y traffig ar eu stryd.

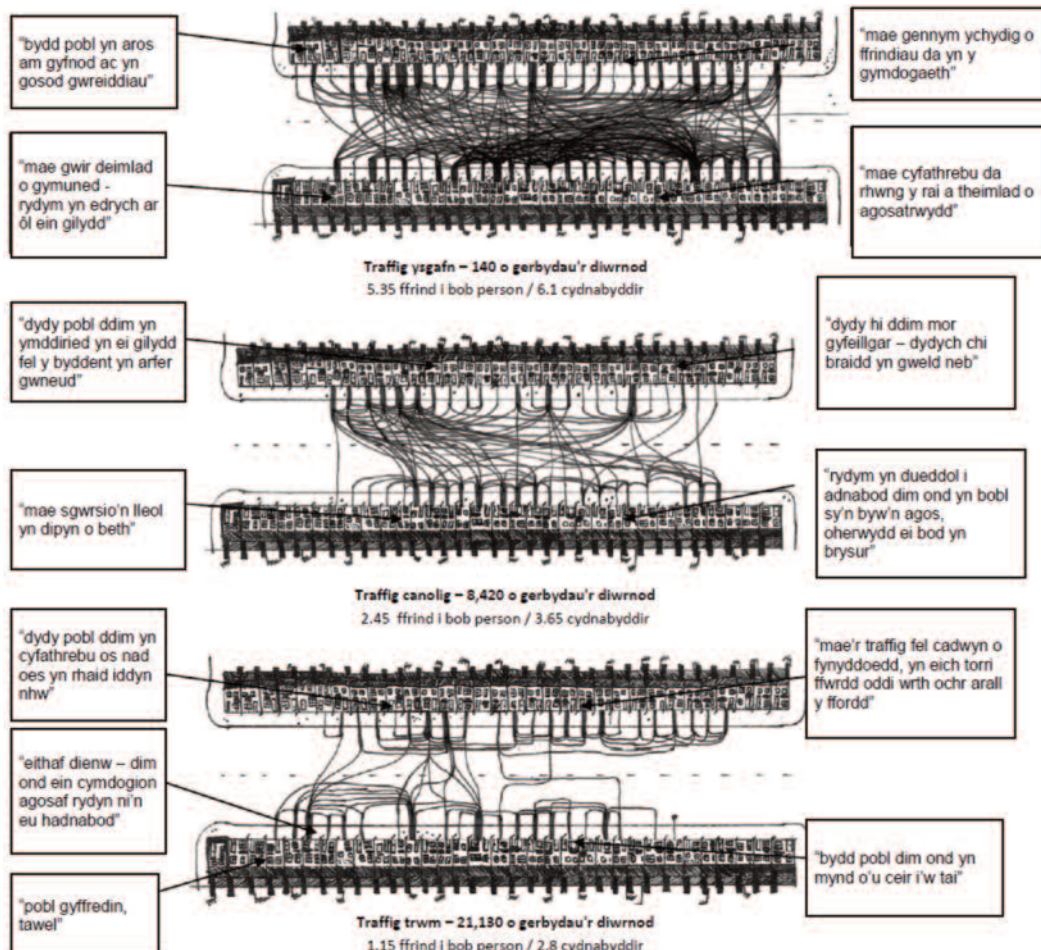
Gan ailadrodd astudiaeth glasurrol a gynhaliwyd yn UDA yn y 1960au, canfu astudiaeth ym Mryste yn 2008 bod nifer

ffrindiau neu gydnabod a adroddwyd gan breswylwyr yn arwyddocaol is ar strydoedd oedd â symiau uwch o gerbydau modur.<sup>49</sup> Gofynnodd yr astudiaeth i breswylwyr ar strydoedd oedd yn dawel, canolig a phrysur o ran traffig i dynnu llinellau ar fap o'u stryd yn dangos lle roedd eu ffrindiau neu eu cydnabod yn byw ar y stryd (gweler Ffigur 4). Cyfartaledd nifer ffrindiau pob preswlydd ar y stryd o draffig ysgafn oedd 5.35, o gymharu â 2.45 ar y stryd o draffig canolig a 1.15 ar y stryd o draffig trwm. Dywedodd preswylwyr ar y stryd traffig ysgafn bod yno hefyd fwy o deimlad o gymuned ac agosatrwydd.

## Dywedodd preswylwyr ar y stryd traffig ysgafn bod yno hefyd fwy o deimlad o gymuned ac agosatrwydd

Mae'r ddibyniaeth gynyddol ar ddefnydd car i gyrraedd siopau, banciau a chyfleusterau cymunedol wedi cael effaith benodol mewn cymunedau gwledig. Er ei bod ychydig yn anghyfleus i bobl sydd â char, mae'r rheini sydd heb un yn dod yn ddibynnol ar drafndiaeth gyhoeddus aml a hawdd ei gyrchu i gyrraedd

**Ffigur 4. Sut mae rhyngweithiadau cymuned yn amrywio yn ôl swm y traffig.<sup>49</sup>**





cyfleusterau a chynnal eu rhwydweithiau cymdeithasol a'u hannibyniaeth.

Cysylltwyd cynnydd yn y defnydd o'r car gyda 'datgysylltiad', arwahanwydd unigolion a chymunedau er enghraifft lle mae ffordd lydan a phrysur yn gwneud teithiau byr ar droed yn anodd.<sup>18</sup>

Caiff unigrwydd ac arwahanrwydd cymdeithasol effaith uniongyrchol ar hyd bywyd yn ogystal â'i ansawdd. Canfu astudiaethau bod lefelau isel o integreiddiad cymdeithasol, ac arwahanrwydd, yn cynyddu marwolaethau'n sylweddol. Canfu un astudiaeth bod arwahanrwydd cymdeithasol yn cynyddu'r perygl o farwolaeth gan un chwarter (26%), wedi'i gyfyngu'n rhannol ond nid yn llwyr gan salwch hirdymor ac amddifadedd cymdeithasol.<sup>50</sup> Mae cyfranogiad cymdeithasol yn gweithredu fel ffactor amddiffynnol yn erbyn dementia a dirywiad gwybyddol mewn pobl dros 65 oed.<sup>51</sup>

Mae lleihau defnydd ceir a chyflymder traffig, a chynyddu mynediad at drafnidiaeth gyhoeddus a theithio llesol wedi eu hamlygu fel blaenoriaethau mewn adroddiad rhyngwladol sy'n edrych ar heneiddio iachus mewn dinasoedd.<sup>52</sup>

Mae lleihau defnydd o'r car a chynyddu mynediad at drafnidiaeth gyhoeddus yn cynorthwyo heneiddio iachus mewn amgylcheddau trefol

## Sŵn trafnidiaeth

**Effeithiau ar iechyd:** cysylltiedig â phwysedd gwaed uchel

Mae tystiolaeth i ddangos bod trafnidiaeth ffordd yn cynhyrchu llygredd sŵn gan arwain at lefelau sŵn sy'n uwch na chanllawiau Sefydliad Iechyd y Byd ar gyfer dros 200,000 o bobl yng Nghymru.<sup>53</sup> Mae'r mwyafrif o'r rhain yn Ne Cymru; yn ein hardal ni maent wedi'u canolbwyntio o gwmpas priffyrdd allweddol yn cynnwys yr M4, A4232, A48 a llwybrau allweddol yng Nghaerdydd.<sup>54</sup>

Er y gellid teimlo bod sŵn trafnidiaeth yn ganlyniad anochel i fyw mewn ardal drefol, neu'n agos at ffordd fawr, caiff effaith niweidiol hirdymor ar iechyd cardiofasgwlaidd, a chaiff ei gysylltu â chynnydd bychan ond arwyddocaol mewn lefelau pwysedd gwaed uwch.<sup>55</sup> Hefyd mae wedi'i gysylltu ag amhariad ar ddatblygiad deallusol plant, tarfu ar gwsg a lleihau lles.<sup>18,56</sup>

Cysylltir sŵn traffig gyda phwysedd gwaed uchel, amhariad ar ddatblygiad deallusol plant a tharfu ar gwsg

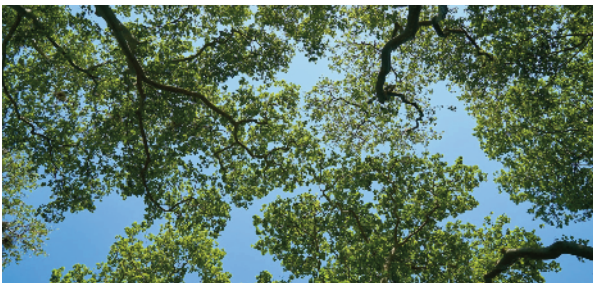
Ni ddylai sŵn traffig fod yn anochel: mae'n bosibl lleihau swm traffig drwy annog dulliau mwy iach o deithio. Mae potensial hefyd i leihau llygredd sŵn drwy leihau cyflymder, a symud oddi wrth drenau a cherbydau modur a yrrir gan betrol a disel..



## Lleihad mewn gofod gwyrdd

**Effeithiau ar iechyd:** cysylltiedig â lleihad mewn gweithgarwch corfforol, dirywiad mewn lles meddyliol, cynnydd mewn marwolaethau

Ar draws y DU gwelwyd dirywiad hanesyddol a graddol mewn gofodau gwyrdd, o ganlyniad i ddatfforestu net a threfoliad.<sup>57</sup> Ar yr un pryd mae sail tystiolaeth sy'n tyfu ynglŷn â'r effaith gadarnhaol ar iechyd meddwl a lles o fod yn byw yn agos at ac ymweld â gofodau gwyrdd.<sup>51,58,59</sup>



Mae'r cynnydd mewn ceir wedi arwain at fwy a mwy o'n hardaloedd gwledig a threfol yn cael eu cuddio gan goncrïd, yn cynnwys y tuedd o balmentu gerddi fel y gellir parcio ceir y tu allan i gartrefi.<sup>60</sup> Yn ogystal â lleihau'r gofod i natur ffynnu, caiff hyn effaith ar allu ardaloedd trefol i sugno'r glaw a lleihau llifogydd yn naturiol.

Canfu adolygiad diweddar gan Sefydliad Iechyd y Byd o fanteision iechyd bod â gofodau gwyrdd trefol bod nifer o effeithiau,<sup>61</sup> yn cynnwys gwell rhyngweithio cymdeithasol a chyfalaf cymdeithasol, effeithiau cadarnhaol ar y system imiwneidd, mwy o weithgarwch corfforol a lleihad mewn gordewdra, llai o gysylltiad â llygredd aer, clustogi sŵn, gwell iechyd cardiofasgwlaidd, lleihad mewn mynychder achosion o ddiabetes math 2, gwell

gweithrediad gwybyddol, a lleihad mewn marolwaethau.

Cysylltir gofodau gwyrdd gyda gwell rhyngweithio cymdeithasol, mwy o weithgarwch corfforol a gwell iechyd cardiofasgwlaidd, a lleihad mewn marwolaethau



## Gwaethygu anghydraddoldebau iechyd

**Effeithiau ar iechyd:** bwlch mewn disgwyliad oes o tua 11 mlynedd (Caerdydd) ac 8 mlynedd (Y Fro) rhwng yr ardaloedd lleiaf a mwyaf amddifadus; mae llygredd yn tueddu i fod yn waeth mewn ardaloedd mwy amddifadus; achosion uwch a chanlyniadau gwaeth ar draws ystod eang o gyflyrau iechyd

Mae anghydraddoldebau iechyd arwyddocaol a pharhaus yng Nghaerdydd a Bro Morgannwg. Dangosir hyn yn fwyaf clir gan y gwahaniaeth dramatig mewn disgwyliad oes yn dibynnu ar lle mae pobl yn byw. Gall dyn sy'n byw yn un o'n cymunedau mwyaf amddifadus yng Nghaerdydd ddisgwyl byw 11 yn llai o flynyddoedd na rhywun sy'n byw yn yr ardaloedd lleiaf amddifadus. Mae graddiant tebyg yn bodoli ar gyfer menywod ac ar gyfer pobl sy'n byw yn y Fro.

Gall dyn sy'n byw yn un o'n cymunedau mwyaf amddifadus yng Nghaerdydd ddisgwyl byw 11 yn llai o flynyddoedd na rhywun sy'n byw yn yr ardaloedd lleiaf amddifadus.



Mae'r cynnydd mewn defnydd car wedi gwaethgu anghydraddoldebau iechyd. Ar un llaw, mae pobl yn y cymunedau lleiaf amddifadus yn fwy tebygol o fod â char na'r rheini sydd yn yr ardaloedd mwyaf amddifadus. Ar y llaw arall, teimlir effeithiau llygredd (yn arbennig NO<sub>2</sub>)<sup>62</sup> yn fwy mewn ardaloedd amddifadus, sy'n dueddol o fod wedi'u lleoli yn agosach at briffyrdd, sydd â chyfran uwch o draffig a 'fewnforwyd' (o ardaloedd llai amddifadus), ac sydd â chyfran uwch o bobl sydd â salwch cronig sy'n eu gwneud yn fwy bregus i gysylltiad â llygredd aer.<sup>51,63</sup> Mae allyriadau carbon deuocsid (CO<sub>2</sub>) o ganlyniad i drafndiaeth yn arwyddocaol uwch o'r 10% lleiaf amddifadus o gartrefi na'r 10% mwyaf amddifadus, gyda'r lleiaf amddifadus yn cyfrannu at 17% o allyriadau CO<sub>2</sub> a'r mwyaf amddifadus yn cyfrannu 2%.<sup>64</sup>

Mae anafiadau traffig ar y ffyrdd hefyd yn uwch mewn ardaloedd mwy amddifadus. Mae plant mewn wardiau mwy amddifadus bedair gwaith yn fwy tebygol o gael eu taro gan gar o gymharu â phlant yn y wardiau lleiaf amddifadus.<sup>51</sup> Mae damweiniau angeuol ar y ffordd hefyd yn arbennig o uchel ymhlith plant rhieni diwaith.<sup>51</sup>

Mae plant mewn wardiau mwy amddifadus bedair gwaith yn fwy tebygol o gael eu taro gan



gar o gymharu â phlant yn y wardiau lleiaf amddifadus

Mae amgylcheddau sy'n ddibynnol ar geir yn arwahanu pobl sydd heb gar, gan ei gwneud hi'n anodd iddynt gael mynediad at gyflogaeth

a chyfleoedd addysg, gan waethgu a gwreiddio anghydraddoldebau ymhellach.<sup>65,66</sup>

Mae hon yn broblem benodol mewn ardaloedd gwledig sy'n fwy dibynnol ar rwydweithiau trafndiaeth gyhoeddus da. Effeithir yn arbennig ar bobl ifanc a phobl hŷn sy'n methu gyrru.

Mae gwariant cyhoeddus y DU i gefnogi trafndiaeth bron bedair gwaith yn uwch ar gyfer y 10% mwyaf cyfoethog (sy'n defnyddio'r car neu'r trê'n yn bennaf) nac ar gyfer y 10% mwyaf amddifadus (sy'n defnyddio'r bws yn bennaf).<sup>44</sup>

Mae mynediad at ac ymweliadau â gofodau gwyrdd, a leiheir yn aml gan estyniad priffyrdd ac sy'n ffactor gyfranogol bwysig mewn lefelau gweithgarwch corfforol, gordewdra a lles, hefyd yn is mewn ardaloedd mwy amddifadus.<sup>51</sup>

Mae effaith ddwbl ar anghydraddoldeb iechyd: y lleiaf amddifadus sy'n berchen ar geir ac yn eu defnyddio fwyaf, ond mae'r canlyniadau negyddol a ddaw yn sgil defnydd ceir yn cael yr effaith waethaf ar y mwyaf amddifadus.

Y lleiaf amddifadus sy'n berchen ar geir ac yn eu defnyddio fwyaf, ond teimlir effeithiau anffafriol yn waethaf ar y mwyaf amddifadus

# Sut mae'r blaned yn ymateb

## Newid hinsawdd

**Effeithiau ar iechyd:** effeithiau iechyd meddwl o ganlyniad i ddigwyddiadau tywydd difrifol; ansicrwydd bwyd; effaith ar gydlynid cymdeithasol o ganlyniad i fudo torfol

Mae tystiolaeth ddiagramuol gan y gymuned wyddonol ryngwladol bod newid hinsawdd yn digwydd o ganlyniad i allyriadau nwyon tŷ gwydr a wnaed gan ddyn. Mae llosgi tanwyddau ffosil yn gyfrannwr mawr i'r allyriadau hyn, ac mae naw o bob deg oedolyn yng Nghymru yn nodi bod allyriadau a wnaed gan ddyn yn rhywbeth sy'n cyfrannu at gynhesu byd-eang.<sup>47</sup>

Os rhoddir yr ymrwymiadau presennol a wnaed gan wledydd o bob rhan o'r byd ar waith, rhagfynegir cynhesu byd-eang o 2.7°C ar hyn o bryd, ond mae perygl mawr y bydd cynhesu yn mynd y tu hwnt i hyn.<sup>67</sup> Mae'r senario modelu 'busnes fel arfer' sy'n tybio bod allyriadau yn parhau heb osteg, yn rhagfynegi cynnydd o fwy na 4°C yn uwch na'r tymheredd cyn yr oes ddiwydiannol erbyn 2100.<sup>68,69</sup> Mae amrywiadau rhanbarthol ledled y byd yn golygu y bydd rhai rhannau o hemisffer y gogledd yn gweld cynnydd o dros 10°C mewn tymheredd.



Mae disgwyl i dymheredd byd-eang gynyddu gan 4°C erbyn 2100 os yw'r tueddiadau presennol yn parhau, gyda rhai ardaloedd yn gweld cynnydd o 10°C

Nid yw cynhesu byd-eang yn rhywbeth i'w groesawu. Mae rhagfynegiadau'n awgrymu y bydd effeithiau gwirioneddol ar bobl, cymunedau a seilwaith ledled y byd o fewn y genhedlaeth nesaf.



Bydd cynnydd mewn tymheredd yn fyd-eang yn deillio ar ddigwyddiadau o dywydd eithafol yn fwy aml (megis tywydd poeth a llifogydd), ansicrwydd bwyd (wrth i'r ardaloedd traddodiadol yn y byd sy'n cynhyrchu bwyd ddiodeff sychder a thir llai ffrwythlon), a'r tebygolrwydd o fudo torfol dros nifer o flynyddoedd, o ardaloedd o'r byd sydd ddim yn anneddadwy mwyach. Bydd lefel y môr yn codi yn cynyddu tebygolrwydd o lifogydd arfordirol - sy'n arbennig o berthnasol yn ein hardal ni.<sup>68</sup> Mae hefyd effeithiau llai rhagfynegadwy, megis y potensial ar gyfer clefydau heintus yn lledu'n haws.<sup>67</sup> Mae'r asesiad risg diweddaraf gan UK Climate Change hefyd yn tynnu sylw at risgiau sylweddol i fywyd gwyllt ac ecosystemau naturiol y DU.

Bydd achosion cynyddol llifogydd yn effeithio ar ein cymunedau a'n seilwaith craidd megis ysbytai, canolfannau ieched a rhwydweithiau trafniadaeth

Teimlir pob un o'r effeithiau hyn yn y DU, yn amrywio o achosion cynyddol llifogydd yn effeithio ar ein cymunedau a'n seilwaith craidd megis ysbytai, canolfannau ieched a rhwydweithiau trafniadaeth;<sup>53,67</sup> pwysau ar argaeledd dŵr yn ystod yr haf; hyd at gynydd mewn prisiau bwyd, sy'n fwyaf tebygol o gael yr effaith waethaf ar y grwpiau mwyaf amddifadus

mewn cymuned; cynydd mewn llif mudol a allai, os yw'n fawr neu na chaiff ei reoli, effeithio'n anffafriol ar gydlynid cymunedol. Yng Nghymru, rhagfynegir bod disgwyl i lawiad yn ystod yr haf leihau gan 20% erbyn y 2080au, a chodi gan swm tebyg ym misoedd y gaeaf, sydd eisos yn rhai gwlyb.<sup>70</sup> Hefyd rhagfynegir effeithiau ar rwydweithiau trafndiaeth, seilwaith ynni a digidol.<sup>71</sup> Mae newid hinsawdd hefyd yn peri bygythiad i arfordiroedd a thwristiaeth sy'n ddibynol ar yr amgylchedd naturiol.

Canfuwyd bod dadleoliad cymunedau cysylltiedig â llifogydd yn y DU wedi achosi problemau iechyd meddwl sylweddol a pharhaus.<sup>72</sup> Ar draws Gorllewin Ewrop rhagfynegir y bydd hefyd gynydd mewn marolwaethau cysylltiedig â gwres o tua 14,000 y flwyddyn os na fydd unrhyw addasiadau a bod newid hinsawdd yn parhau ar y gyfradd bresennol.<sup>73</sup> Cydnabyddir bygythiad newid hinsawdd i iechyd pobl yn gynyddol ym maes iechyd cyhoeddus y DU.<sup>68,74,75</sup>

### Canfuwyd bod dadleoliad cymunedau cysylltiedig â llifogydd yn y DU wedi achosi problemau



iechyd meddwl sylweddol a pharhaus.

Teimlir effeithiau newid hinsawdd gryfaf yn hemisffer y de ac mewn gwledydd tlotach. Yn fyd-eang, rhwng 2030 a 2050, rhagfynegir y bydd newid hinsawdd yn achosi tua 250,000 o farwolaethau ychwanegol y flwyddyn, o ganlyniad i ddiffyg maeth, malaria, dolur rhydd a straen gwres.<sup>76</sup>

Mae dwy ran o dair (67%) o'r oedolion yng Nghymru yn poeni am newid hinsawdd,<sup>47</sup> ac mewn 'sgwrs genedlaethol' ddiweddar ar gyfer Deddf Llesiant Cenedlaethau'r Dyfodol, a oedd

yn cynnwys 70,000 o bobl ledled Cymru, graddiwyd newid hinsawdd fel yr un mater pwysicaf i bobl yng Nghymru.<sup>77</sup>

### Mae chwarter o'r allyriadau nwy tŷ gwydr o ganlyniad i drafnidiaeth ceir

Daeth chwarter (23%) o'r allyriadau nwy tŷ gwydr domestig y DU o drafnidiaeth ceir yn 2014,<sup>64</sup> i fyny o 15% ym 1990.<sup>8</sup> Mewn cyferbyniad, 3% yn unig o allyriadau cartrefi sydd o ganlyniad i drafnidiaeth gyhoeddus. Mae allyriadau CO<sub>2</sub> ceir yn uwch yn yr ystod oedran 45-55, ac yn is ymhlith y rhai dan 25 oed a dros 65 oed. Yn ein hardal ni, amcangyfrifir bod 5 tonnell fetrig o CO<sub>2</sub> yn cael ei allyrru fesul person yng Nghaerdydd, a 4.9 tonnell fetrig fesul person yn y Fro.<sup>78</sup> Mae'r ddau yma wedi dangos dirywiad graddol dros y 10 mlynedd diwethaf.

Nid yw problem allyriadau nwy tŷ gwydr o drafnidiaeth wedi'i datrys o gwbl: ar gyfer pob un o'r ddwy flynedd ddiwethaf yn y DU, mae allyriadau o drafnidiaeth ffordd mewn gwirionedd wedi cynyddu.<sup>79,80</sup> Byddai lleihau llosgi tanwydd ffosil ar gyfer trafndiaeth nid yn unig yn cael effaith fuddiol ar yr hinsawdd, ond byddai iddo fanteision geowleidyddol a chynaliadwyedd hefyd, gan leihau dibyniaeth y DU ar fewnforion nwy ac olew.

Eto, mae lleihau defnydd car yn fater sy'n isel ym meddwl y cyhoedd pan ddaw i fynd i'r afael â newid hinsawdd. Yn Arolwg Cenedlaethol Cymru, arolwg mawr o gartrefi, dywedodd bron pawb bod ailgylchu gwastraff yn fodd i ddiogelu'r amgylchedd (97%), gyda chyfran llawer llai, 1 o bob 4 (25%), yn dweud eu bod wedi lleihau faint y maent yn ei deithio mewn car.<sup>47</sup>

# Gallem wneud pethau'n wahanol

## Beth sydd angen i ni wneud

Mae corff cynyddol o dystiolaeth yn disgrifio'r effeithiau cadarnhaol ar iechyd a lles ar draws cymdeithas sy'n bosibl os byddwn yn cynyddu ein cyfraddau teithio llesol, lleihau llygredd aer a blaenoriaethu cynllunio cymunedau trefol a gwledig atyniadol sydd wedi'u cynllunio'n dda. Gall datblygiadau technolegol diweddar helpu gyda hyn hefyd.



### Cefnogi teithio llesol a thrafnidiaeth gyhoeddus

#### Lleihau defnydd car

Er mwyn cynyddu gweithgarwch corfforol mae angen lleihau defnydd car.<sup>66</sup> Gellid gwneud llawer o'r siwrneiau a wneir fel arfer mewn car yng Nghaerdydd a'r Fro drwy gerdded, beicio neu ar drafnidiaeth gyhoeddus. Dylai siwrneiau yn ystod y dydd sy'n llai na 2km o hyd, ac sydd ddim yn gofyn am gario llwythi mawr, fel arfer fod yn gerddadwy gan unigolion rhwng 5 a 74 oed sydd heb anabledd.<sup>81</sup> Pan gyfunir hyn gyda thrafnidiaeth gyhoeddus fel rhan o system drafnidiaeth integredig, gall teithio llesol hefyd fod yn ddewis cynaliadwy ac iachus arall i deithiau mewn car ar gyfer siwrneiau hwy.<sup>65</sup>



#### Dylai siwrneiau yn ystod y dydd sy'n llai na 2km o hyd fod yn gerddadwy gan unigolion rhwng 5 a 74 oed sydd heb anabledd

Mae dros hanner preswylwyr Toronto (54%) a Copenhagen (63%) yn beicio'n rheolaidd.<sup>5</sup> Dywed cyfran debyg yng Nghaerdydd (56%) y byddent yn hoffi reidio beic yn amlach, ac mae

tri chwarter (74%) yn meddwl y byddai'n well pe bai mwy o feicio.<sup>5</sup> Hefyd, mae dros hanner preswylwyr Caerdydd (57%) yn teithio llai na 5km i'r gwaith.<sup>5</sup> Mae 84% o breswylwyr y Fro yn defnyddio car unwaith neu ragor yr wythnos, o gymharu â 7% sy'n beicio'n wythnosol.<sup>6</sup>

Oherwydd bod ffyrdd o fyw wedi datblygu o amgylch defnydd car bron yn gyfan gwbl, rhaid i ddewisiadau amgen i'r car gael ei mabwysiadu'n eang.<sup>66</sup> Yng Nghaerdydd, mae defnydd car ar gyfer cymudo yn cyfrif am ddim ond am chwarter y siwrneiau, gyda chyfran debyg yr un ar gyfer hamdden, siopa a dibenion eraill.<sup>5</sup>

Mae NICE yn argymhell defnyddio diwrnodau di-gar er mwyn codi ymwybyddiaeth o, a diddordeb mewn, teithio llesol,<sup>41</sup> ac mae wedi cyhoeddi canllaw seiliedig ar dystiolaeth ar gynyddu lefelau cerdded a beicio.<sup>82</sup>

Mae 'Designed to move: Active Cities' yn dyfynnu sail tystiolaeth eang ynglŷn â manteision economaidd, lles ac amgylcheddol dinasoedd yn dod yn fwy llesol.<sup>83</sup> Mae enghreifftiau yn cynnwys cynnydd sylweddol mewn cyflogaeth ac ymglymiad cymunedol; a lleihad mewn trosedd (74%), llygredd a straen.

#### Gwella seilwaith i gefnogi teithio llesol

Mae seilwaith sydd wedi'i gynllunio'n dda i gefnogi teithio llesol, yn ogystal â thrafnidiaeth gyhoeddus aml, ddibynadwy sy'n cwmpasu

holl brif gyrchfannau lleol, yn elfennau hanfodol mewn cynyddu'r niferoedd sy'n defnyddio'r dulliau teithio hyn.<sup>51</sup> Mae wyth o bob deg o breswylwyr Caerdydd yn meddwl bod angen gwella diogelwch ar gyfer beicio.<sup>5</sup>

Yn hanesyddol, mae buddsoddiad mewn seilwaith ar gyfer ceir wedi bod yn llawer uwch na hwnnw ar gyfer llwybrau cerdded a beicio. Mae Cyfadran Iechyd y Cyhoedd y DU wedi galw am i 10% o gyllidebau trafndiaeth gael eu hymrwymo i gerdded a beicio.<sup>84</sup> Canfu NICE bod llwybrau beicio oddi ar y ffordd yn werth da am arian, gyda phob £1 o fuddsoddiad mewn llwybrau oddi ar y ffordd yn rhoi tua £14 mewn budd.<sup>41</sup> Mae'n cynghori y dylai llwybrau beicio yn ddelfrydol fod ar strydoedd tawel neu wedi'u gwahanu, er mwyn lleihau cymaint â phosibl dod i gysylltiad â llygredd aer. Mae buddsoddiadau mewn seilwaith cerdded yn rhoi £37 am bob £1 a fuddsoddir.<sup>85</sup>



Canfu NICE bod llwybrau beicio oddi ar y ffordd yn werth da am arian, gyda phob £1 o fuddsoddiad mewn llwybrau oddi ar y ffordd yn rhoi tua £14 mewn budd



Yn raddol dylai gofod ffyrdd gael ei ail-glustnodi i ddulliau teithio llesol wrth i'w cyfran o siwrneiau gynyddu,<sup>22,66</sup> mae hyn yn atal defnydd car rhag cynyddu eto wrth i dagfeydd ddechrau

lleihau, ac mae hefyd yn hynod effeithlon, yn arbenig ar gyfer poblogaeth sy'n tyfu: gellir storio 12 beic mewn un gofod parcio car.<sup>86</sup> Dylid modelu croesfannau ffyrdd ar gerddwyr a dilyn y llinellau a 'ddymunnir' ganddynt.<sup>51</sup>

## Gellir storio 12 beic mewn un gofod parcio car

Wrth gynllunio amgylcheddau i annog teithio llesol, gallai gwerthusiad llwyddiant gynnwys defnydd data o apiau ffonau clyfar, er enghraifft data apiau beicio a allai ddatgelu patrymau newidiol teithio lleol.<sup>87</sup>

## Blwch 2. Cynllunio ffyrdd yn Ewrop

Ym 1992 mabwysiadodd yr Iseldiroedd bum egwyddor **diogelwch cynaliadwy** er mwyn atal gwrthdrawiadau difrifol a lleihau difrifoldeb yr anafiadau pan fydd gwrthdrawiadau yn digwydd.<sup>88</sup> Mae'r egwyddorion yn cynnwys categoriadau ffyrdd wedi'u diffinio'n glir sy'n gwahanu defnyddwyr ffordd yn ôl cyflymder a diben, a gwahanu traffig lle na ellir dileu gwahaniaethau cyflymder. Caiff cerbydau modur eu hystyried yn 'westeion' mewn ardaloedd preswyl, gyda blaenoriaeth i gerddwyr a beicwyr.<sup>89</sup> Anogir trefn ffyrdd rhagfynegiadol, gydag amgylcheddau 'maddeuol' os bydd camgymeriadau'n digwydd (e.e. ymylon palmentydd 45° yn hytrach na 90° i leihau'r tebygolrwydd bod beiciwr yn cwmpo petai'n taro ymyl y cwrbyn). Gwelwyd bod diogelwch cynaliadwy yn cyfrannu at leihad sylweddol mewn marwolaethau.<sup>90</sup> Mae **athreiddedd wedi'i hidlo** yn gysyniad arall sy'n gyffredin mewn cynllunio trafndiaeth yn Ewrop, gyda cherddwyr a beicwyr yn cael mantais, o ran cyflymder a hwylustod, o gymharu â thraffig modurol – er enghraifft, llwybr beicio dwyffordd ond traffig ceir unffordd.<sup>84</sup>



## Cefnogi pobl i deithio'n llesol ar adegau sbardun yn eu bywydau

Mae angen seilwaith teithio cynaliadwy addas er mwyn galluogi newid moddol, er nad yw hynny'n ddigonol ynddo'i hun.<sup>91</sup> Yn ogystal â buddsoddi mewn seilwaith, ar gyfer nifer o bobl mae'r sbardun dechrau teithio'n llesol yn ddigwyddiad arwyddocaol yn eu bywydau.<sup>92</sup> Er enghraifft, gwelwyd bod dechrau swydd newydd neu symud lleoliad gweithle, dod yn rhiant, pobl yn adfer wedi salwch, a phobl yn ymddeol i gyd wedi bod yn sbardunau sy'n gwneud i bobl fod yn fwy tebygol i ailedrych ar eu dewisiadau o ran teithio a newid i deithio llesol. Mae sôn am bwnc teithio llesol ar y pwyntiau critigol hyn yn rhywbeth y gellid ei wneud yn systematig drwy'r sector cyhoeddus.

Ar gyfer nifer o bobl mae'r sbardun dechrau teithio'n llesol yn ddigwyddiad arwyddocaol yn eu bywydau

## Darparu trafndiaeth gyhoeddus hyblyg, o ansawdd uchel

Hwylusir defnydd trafndiaeth gyhoeddus gan brisiau tocynnau fforddiadwy, hyblygrwydd mewn arosfannau, gwybodaeth teithio o ansawdd uchel a gwasanaethau rheolaidd.<sup>22,93</sup>

Canfu gwaith modelu yn Awstralia bod potensial mawr i gynyddu nifer yr oedolion a oedd yn gorfforol egniol drwy annog pobl i ddefnyddio trafndiaeth gyhoeddus.<sup>94</sup> Edrychodd yr astudiaeth ar dystiolaeth ryngwladol a chanfu y cysylltwyd ar gyfartaledd tua 15 munud o amser cerdded gyda defnydd trafndiaeth gyhoeddus bob dydd.

Gellid galluogi teithio dulliau cymysg, sy'n arbennig o bwysig mewn ardaloedd gwledig lle mai cyfuniad o deithio llesol a thrafnidiaeth gyhoeddus yw'r dull mwyaf pragmatig ar gyfer

nifer o siwrneiau, drwy ganiatáu cludo beiciau yn hawdd ar fysiau a threnau.<sup>93</sup> Yn yr Almaen arweinodd astudiaeth wedi'i rheoli a roddodd docynnau trafndiaeth gyhoeddus am ddim ac amserlen bersonol i bobl oedd wedi symud tŷ'n ddiweddar at ddyblu defnydd trafndiaeth gyhoeddus (18% i 36%) a lleihad mewn defnydd car (53% i 39%).<sup>66</sup>

Hwylusir defnydd trafndiaeth gyhoeddus gan brisiau tocynnau fforddiadwy, hyblygrwydd mewn arosfannau, gwybodaeth teithio o ansawdd uchel a gwasanaethau rheolaidd



## Lleihau llygredd aer ac allyriadau carbon

Yn ddiweddar cyhoeddodd y Sefydliad Cenedlaethol dros Ragoriaeth mewn Iechyd a Gofal (NICE) ganllaw manwl ar wella ansawdd aer ac iechyd. Mae'r argymhellion yn cynnwys cefnogi teithio llesol, darparu seilwaith ar gyfer gwefru cerbydau trydan, cyflwyno parthau aer glân, a chyflwyno is-ddeddau 'dim segura' y tu allan i ysgolion (gweler Blwch 3).<sup>41</sup>

Mae NICE yn argymhell cyflwyno Parthau Aer Glân sy'n cefnogi teithio allyriadau isel

Canfu NICE bod parthau aer glân yn costio tua £2 y pen bob blwyddyn (yn seiliedig ar gostau Amsterdam) ond yn rhoi manteision sy'n llawer mwy na hyn - budd o tua £29 am bob £1 a warir.<sup>41</sup> Yn ddelfrydol dylai parthau allyriadau isel gwmpasu pob traffig modur, yn cynnwys ceir a faniau, er mwyn bod yn effeithiol mewn gwella ansawdd aer.<sup>26</sup>



Amcangyfrifwyd bod parthau dim segura tu allan i ysgolion yn rhoi £44 am bob £1 a warir.<sup>41</sup>



Mae Parthau Aer Glân yn rhoi budd gwerth £29 am bob £1 a warir

### Blwch 3. Detholiad o argymhellion o ganllawiau NICE ar wella ansawdd aer.<sup>41</sup>

Cefnogi teithio llesol. Dylai fod dewis o lwybrau beicio, yn cynnwys llwybrau sy'n osgoi ffyrdd sydd â llygredd trwm

Cefnogi cynlluniau rhannu car a chlybiau car

Darparu manau gwefru cerbydau trydan mewn gweithleoedd, datblygiadau masnachol ac ardaloedd preswyl

Ystyried cyflwyno parth aer glân sy'n cyflwyno cyfyngiadau neu daliadau ar ddsbarthiadau penodol o gerbydau, ac sy'n cefnogi teithio dim allyriadau ac allyriadau isel (yn cynnwys teithio llesol)

Lle bo tagfeydd traffig yn cyfrannu at ansawdd aer gwael, ystyried ymgorffori parth tâl atal tagfeydd o fewn y parth aer glân

Cyflwyno is-ddeddfau i gefnogi ardaloedd 'dim segura' lle mae grwpiau agored i niwed yn ymgynnull, megis tu allan i ysgolion, ysbytai a chartrefi gofal

Nodi safonau allyriadau ar gyfer cerbydau llogi preifat a cherbydau trwyddedig eraill

Mynd i'r afael ag allyriadau o drafndiaeth sector cyhoeddus

Cyflwyno parthau 20mya heb fesurau ffisegol, er mwyn osgoi cyflymu ac arafu diangen sy'n cyfrannu at lygredd aer

Caiff nifer o ganllawiau NICE eu hadleisio yn adroddiad mawr i lygredd aer a luniwyd ar y cyd gan y Colegau Brenhinol,<sup>95</sup> sydd hefyd yn argymhell hyrwyddo 'teithiau i'r ysgol' diogelach sy'n osgoi defnyddio'r car, annog cyflogwyr i gefnogi dewisiadau amgen i gymudo mewn car, hybu beicio hamdden, a monitro ac arddangos llygredd aer o amgylch ysgolion. Maent hefyd yn argymhell y dylai awdurdodau lleol gyhoeddi rhybuddion digwyddiadau difrifol pan fydd lefelau'n mynd yn uwch na therfynau Sefydliad Iechyd y Byd a'r Undeb Ewropeaidd.<sup>40</sup> Mae'r adroddiad yn galw ar y GIG i arwain drwy esiampl a gosod y meincnod ar gyfer aer glân a gweithleoedd diogel. Mae disgwyl i ganllaw ar leihau llygredd aer yn yr awyr agored gael ei gyhoeddi'n fuan i GIG Cymru.



Dylai'r GIG osod y meincnod ar gyfer aer glân a gweithleoedd diogel

Er mai cerbydau trydan yw'r dewis a ffafrir o gymharu â cherbydau petrol a disel o ran llygredd aer, mae'n bwysig nodi bod cerbydau trydan yn dal i gynhyrchu deunydd gronynnol, er bod hynny ar lefelau is na cherbydau disel yn arbennig. Felly, dylai strategaethau i wella ansawdd aer ac iechyd barhau i ganolbwyntio'n bennaf ar deithio llesol a thrafnidiaeth gyhoeddus allyriadau isel. Lle bod dal angen cerbydau, dylid blaenoriaethu cerbydau trydan (a thechnolegau allyriadau isel iawn eraill) dros gerbydau ICE.

Byddai symud y model perchnogaeth car i fodel rhannu neu logi yn newid proffil cost gyrru; yn hytrach na buddsoddiad mawr ymlaen llaw (prynu car) gyda siwrneiau unigol yn gymharol rhad i'w gwneud wedi hynny (ac felly eu bod yn cael eu hannog), byddai'r costau'n cael eu lledaenu'n fwy cyfartal. Byddai hyn nid yn unig yn lleihau'r rhwystr i ddefnyddio car pan fo'i angen (e.e. cario nwyddau mawr) ond hefyd yn

peidio ag annog defnydd o'r car pan allai trafndiaeth gyhoeddus neu deithio llesol fod yr un mor hawdd. Byddai hyn hefyd o bosibl yn arbed costau ar gyfer cartrefi mwy amddifadus, gan leihau anghydraddoldebau.<sup>66</sup>

Mae astudiaethau achos sy'n dangos dulliau systematig ar gyfer gwella ansawdd aer ar gael ar wefan Defra,<sup>96</sup> ac mae disgwyl cael canllaw ar gyfer ardaloedd lleol yng Nghymru gan Lywodraeth Cymru yn fuan.

## Cynllunio cymunedau sydd wedi'u cysylltu'n dda ac sy'n atyniadol

Gwelwyd bod trefn strydoedd a pha mor agos ydynt i lwybrau eraill yn gysylltiedig ag ymddygiad teithio llesol, gyda mwy o deithio llesol a llai o ddefnydd car mewn strydoedd mwy 'integredig' (y rheini sy'n cysylltu'n well i strydoedd eraill).<sup>97,98</sup> Canfuwyd hefyd bod gan strydoedd sydd â symiau traffig is rwydweithiau cymdeithasol cryfach rhwng cymdogion,<sup>49</sup> gan leihau arwahanrwydd cymdeithasol.

Caiff cerdded ei annog gan lwybrau cerdded di-draffig a diogel a gofodau cyhoeddus agored.<sup>51</sup> Canfu arolwg yn y DU ar gerddadwyedd mewn dinasoedd mawr bod gan Gaerdydd sgôr is ar gyfer cyrchu gofodau gwyrdd (50%) o gymharu â chymedr y DU (54%), ond sgoriodd yn dda ar gyfer diogelwch cerdded.<sup>99</sup> Mae Cyfadran Iechyd y Cyhoedd yn awgrymu y dylai cyngion trafndiaeth a defnydd tir sydd ag effaith negyddol ar gerdded a beicio gael eu gwrthod fel mater o drefn, ac y dylai trefi a dinasoedd fod yn 'bobl gyfeillgar' yn hytrach nac yn gar gyfeillgar.<sup>84</sup> Dylid annog datblygiadau dwysedd uwch yn agos at hybiau trafndiaeth gyhoeddus,<sup>22</sup> a dylai datblygiadau masnachol fod â dim parcio ar gyfer ceir ac eithrio defnyddwyr bathodyn glas.<sup>22</sup>

Mae lleihau cyflymder traffig, gyda therfynau 20mya, yn gwneud strydoedd yn fwy apelgar ar gyfer cerdded, cymdeithasu a beicio. Mae modelu a gyhoeddwyd ar gyfer Cymru wedi amcangyfrif pe bai'r terfyn cyflymder ar bob ffordd sydd â therfyn o 30mya yn cael ei ostwng i 20mya yng Nghymru, byddai rhwng 1,200-2,000 o anafedigion yn cael eu hosgoi bob blwyddyn, ynghyd â lleihad net mewn marwolaethau a blynyddoedd bywyd a gollir o ganlyniad i lygredd aer.<sup>100</sup> Mae Cyfadran Iechyd y Cyhoedd wedi galw am derfynau 20mya i fod yn norm ar gyfer strydoedd preswyl, gyda therfynau uwch dim ond ar lwybrau traffig strategol.<sup>84</sup>

Mae lleihau cyflymder traffig, gyda therfynau 20mya, yn gwneud strydoedd yn fwy apelgar ar gyfer cerdded, cymdeithasu a beicio

Mae pobl sy'n cerdded ac yn beicio mewn cymdogaeth yn fwy tebygol o wario arian mewn siopau lleol na phobl mewn ceir sy'n fwy tebygol o yrru trwodd.<sup>51,65</sup> Gwelwyd bod gwerthiant manwerthol yn cynyddu gan tua 30% lle cynhaliwyd prosiectau cerdded a beicio.<sup>101</sup> Mae hi felly'n bwysig ymgysylltu â chymunedau busnes lleol er mwyn codi ymwybyddiaeth o'r manteision ariannol sy'n gysylltiedig â blaenoriaethu cerddadwyedd, teithio llesol a mynediad at drafnidiaeth gyhoeddus.<sup>93</sup>



Mae pobl sy'n cerdded ac yn beicio mewn cymdogaeth yn fwy tebygol i wario arian mewn siopau lleol

Mae offer i gynorthwyo pobl sy'n symud i ardal i ganfod cymdogaethau sy'n fwy cerddadwy yn dechrau ymddangos, megis Walk Score yn UDA.<sup>102</sup> Profwyd sgôr cerddadwyedd sydd newydd ei ddyfeisio ar gyfer Llundain yn erbyn ymddygiad cerdded mewn astudiaeth carfan

fawr, a chanfuwyd bod pobl mewn ardaloedd mwy cerddadwy yn fwy tebygol o gerdded, sydd ddim yn syndod.<sup>103</sup> Felly, mae deall nodweddion cymdogaethau cerddadwy a chynnwys y rhain mewn datblygiadau a gweithiau yn y dyfodol yn bwysig mewn gwella gweithgarwch corfforol.

Mewn rhai ardaloedd o'r DU mae preswylwyr yn gweithio gydag awdurdodau lleol i ganiatáu i blant chwarae'n ddiogel yn y strydoedd y tu allan i'w tai, drwy gau'r stryd dros dro.<sup>104</sup> Mae nifer o'r enghreifftiau yn Lloegr, ond bu hefyd enghreifftiau diweddar yng Nghaerdydd (gweler arfer da yn lleol, isod) sydd wedi cael derbyniad da ac sy'n dangos y gall y dull hwn weithio mewn cyd-destun lleol.

## Diogelu a gwella ein gofod gwyrdd

Mae sicrhau bod gan bawb fynediad at ofodau agored a gwyrdd o ansawdd uchel yn un o argymhellion allweddol adroddiad Marmot ar gynllunio gofodol ac anghydraddoldebau iechyd.<sup>51</sup> Mae gofodau gwyrdd yn annog gweithgarwch corfforol a chwarae, a dylent fod yn hygyrch i'r rheini sy'n cerdded, beicio ac yn defnyddio trafndiaeth gyhoeddus, a bod ynddynt ddigon o fannau parcio beiciau.<sup>51</sup> Mewn cyd-destun gwledig, mae hamdden a gweithgareddau yn yr awyr agored yn ysgogwr allweddol yr economi.<sup>53</sup>

Mae coed yn amsugno llygredd aer yn naturiol ac yn gwella ansawdd aer,<sup>60</sup> gan leihau deunydd gronynnol gan hyd at chwarter (24%) yn yr ardal o'u hamgylch.<sup>105</sup> Mae coed hefyd yn storio carbon (gan liniaru newid hinsawdd), yn gostwng tymheredd yr aer yn yr haf gan rhwng 0.5 a 2.0°C (er enghraifft yn ystod tywydd poeth), ac yn lleihau llygredd sŵn.<sup>105</sup>

## Darparu arweinyddiaeth

Mae uwch arweinyddiaeth a modelu rôl gwledol ar y materion hyn yn hanfodol er

mwyn codi ymwybyddiaeth a gwybodaeth a meithrin cydsyniad eang am y gweithredu sydd ei angen. Mae ymgysylltu â phreswylwyr a sefydliadau lleol yn rhan allweddol o hyn.<sup>65</sup> Dylid blaenoriaethu teithio llesol wrth gynllunio trefol a datblygu seilwaith.<sup>65</sup>

Galwodd y British Medical Journal (BMJ) yn angerddol ar i weithwyr gofal iechyd proffesiynol arwain drwy esiampl yn hyn o beth, drwy leihau eu defnydd eu hunain o geir a rhoi arweiniad i eraill i wneud hynny.<sup>106</sup>

Mae symudiadau megis cyflwyno tâl atal tagfeydd Llundain, a arweiniodd at gynnydd o 80% mewn beicio yng Nghanol Llundain ers ei sefydlu yn 2000,<sup>84</sup> ac amserlen Llywodraeth y DU ar gyfer gwaredu'n raddol geir tanwydd ffosil erbyn 2040,<sup>28</sup> wedi ailosod disgwyliadau o beth sy'n bosibl, a thelerau trafodaeth gyhoeddus ynglŷn â theithio a thrafnidiaeth. Mae hyn yn bwysig: rydym ar hyn o bryd yn gweithio o 'norm' o ddefnyddio ceir petrol a disel yn arferol a bydd hyn ond yn newid os bydd arweinyddiaeth yn parhau i gael ei ddangos yn y maes hwn.



Arweiniodd tâl atal tagfeydd Llundain at gynnydd o 80% mewn beicio

## Cynnydd technolegol diweddar

Cefnogir y dystiolaeth o sut y gallwn wneud newidiadau cadarnhaol gan, ac mewn rhai achosion caiff ei oddiweddyd gan, gynnydd sylweddol mewn nifer o wahanol dechnolegau dros y degawd diwethaf.

Bydd gallu deall ac ymateb i dechnolegau sy'n amharu yn rhan hollbwysig o strategaeth yn y dyfodol.



## Beiciau

### Llogi beiciau di-standin

Mae cynlluniau llogi beiciau wedi bod ar gael am amser hir, ac maent wedi cynyddu mewn poblogrwydd ac o ran pa mor weledol ydynt yn ystod y degawd diwethaf, gyda chynlluniau megis 'Boris bikes' yn Llundain. Fodd bynnag, mae cost sefydlu cynllun o'r fath yn uchel, ac maent yn dibynnu ar bobl yn dod o hyd i standin sy'n agos i ddechrau a diwedd eu siwrnai.

Yn fwy diweddar mae cynlluniau beic 'di-standin' wedi dechrau ymddangos, yn gyntaf yn Ne Ddwyrain Asia a nawr yn Ewrop.<sup>107,108</sup> Nid oes angen standinau ar y cynlluniau hyn, gyda defnyddwyr yn dod o hyd i'r beic agosaf sydd ar gael drwy ap ffôn clyfar, ac yn gadael y beic yn unrhyw leoliad cyfleus sy'n agos i'w cyrchfan. Cynhelir y cynlluniau yn uniongyrchol gan y cwmni llogi beiciau, ac nid oes angen buddsoddiad gan y ddinas sy'n eu cynnal. Er eu bod yn addo mwy o hwylustod i breswylwyr a dim costau sefydlu i'r ddinas, lleiswyd rhai pryderon gan awdurdodau dinasoedd, yn bennaf lle mae nifer fawr o feiciau wedi'u gwaredu neu eu gadael mewn manau amhriodol. Byddai gweithio gyda gweithredwyr cynllun i gytuno ar ddull sy'n fuddiol i breswylwyr lleol ac sy'n mynd i'r afael â'r pryderon yn fanteisiol i'r awdurdodau lleol a'r cwmnïau preifat.

### Mae cynlluniau rhannu beiciau yn cynnwys llogi beiciau a beiciau cronfa yn cynyddu argaeledd beiciau

Yn fwy eang, mae cynlluniau beiciau eraill megis beiciau cronfa mewn gweithleoedd, rhannu beiciau rhwng cymheiriaid, a chynlluniau prynu beic drwy'r gweithle hefyd yn cynnig ffyrdd i gynyddu argaeledd beiciau.<sup>109</sup>

### E-feiciau

Un o'r rhwystrau i bobl ddechrau beicio, yn arbennig mewn ardaloedd mwy gwledig, lle gallai siwrneiau fod yn hwy ac yn fryniog, yw'r ymdrech gorfforol sydd ei hangen i feicio. Mae e-feiciau yn cynnig beicio gyda chymorth pŵer, gyda'r pŵer yn cael ei ddarparu gan fatri sy'n rhan o'r beic. Mae'n dal angen pedlo i symud y beic, ond mae'r modur yn helpu pan fo gwrthiant sylweddol megis rhiw.

Mae technoleg e-feiciau yn gwella ac yn gostwng mewn pris yn gyflym, ac mae'n ddewis cystadleuol o ran pris ar gyfer perchnogaeth bersonol, llogi beiciau neu gynlluniau rhannu beic.

### Rhannu car a chronfa ceir

Nod cronfa ceir, pan fydd unigolion yn defnyddio car a rennir (e.e. wedi'i weithredu yn eu gweithle, neu gyda phreswylwyr eraill mewn ardal leol), yw lleihau nifer y siwrneiau a wneir gan geir tra'n cadw mynediad at gar pan fo angen. Er enghraifft, os bydd staff mewn swyddfa angen gwneud ymweliadau â chartrefi neu deithio ar gyfer cyfarfodydd yn ystod y dydd, byddai car cronfa yn galluogi iddynt gymudo i'r gwaith ar drafnidiaeth gyhoeddus, yna defnyddio car cronfa pan fo angen yn ystod y dydd.

Gellir trefnu systemau cronfa ceir yn lleol, neu mae darparwyr mawr yn cynnwys rhai cwmnïau llogi ceir yn cynnig y gwasanaeth hwn. Mae blaenoriaethu parcio ar gyfer ceir cronfa yn annog eu defnydd. Mae ffonau clyfar wedi galluogi systemau cronfa ceir i gael eu defnyddio mewn ardaloedd preswyl, gyda phreswylwyr yn dod o hyd i'r car cronfa agosaf drwy ap pan fyddant yn gwneud siwrnai y mae angen car arnynt ar ei chyfer.

Nod cynlluniau rhannu car yw rhoi cydweithwyr sy'n byw'n agos i'w gilydd mewn cysylltiad, er mwyn eu helpu i arbed tanwydd a lleihau allyriadau drwy rannu siwrneiau ar hyd yr un llwybr.<sup>22</sup>

## Monitro llygredd amser real

Mae technoleg i fonitro llygredd yn dod yn rhatach ac yn fwy cludadwy. Mae dyfais monitro bersonol eisoes ar gael sy'n costio llai na £50, CleanSpace.<sup>110</sup> Mae ap sy'n cyd-fynd â'r ddyfais yn tracio eich cysylltiad â charbon monocsid yn ystod eich siwrneiau bob dydd (mesur o gysylltiad â llygredd pibell fwg cerbydau) ac yn rhoi crynodeb i chi o'ch siwrnai ar fap. Mae hyn yn caniatáu i bobl sy'n teithio ar droed neu feic i osgoi ardaloedd sy'n drwm o lygredd ar gyfer siwrneiau yn y dyfodol.

Er bod ei datblygiad a'i gweithrediad wedi'i oedi, bydd system yn dechrau yn fuan iawn yn Abertawe (Nowcaster) a fydd yn monitro ansawdd aer ac yn dargyfeirio gyrwyr gydag arwyddion electronig pan fo llygredd yn uwch na lefel benodol.<sup>111</sup>



## Cerbydau allyriadau isel iawn

### Ceir

Mae lleihau allyriadau o gerbydau yn bwysig er mwyn gwella ansawdd aer a lleihau cynhyrchiad nwy tŷ gwydr niweidiol. Y dechnoleg allyriadau isel iawn mwyaf datblygedig sydd ar gael ar hyn o bryd yw'r cerbyd trydan batri, gyda'r seilwaith ar gyfer gwefru a'r dewis o geir yn tyfu'n gyflym. Mae'r diwydiant ceir yn mynd drwy gyfnod o newid cyflym, gyda nifer y gwneuthurwyr sy'n lansio ceir trydan llwyr yn cynyddu, ac yn ddiweddar ymrwymodd Volvo y byddai pob model newydd yn hybrid neu'n drydan llwyr o 2019 ymlaen.<sup>112</sup>

## Mae'r diwydiant ceir yn mynd drwy gyfnod o newid, gyda nifer y cynhyrchwyr sy'n lansio ceir trydan llwyr yn cynyddu'n gyflym

Er mwyn ysgogi ymhellach drawsnewidiad i gerbydau trydan, mae angen parhau i gyflwyno cyfleusterau gwefru, ac yn arbennig mynd i'r afael â gwefru lle nad oes parcio oddi ar y ffordd ar gael. Er enghraifft, mae treialon yn cael eu cynnal nawr yn Llundain ac mewn mannau eraill yn y DU ar gyfer gwefru cerbydau trydan o lampau stryd.<sup>113</sup> Ar gyfer defnydd trawsnewidiol lle mae'r pellter gyrru presennol yn annigonol, mae modelau hybrid ar gael y gellir eu plygio i mewn sy'n rhoi swm sylweddol is o allyriadau a defnydd tanwydd na cherbydau motor tanio mewnol (ICE) llwyr.

## Wyddoch chi...?

Nid yw cerbydau trydan yn newydd. Adeiladwyd y cerbyd trydan cyntaf ym 1884, dros 20 mlynedd cyn dechrau cynhyrchu'r Ford Model T ym 1908

Mae nifer o ddinasoedd ledled y DU nawr yn cymhell neu'n gorfodi tacsis i fod yn gerbydau hybrid plygio i mewn neu'n gerbydau trydan llwyr, yn cynnwys Llundain lle bydd angen i bob tacsî newydd a gyflwynir ar gyfer ei drwyddedu o 1 Ionawr 2018 fod yn gallu teithio o leiaf 30 milltir gyda dim allyriadau.<sup>114</sup> Mae grant tacsî plygio i mewn y Llywodraeth hefyd wedi'i gyflwyno i gymhell tacsî trydan, ac mae seilwaith gwefru tacsî yn derbyn



cymhorthdal mewn 10 dinas.<sup>115</sup> Mae cerbydau fflyd yn gyfle arall i gyflwyno cerbydau allyriadau isel iawn. Mae nifer o sefydliadau'r GIG yn y DU, yn cynnwys ymddiriedolaethau aciwt a gwasanaethau ambiwlans, eisoes wedi dechrau cyflwyno cerbydau trydan i'w fflyd,<sup>116,117</sup> ac mae'r Post Brenhinol wedi dechrau treialu faniau dosbarthu trydan.<sup>118</sup>

#### Blwch 4. Symud i ffynonellau ynni glanach

Mae newid i gerbydau dim allyriadau yn gyfraniad pwysig i leihau llygredd aer yn lleol. Yn y bôn mae cerbydau trydan 3-5 gwaith yn fwy effeithlon yn eu defnydd o ynni na cherbydau ICE.<sup>120</sup> Fodd bynnag, er mwyn lleihau llygredd aer ac allyriadau carbon ehangach, mae'n bwysig bod y trawsnewidiad i gerbydau trydan yn cyd-fynd â dadgarboneiddio grid trydan y DU, drwy ddefnydd cynyddol o ffynonellau ynni adnewyddadwy.<sup>53,95</sup>

Mae cyfle i gyplysu peth galw newydd am ynni gyda chynhyrchiad yn y man defnyddio, megis drwy feysydd parcio solar,<sup>121</sup> neu orsafoedd gwefru e-feiciau. Ar hyn o bryd mae Cymru yn cynhyrchu tua 9,000 gigawat awr o ynni o adnoddau adnewyddadwy, ac mae'r ffigur hwn yn cynyddu.<sup>60</sup>



### Mae nifer o ddinasoedd ar draws y DU nawr yn cymell neu'n gorfodi tacsis i fod yn rhai trydan

Er bod cerbydau trydan yn sicr yn cynorthwyo i leihau llygredd aer yn lleol, nid ydynt yn ei waredu'n llwyr (oherwydd y deunydd gronynnol a gynhyrchir gan deiars yn gwisgo), ac nid ydynt yn gwneud dim i wella cyfraddau gweithgarwch corfforol, felly mae mesurau i symud pobl tuag at deithio llesol a thrafnidiaeth gyhoeddus yn dal yn hollbwysig.<sup>119</sup>

### Bysiau

Mae bysiau yn ffynhonnell fawr o lygredd, yn arbennig bysiau disel hŷn. Mae gan dechnoleg fwy newydd (megis disel Euro VI) allyriadau NOx llawer is na chenedlaethau blaenorol o injans. Yn ddiweddar mae Bws Caerdydd wedi prynu deg model Euro VI.<sup>122</sup> Mae fflyd bysiau mewn rhannau eraill o'r DU hefyd wedi cyflwyno bysiau hybrid, hybrid plygio i mewn a bysiau trydan llwyr i'w fflyd.<sup>32</sup> Er bod trosi fflyd gyfan yn ddrud, gellid gwneud hyn dros amser, gyda'r llwybrau prysuraf yn cael eu newid yn gyntaf; a gyda chost y trosi yn cael ei gymorthdalun uniongyrchol gan ardollau ar gerbydau sy'n llygru.

Mae technoleg retroffit ar gyfer bysiau wedi'i ddefnyddio'n eang ledled y DU, gyda thua 3,000 o fysiau disel hŷn yn cael eu retroffitio gyda lleihad catalytig dethol (SCR) er mwyn lleihau allyriadau NOx gan dros 90%, lleihad sydd wedi'i gadarnhau mewn profi bywyd go iawn gan Transport for London (TfL).<sup>32</sup> Mae TfL ei hun wedi retroffitio dros 2,100 o fysiau gyda SCR.

### Gall retroffitio bysiau leihau allyriadau NOx gan 90%

Dewis arall mewn rhai achosion fyddai i ddisodli llwybrau bysiau a wasanaethir gan fysiau sy'n llygru gyda gwasanaethau rheilffordd gul trydan.



## Blwch 5. Cynigion Metro Prifddinas-Ranbarth Caerdydd

Cytunwyd ar Fargen Ddinesig gwerth £1.2 biliwn ym mis Mawrth 2016 yn cwmpasu deg o awdurdodau lleol De Ddwyrain Cymru, yn cynnwys buddsoddiad sylweddol mewn system drafnidiaeth gyhoeddus integredig Metro Prifddinas-Ranbarth Caerdydd. Mae manylion y Metro yn dal i gael eu trafod, ond mae'r cynnig yn cynnwys rheilffordd drydan; hybiau trafrnidiaeth integredig; cyfleusterau parcio a theithio; llwybrau cludiant chwim rheilffordd gul a/neu fws; gwell integreiddio ar draws dulliau a gweithredwyr; ac ymyriadau teithio llesol.<sup>123</sup> Roedd y Fargen Ddinesig hefyd yn cynnwys ymrwymiad i drydaneiddio rhwydwaith rheilffordd Llinell y Cymoedd erbyn 2023<sup>5</sup>

### Trenau

Mae trenau disel hefyd yn gyfrifol am lefelau uchel o lygryddion. Bydd trydaneiddio llinellau yn lleihau'r defnydd o locomotifau disel, ond gall fod yn ddrud iawn i'w gyflwyno. Mae hyn wedi'i gynllunio eisoes ar gyfer y brif linell i Gaerdydd,<sup>124</sup> er bod polisi blaenorol i ymestyn tyrdaneiddio ymhellach i'r gorllewin wedi'i ganslo'n ddiweddar. Mae treialon wedi awgrymu efallai y gall locomotifau a weithredir gan fatri ddarparu ateb ar gyfer ardaloedd lle mae trydaneiddio'n rhy ddrud.<sup>31</sup>

### Gweithio o gartref a thechnoleg cyfarfod o bell

Dewis amgen arall i deithio mewn car i'r gwaith neu yn ystod amser gwaith yw osgoi teithio yn gyfan gwbl drwy ddefnyddio technolegau o bell. Mae hyn yn cynnwys gweithio o gartref ond hefyd lleihau amser teithio yn ystod oriau gwaith drwy gyfnewid cyfarfodydd wyneb yn wyneb am delegynadledda neu fideo-gynadledda. Er bod gweithio o gartref a chyfarfodydd o bell ond yn addas ar gyfer rhai rolau, peth o'r

amser, maent serch hynny yn opsiynau pwysig fel rhan o ddatrysiad cyffredinol. Er enghraifft, mae gweithio o gartref am un diwrnod o'r wythnos yn debygol o leihau llygredd aer cysylltiedig â thrafrnidiaeth ac allyriadau carbon ar gyfer gweithiwr gan un rhan o bump.

### Defnyddio data i ddadansoddi bylchau mewn trafrnidiaeth gyhoeddus

Erbyn hyn mae swm enfawr o ddata wedi'i ddienwi yn cael ei gasglu ar lefel poblogaeth ynglŷn â symudiadau pobl, gan ddefnyddio gwybodaeth o ffonau clyfar. Gellir defnyddio'r data hwn i wella trafrnidiaeth gyhoeddus. Defnyddiodd gwneuthurwyr ap trafrnidiaeth poblogaidd, CityMapper, ddata yn Llundain i nodi bylchau mewn llwybrau presennol ac mae nawr wedi sefydlu llwybr bws nos i fodloni'r angen hwn.<sup>125</sup>

### Technoleg ar y gorwel

#### Gwelliannau mewn technoleg cerbydau trydan

Mae ystod a fforddiadwyedd cerbydau trydan yn cynyddu'n gyflym, gyda'r rhan fwyaf o'r gwneuthurwyr nawr yn bwriadu rhyddhau cerbydau trydan o fewn yr 1-2 flynedd nesaf. Mae disgwyl i brisiau cerbydau trydan ddisgyn yn raddol.

Bydd cynnydd yn y nifer sy'n defnyddio cerbydau trydan yn gofyn am gyflwyno technoleg gwefru glyfar er mwyn osgoi gorlwytho'r grid trydan, er enghraifft drwy amserlennu gwefru mewn gwahanol bwyntiau dros nos i lyfnhau'r galw.

Mae technoleg i ganiatáu gwefru cerbydau wrth fynd ('gwefru deinamig') drwy wyneb y ffordd eisoes yn cael ei dreialu yn Ne Corea ac UDA.<sup>126</sup> Mae gan hyn y potensial i ganiatáu i gerbydau trafrnidiaeth gyhoeddus aros mewn gwasanaeth tra'n gwefru.

## Cerbydau annibynnol ac wedi'u cysylltu

Er bod rhai cerbydau sydd eisoes ar gael yn cysylltu i'r rhyngwrdd, mae gan gwmpas a natur y cysylltedd hwn y potensial i esblygu ymhellach dros y blynyddoedd nesaf, gyda cheir yn cysylltu â goleuadau traffig neu gyda cheir eraill, er mwyn deall yn well amodau traffig lleol, lefelau llygredd, ac er mwyn osgoi gwrthdrawiadau.<sup>127</sup>

Mae ceir hunan-yrru ar fin dod yn realiti o ganlyniad i welliannau mewn synwryddion a datblygiadau mewn gwybodaeth artiffisial. Mae ceir eisoes ar y farchnad sy'n gallu brecio eu hunain er mwyn osgoi gwrthdrawiadau, parcio eu hunain, a gyrru'n annibynnol ar draffyrdd. Mae'r prif wneuthurwyr yn bwriadu cael ceir sydd bron yn gwbl annibynnol ar y ffordd o fewn y 4 blynedd nesaf.<sup>128</sup> Cynllunir cerbydau cario llwythi annibynnol hefyd.

### Mae'r prif wneuthurwyr yn bwriadu cael ceir annibynnol iawn ar y ffordd o fewn y 4 blynedd nesaf

Mae effaith bosibl cerbydau annibynnol neu di-yrwr o fewn y 10-15 mlynedd nesaf wedi'i nodi yn adroddiad Tueddiadau'r Dyfodol Llywodraeth Cymru.<sup>71</sup>

O fewn cyd-destun system drafndiaeth integredig, efallai mai'r potensial mwyaf ar gyfer cerbydau annibynnol yw rôl mewn 'symudedd fel gwasanaeth'. Byddai hyn yn gweld cerbydau annibynnol yn teithio ar hyd llwybr sefydlog, neu i'w cael ar alw (tacs di-yrwr yn y bôn), a gallai helpu i gau bylchau mewn cwmpas trafndiaeth gyhoeddus. Mae podiau di-yrwr wedi cael eu defnyddio ym maes awyr Heathrow Llundain am dros 5 mlynedd nawr, ac maent nawr yn cael eu treialu yn Greenwich.<sup>129</sup> Mae cwmnïau technoleg rhannu ceir megis Uber, sydd eisoes yn cael effaith aflonyddgar ar y sector trafndiaeth, hefyd yn treialu technoleg annibynnol.<sup>130</sup>

Wrth i dechnoleg aeddfedu, mae gan gerbydau annibynnol y potensial i gael ystod eang o effeithiau, o welliannau mewn diogelwch ar y ffyrdd i leihau perchnogaeth ceir personol, ac effeithiau ar swyddi yn y diwydiant trafndiaeth.



## Sut gallai iechyd a lles wella

Dylai annog cerdded a beicio, a lleihau llygredd aer, arwain at welliannau sylweddol mewn iechyd cardiofasgwlaidd, cyfraddau diabetes, bod dros bwysau a gordewdra, cwympiadau, canser ac iechyd meddwl, yn ogystal â chynnydd cyffredinol mewn disgwyliad oes.

Er enghraifft, mae cynnydd mewn gweithgarwch corfforol yn arwain at leihad yng nghyfradd gyffredinol marwolaethau gan hyd at 30%, risg 20% i 35% yn is o gael clefyd cardiofasgwlaidd a strôc, lleihad o 30% i 40% mewn diabetes math 2, risg 30% yn is o gwmpo ymhlith oedolion hŷn, risg 30% yn is o ganser y coluddyn a risg 20% yn is o ganser y fron, a risg 20-30% yn is o ddiodef iselder a dementia ymhlith oedolion.<sup>93,131-133</sup>

Mae manteision eraill yn cynnwys lleihad mewn babanod gyda phwysau geni isel, llai o absenoldeb oherwydd salwch a gwell cynhyrchiant ymhlith staff, a chynnydd yn yr amser y mae plant yn ei dreulio yn chwarae yn yr awyr agored.



# Mae'r amser yn iawn ar gyfer newid

Mae nifer o gyfleoedd yn bodoli drwy ddeddfwriaeth, polisi cenedlaethol a lleol, a diwylliant sy'n newid yn raddol o ran defnydd ceir, sy'n dweud mai nawr yw'r amser i weithredu Mae'r bennod hon yn disgrifio'r prif gyfleoedd y mae angen i ni gydio ynddynt.

Ni fydd creu newid diwylliannol yn ein cymunedau a'n sefydliadau mawr yn digwydd dros nos. Bydd angen i ddefnydd dulliau ar gyfer newid y rhoddwyd cynnig arnynt a'u profi megis methodoleg gwelliant parhaus, a gwneud y defnydd gorau posibl o'r cyfleoedd a roddir gan dechnolegau aflonyddgar, fod yn sylfaenol i'n dull .

## Deddfwriaeth

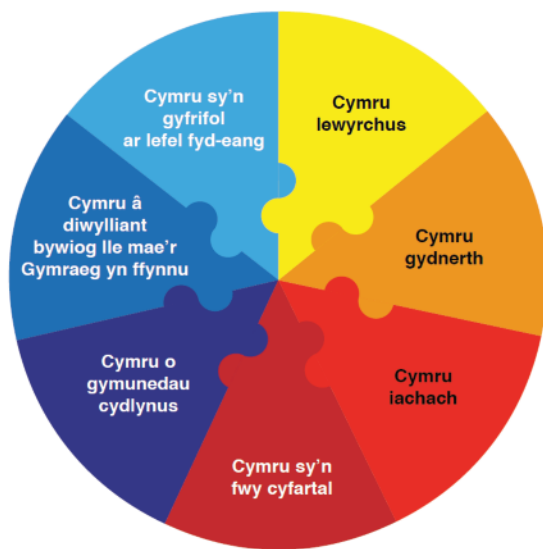
### Cenedlaethol

Pasiwyd pedwar darn allweddol o ddeddfwriaeth yng Nghymru yn ddiweddar, sy'n ymwneud â gwella iechyd, lles a chynaliadwyedd amgylcheddol (gweler Blwch 6).

#### **Blwch 6. Deddfwriaeth ddiweddar yng Nghymru sy'n berthnasol i deithio cynaliadwy, iechyd a lles**

Deddf Llesiant Cenedlaethau'r Dyfodol (Cymru) 2015 <sup>134</sup>	Mae'n cyflwyno dyletswyddau ar sefydliadau sector cyhoeddus yng Nghymru i roi ystyriaeth i genedlaethau'r dyfodol wrth gynllunio gwasanaethau a gwneud penderfyniadau
Deddf Teithio Llesol (Cymru) 2013 <sup>135</sup>	Mae'n ei gwneud hi'n ofyniad cyfreithiol i awdurdodau lleol yng Nghymru fapio a chynllunio llwybrau addas ar gyfer teithio llesol ac adeiladu a gwella eu seilwaith ar gyfer cerdded a beicio bob blwyddyn.
Deddf yr Amgylchedd (Cymru) 2016 <sup>136</sup>	Mae'n rhoi dyletswydd ar Weinidogion Llywodraeth Cymru i sicrhau bod y cyfrif allyriadau net yng Nghymru yn 2050 o leiaf 80% yn is na'r waelodlin. <sup>a55</sup>
Deddf Iechyd Cyhoeddus (Cymru) 2017 <sup>137</sup>	Mae'n cyflwyno dyletswydd i gynnal Asesiadau Effaith ar Iechyd

**Ffigur 5. Nodau lles a sefydlwyd o dan Ddeddf Llesiant Cenedlaethau'r Dyfodol**



Mae Deddf Llesiant Cenedlaethau'r Dyfodol yn sefydlu byrddau gwasanaethau cyhoeddus ym mhob awdurdod lleol gyda dyletswydd ar aelodau i weithredu gyda'i gilydd ac yn unigol i ymateb i'r heriau yn yr ardal a nodwyd drwy asesiad lles. Mae'r Ddeddf a'i gweithrediad yn rhoi cyfle sylweddol i fynd i'r afael â materion a amlygir yn yr adroddiad hwn.

Rôl Comisiynydd Cenedlaethau'r Dyfodol yw gweithredu fel eiriolwr dros genedlaethau'r dyfodol a llywio gweithrediad Deddf Llesiant Cenedlaethau'r Dyfodol. O'r saith prif flaenoriaeth a restrir gan y Comisiynydd sydd yn y swydd, mae pump yn uniongyrchol

gysylltiedig â'r materion a drafodir yma: Bargeinion Rhanbarth Dinesig, systemau trafnidiaeth integredig yn cynnwys Metro De Cymru, atal, blynyddoedd cynnar a newid hinsawdd.<sup>138</sup> Ar wahân mae'r Comisiynydd wedi ailadrodd y gofyniad am weithredu brys ar newid hinsawdd.<sup>139,140</sup>

## Rhyngwladol

Yn rhyngwladol, mae'r DU yn llofnodwr Cytundeb Paris 2015 ar newid hinsawdd. Mae'r cytundeb hwn sydd wedi'i rwymo mewn cyfraith yn ymrwymo'r DU i gymryd camau sylweddol i leihau allyriadau nwy tŷ gwydr er mwyn cyfyngu cynhesu byd-eang i lai na 2°C, gyda nod o uchafswm o 1.5°C o gynhesu.<sup>141</sup> Er mwyn i'r DU fodloni ei dyletswyddau o dan Gytundeb Paris bydd angen lleihad sylweddol mewn allyriadau o drafnidiaeth ffordd.

## Strategaeth a pholisi

Mae nifer o strategaethau a pholisïau sy'n berthnasol i'r materion a ddisgrifir yma. Rhestrir strategaethau rhyngwladol a chenedlaethol ym Mlwch 7, a strategaethau lleol y Mlwch 8. Rhoddir disgrifiad a chyfeirnod i bob un yn yr Atodiad.

Yn ogystal â'r strategaethau lleol a ddangosir, mae gan bob un o'r sefydliadau sector cyhoeddus strategaeth teithio llesol; ac mae strategaeth ansawdd aer yn cael ei datblygu ar gyfer Caerdydd ar hyn o bryd.

## Blwch 7. Strategaeth a pholisi rhyngwladol a chenedlaethol allweddol

Cynllun y DU ar gyfer mynd i'r afael â chrynodiadau nitrogen deuocsid ymyl y ffordd
Rheoliadau Allyriadau Gyrru Real
Grantiau Swyddfa ar gyfer Cerbydau Allyriadau Isel
Canllaw y Gymdeithas Cynllunio Gwlad a Thref: Cynllunio ar gyfer gwell iechyd a lles yng Nghymru
Polisi y Sefydliad Cynllunio Trefol Brenhinol
Canllaw Rheoli Ansawdd Aer Lleol Cymru 2017
Llawlyfr Strydoedd
Confensiwn y Cenedloedd Unedig ar Hawliau'r Plentyn a Mesur Hawliau Plant a Phobl Ifanc (Cymru) 2011
Amcanion Lles Iechyd Cyhoeddus Cymru
Comisiynydd Cenedlaethau'r Dyfodol Cymru - Cynllun strategol drafft 2017-23

## Blwch 8. Strategaethau lleol a rhanbarthol allweddol

Byrddau Gwasanaethau Cyhoeddus – Amcanion a chynlluniau lles
Bwrdd Partneriaeth Rhanbarthol – Cynllun ardal (yn cael ei ddatblygu)
Cynlluniau Datblygu Lleol
Cynlluniau Trafnidiaeth Lleol
Siapio ein Lles i'r Dyfodol
Strategaeth Trafnidiaeth Caerdydd
Strategaeth Beicio Caerdydd
Bargen Ranbarth Ddinesig

## Newid Diwylliant

Mae egin gwyrdd symudiad oddi wrth geir yn dechrau ymddangos. Mae preswylwyr yn ein hardal yn awyddus i feicio mwy, gwneud mwy o weithgarwch corfforol ac maent am weld gwelliannau mewn trafndiaeth gyhoeddus.

Mae gyrru car wedi dod yn llai poblogaidd ymhlith pobl ifanc dros yr ychydig flynyddoedd diwethaf, yn rhannol o ganlyniad o gynnydd anferth mewn cost yswiriant ynghyd ag argaeledd apiau rhannu lifft megis Uber.8 Hefyd bu cynnydd mewn siopwyr sy'n ymweld â'r stryd fawr yn hytrach na safleoedd cyrion tref yng Nghymru.<sup>142</sup>

### Mae gyrru wedi dod yn llai poblogaidd ymhlith pobl ifanc

Tra arferai'r car fod yn ddull hanfodol i gadw mewn cysylltiad â ffrindiau a pherthnasau, mae'r ffrwydrad diweddar yn y defnydd o gyfryngau cymdeithasol, galwadau fideo a negeseua gwib wedi gwneud llawer o'r siwrneiau hyn yn ddiangen.

Mae hygyrchedd trafndiaeth gyhoeddus ar gyfer pobl sydd ag anawsterau symudedd wedi cynyddu'n sylweddol dros y 10 mlynedd diwethaf gyda bron pob bws (94%) yn hygyrch yn Lloegr, i fyny o 65% ers 2005.<sup>8</sup> (nid oes ffigurau cymharol ar gael ar gyfer Cymru).

Er bod ceir petrol a disel yn dal i ddominyddu gwerthiannau, mae gwerthiant cerbydau allyriadau isel iawn yn codi'n gyflym yn ein hardal. Gwerthwyd llai nag 20 cerbyd yng Nghaerdydd a'r Fro bob chwarter dair blynedd yn ôl ond erbyn hyn gwerthir dros 300.<sup>143</sup>

## Arfer da yn lleol

Ceir eisoes rai enghreifftiau gwych o brosiectau sy'n palmentu'r ffordd ar gyfer dyfodol gwell yn ein hardal.

### Bwrdd Iechyd Prifysgol Caerdydd a'r Fro

Ceir nifer o enghreifftiau o arfer da ar draws y Bwrdd Iechyd, gan gynnwys cynllun Parcio a Theithio ar gyfer safle Mynydd Bychan (gweler Blwch 9); datblygiad Y Berllan yn Ysbyty Athrofaol Llandochoau, i annog gweithgarwch corfforol mewn gofod gwyrdd cyfagos; cynllun prynu beic; sefydlu cynllun 'Parcio a Cherdded' yn Ysgol Gynradd Severn Road yng Ngorllewin Caerdydd, i leihau allyriadau ceir a pheryglon tu allan i gatieu ysgol; cynlluniau ar gyfer hyb bysiau integredig ar safle YAC, gan weithio gyda'r awdurdodau lleol; cynnwys hwyluso mynediad gyda thrafnidiaeth gyhoeddus a theithio llesol mewn penderfyniadau ynghylch datblygu canolfannau iechyd a lles newydd ar draws yr ardal; a sefydlu grŵp i adolygu data ansawdd aer ar gyfer ysgolion i helpu i hyrwyddo teithio llesol.

### Blwch 9. Gwasanaeth Parcio a Theithio ar gyfer Ysbyty Athrofaol Cymru

#### Park and Ride Service for UHW



Mae gwasanaeth bws Parcio a Theithio newydd wedi'i gyflwyno ar gyfer Ysbyty Athrofaol Cymru, mewn cydweithrediad â Bws Caerdydd a Chyngor Dinas Caerdydd. Mae'r gwasanaeth bws rheolaidd yn lleihau tagfeydd ac allyriadau cysylltiedig â thraffig ar y safle gan helpu i wneud yr amgylchedd yn fwy derbynol dros amser ar gyfer teithio llesol a cherddwyr. Mae defnyddio'r Parcio a Theithio yn rhatach ar gyfer staff ac ymwelwyr na pharcio ar y safle.



## Cyngor Bro Morgannwg

Mae Cyngor Bro Morgannwg yn awyddus i weld ei staff yn teithio'n gynaliadwy (gweler Blwch 10). Mae'r cynllun Greenlinks yn y Fro yn fath o drafnidiaeth ar alw, gan alluogi pobl sydd heb fynediad cyson at gar i wneud siwrneiau ad hoc nad ydynt wedi'u gwasanaethu gan y rhwydwaith trafnidiaeth gyhoeddeus.<sup>144</sup>

### Blwch 10. Helpu staff i deithio'n gynaliadwy

Mae Cyngor Bro Morgannwg yn arwain y ffordd mewn annog ei staff i deithio'n gynaliadwy. Mae ei ddulliau yn cynnwys darpariaeth beiciau cronfa i fynd a dod rhwng swyddfeydd cyfagos; ceir cronfa; a pholisi treuliau teithio sy'n annog gwneud siwrneiau byr mewn modd llesol.



## Cyngor Dinas Caerdydd

Yn ychwanegol at Strategaeth Trafnidiaeth Caerdydd uchelgeisiol,<sup>5</sup> mae nifer o brosiectau sy'n annog pobl i beidio defnyddio eu ceir yng Nghaerdydd. Mae rhain yn cynnwys chwarae stryd (gweler Blwch 11); rhaglen i annog teithio llesol ymhlith staff sy'n gweithio yn Neuadd y Sir; cynllun rhannu car Caerdydd; a datblygiad parhaus strategaeth ansawdd aer lleol.

### Blwch 11. Annog chwarae stryd

Caewyd strydoedd yn Nhrelai ac Eglwys Newydd yng Nghaerdydd ar 2 Awst 2017 i roi cyfle i blant chwarae'n ddiogel mewn ardal breswyl. Y gobaith yw y bydd y digwyddiadau hyn, a drefnwyd gan Chwarae Cymru ac sy'n dilyn y model 'Chwarae Allan', gyda chefnogaeth Cyngor Dinas Caerdydd, yn un o nifer o enghreifftiau o'r fath sy'n caniatáu i blant fynd allan a bod yn egniol, lleihau amser gwyllo'r sgrin a chynyddu gweithgarwch corfforol. Anogwyd plant i ddod ynghyd i chwarae ar y stryd gyda'u teuluoedd a dod a'u sgwteri, peli pêl-droed, sialc a rhaffau sgipio.

Dywedodd Toni Morgan, un o breswylwyr Caerdydd ac sy'n fam i ddau, 'Roeddwn am ddechrau'r prosiect yn fy stryd gan fy mod yn ymwybodol o'r lluo o deuluoedd sy'n byw yn y stryd, fodd bynnag nid oeddwn wedi dod ar draws unrhyw blant ar unrhyw adeg yn chwarae allan mewn tair blynedd o fyw yma.

### Enghreifftiau eraill



Mae lechyd yr Amgylchedd Iechyd Cyhoeddus Cymru yn gweithio'n agos gyda thimau iechyd cyhoeddus a chynghorau ar draws Cymru i feithrin cydweithio agosach rhwng arbenigwyr lleol er mwyn gwella ansawdd aer yn lleol, ac maent wedi bod â rôl allweddol mewn codi proffil ac ymwybyddiaeth o lygredd aer fel problem iechyd yng Nghymru.

Mae gwybodaeth am lygredd aer yn cael ei datblygu ar gyfer ysgolion cynradd ac uwchradd yng Nghymru,<sup>145</sup> wedi'i seilio ar brofiadau yn yr Alban a Gogledd Iwerddon.

# Achub ar y cyfle: gweledigaeth ar gyfer Caerdydd a'r Fro

Pa ddyfodol ydym ni am ei gael ar ein cyfer ni ein hunain a'n cymunedau? Cyflwynir gweledigaeth yma yn seiliedig ar bump thema allweddol gan ddangos beth allem ni ei gyflawni yng Nghaerdydd a'r Fro.

 <p>Teithio llesol yw'r dewis diofyn ar gyfer siwrneiau byr</p>	<p>Mae seilwaith adeiledig yn gyson yn galluogi a hyrwyddo cerdded a beicio fel y dewis diofyn ar gyfer siwrneiau byr</p> <p>Mae preswylwyr, gan gynnwys disgyblion ysgol, yn defnyddio dulliau llesol fel mater o drefn ar gyfer siwrneiau byr</p> <p>Sonnir am a hyrwyddir teithio llesol ar bwyntiau allweddol mewn bywyd ar gyfer preswylwyr a staff yng Nghaerdydd a'r Fro</p> <p>Mae cyflogwyr yn annog yn gadarnhaol deithio llesol, gan gydnabod manteision o ran lles staff, absenoldeb oherwydd salwch a chynhyrchiant</p> <p>Ariennir datblygiadau seilwaith ar gyfer teithio llesol a chynaliadwy drwy daliadau ar drafndiaeth sy'n llygru a glustnodir</p> <p>Busnesau lleol yn cefnogi teithio llesol gan gwsmeriaid</p> <p>Cynhelir un neu ragor o ddiwrnodau di-gar blynyddol wedi'u cydgysylltu ar draws canol dinas Caerdydd a threfi'r Fro</p> <p>Osgoir rhai siwrneiau ar gyfer gwaith drwy ddefnyddio technolegau o bell</p>
 <p>Mae system drafndiaeth gwbl integredig a ddefnyddir yn dda</p>	<p>Ceir system drafndiaeth gyhoeddus gynhwysfawr gydag amserlenni a thocynnau wedi'u hintegreiddio ar draws gwahanol ddulliau teithio</p> <p>Mae preswylwyr yn teithio'n arferol ar drafndiaeth gyhoeddus (ac/neu deithio'n llesol) ar gyfer siwrneiau o dros 2km yn y rhanbarth</p> <p>Mae gostyngiad cyson yn y defnydd o geir preifat ar gyfer cymudo a hamdden</p>
 <p>Cymunedau sydd wedi'u cysylltu'n dda, sy'n egnïol ac yn gymdeithasol</p>	<p>Cyflwynir terfynau cyflymder 20mya yn y trefi ac ar draws y ddinas drwy'r rhanbarth</p> <p>Mae'r system gynllunio a phobl sy'n symud i'r ardal yn cydnabod pwysigrwydd cerddadwyedd ardaloedd preswyl ac ardaloedd defnydd cymysg</p> <p>Bydd plant yn chwarae'n ddiogel yn rheolaidd ar strydoedd preswyl</p> <p>Gwarchodir a chyfoethogir gofodau gwyrdd (yn cynnwys coed) gyda mynediad da i ardaloedd drwy deithio llesol a thrafndiaeth gyhoeddus</p> <p>Mae cymunedau yn fwy cydlynol, gyda rhwydweithiau cymdeithasol cynyddol ar y strydoedd</p> <p>Gwelir gwelliannau mewn teithio llesol a llygredd aer, yn gyntaf yn ein cymunedau mwyaf amddifadus</p> <p>Mae adfywiad parhaus o siopau stryd fawr ar gyfer siopa a hamdden, gyda'r lleoliadau hyn wedi'u dewis gan siopau lleol a siopau cadwyn cenedlaethol cyn ardaloedd 'ar gyrion tref'.</p>

 <b>Lleiheir allyriadau trafndiaeth yn sylweddol</b>	Bysiau, trenau, tacsis a cherbydau fflyd sector cyhoeddus allyriadau isel.
	Ceir un neu ragor o barthau allyriadau isel yng Nghaerdydd
	Mae seilwaith gwefru cynhwysfawr ar gyfer cerbydau trydan
	Mae ymwybyddiaeth y cyhoedd o lygredd aer lleol yn uchel
	Cyflwynir parthau 'dim segura' o amgylch pob ysgol a chyfleuster iechyd yng Nghaerdydd a'r Fro
	Mae egwyddorion cynllunio lleol yn cynnwys disgwyliadau o ran lleihau defnydd a pherchnogaeth cerbydau preifat a hyrwyddo cerbydau allyriadau isel iawn
 <b>Mae Caerdydd a'r Fro yn arweinwyr yn y maes hwn</b>	Mae datgarboneiddio trafndiaeth yn cydreddeg â chynnydd yn yr ynni adnewyddadwy a gynhyrchir yn lleol
	Cydnabyddir Caerdydd a'r Fro fel patrwm ar gyfer teithio llesol a lleihau'r defnydd o'r car o fewn y DU ac yn rhyngwladol.

Dyma grynodedb o weledigaeth fanylach a baratowyd ar gyfer yr adroddiad hwn.

## Yr effaith bosibl...

Effaith cyflawni ein gweledigaeth	Beth allai hyn ei olygu i ni...
Llai o salwch a marwolaethau o ganser	Risg 30% yn is o ganser y coluddyn a risg 20% yn is o ganser y fron
Llai o salwch a marwolaethau o glefyd cardiofasgwlaidd a strôc	20-35% yn llai o achosion
Cyfraddau is o achosion o fod dros bwysau a gordewdra	Lleihad o 0.3-0.45kg/m <sup>2</sup> mewn BMI
Llai o ddiabetes math 2	30-40% yn llai o achosion
Gwell lles meddwl	Risg 20-30% yn is o iselder a dementia
Cyfraddau llai o gwmpadau ymhlith oedolion hŷn	Risg 30% yn is
Llai o absenoldebau oherwydd salwch	46% o leihad os bydd pobl yn beicio i'r gwaith
Gwell cynhyrchiant gan gyflogeion	15% o gynnydd mewn canolbwytio, gostyngiad mewn straen
Cynnydd mewn gwerthiannau manwerthu	30% o gynnydd mewn gwerthiannau manwerthu
Manteision eraill...	Llai o anghydraddoldebau mewn disgwyliad oes rhwng yr ardaloedd mwyaf a lleiaf amddifadus
	Cymunedau mwy cydlynol a gostyngiad mewn unigrwydd
	Llai o lygredd aer ac allyriadau carbon is sy'n cyfrannu at gynhesu byd-eang
	Llai o alw am wasanaethau iechyd a gofal cymdeithasol

# Pawb yn gwneud eu rhan: beth sydd angen i ni ei wneud gyda'n gilydd

Rydym wedi gosod gweledigaeth heriol o'r dyfodol yn lleol. Mae'r weledigaeth hon yn hollol gyraeddadwy; yn wir mae sawl agwedd arni yn realiti mewn dinasoedd fel Amsterdam; ac mae dinasoedd Ewropeaidd eraill, gan gynnwys Hamburg a Madrid, wedi cyflwyno cynlluniau i leihau'n aruthrol nifer y ceir sydd ynddynt yn yr 20 mlynedd nesaf.<sup>149</sup>

Er mwyn gwneud gwelliant sylweddol a chyson i'n hiechyd a'n lles mae angen i ni weithredu'n bendant nawr a dros y 5-10 mlynedd nesaf. Bydd gwneud hynny yn nodi Caerdydd a Bro Morgannwg yn arweinwyr yn y maes yng Nghymru a ledled y DU. Mae gan y sector cyhoeddus rôl i'w chwarae mewn arwain a modelu ymddygiadau.

Drwy'r penodau rydym wedi awgrymu llawer o weithredu a fydd yn gwneud gwahaniaeth parhaus mewn gwella iechyd drwy wneud teithio llesol ac iach yn norm yn ein cymunedau. Amlygir y gweithredu pwysicaf a mwyaf cyraeddadwy isod.

Pwy	Beth ddylid ei wneud
Cyngor Dinas Caerdydd a Chyngor Bro Morgannwg	<p><b>(a) Cyflymu gwelliannau i seilwaith er mwyn cefnogi teithio llesol a thrafnidiaeth allyriadau isel</b></p> <ul style="list-style-type: none"> <li>• parhau gyda'r gwelliannau a datblygiad parhaus seilwaith cerdded a beicio penodol, gan roi blaenoriaeth i ardaloedd amddifadus yn gyntaf</li> <li>• darparu mynediad at ofodau gwyrdd lleol drwy deithio llesol</li> <li>• manteisio i'r eithaf at y cyfleoedd a gyflwynir gan raglen Metro, yn cynnwys mewn ardaloedd gwledig</li> <li>• cyflwyno cynlluniau llogi beiciau (yn cynnwys e-feiciau)</li> <li>• ystyried cyflwyno parthau 20mya yn eang</li> <li>• cynyddu seilwaith gwefru cerbydau trydan, yn arbennig ar gyfer ardaloedd sydd heb fannau parcio oddi ar y stryd</li> <li>• gwrthod cynigion cynllunio sy'n effeithio'n anffafriol ar gerdded neu feicio</li> <li>• cefnogi cynhyrchu ynni adnewyddadwy yn lleol</li> </ul> <p><b>(b) Cefnogi staff i ddewis teithio llesol</b></p> <ul style="list-style-type: none"> <li>• annog pob aelod o staff i deithio'n llesol, er mwyn lleihau absenoldeb oherwydd salwch a chynyddu cynhyrchiant</li> <li>• uwch arweinyddiaeth a modelu rôl gweladwy</li> <li>• asesu cyfleoedd ar adegau symud gweithle</li> <li>• cefnogi gweithwyr sy'n paratoi ar gyfer ymddeol</li> </ul>

	<p><b>(c) Ymgysylltu â'r gymuned a busnesau lleol ar fanteision teithio llesol</b></p> <ul style="list-style-type: none"> <li>• cytuno ar gyfathrebu sy'n gyson ar draws y sector cyhoeddus yn lleol</li> <li>• pwysleisio cynnydd gwariant cwsmeriaid mewn ardaloedd cerddadwy</li> <li>• trefnu a hyrwyddo diwrnodau di-gar wedi'u cydgysylltu ar draws y rhanbarth</li> </ul> <p><b>(d) Peidio ag annog teithio sydd ddim yn iach ac sy'n llygru</b></p> <ul style="list-style-type: none"> <li>• cyflwyno parthau 'dim segura' tu allan i bob ysgol</li> <li>• ystyried cynnydd graddol mewn taliadau meysydd parcio cyhoeddus i ariannu a chyflymu gwelliannau mewn cyfleusterau teithio llesol a thrafnidiaeth gyhoeddus</li> <li>• sgopio cyflwyniad parth allyriadau isel yng Nghaerdydd, gan ddefnyddio unrhyw daliadau a godir i ariannu teithio llesol a gwelliannau trafndiaeth gyhoeddus</li> <li>• cyflwyno ceir cronfa allyriadau isel ar gyfer safleoedd mawr lle nad ydynt eisoes ar waith</li> </ul>
BIP Caerdydd a'r Fro	<p><b>(a) Cyflymu gwelliannau i seilwaith er mwyn cefnogi teithio llesol a thrafnidiaeth allyriadau isel</b></p> <ul style="list-style-type: none"> <li>• gweithio'n agos gydag awdurdodau lleol i fanteisio i'r eithaf ar gyfleoedd ar gyfer teithio'n llesol i safleoedd presennol a safleoedd yn y dyfodol, gan gynnwys cysylltiadau gyda llwybrau beicio strategol newydd</li> <li>• cyflwyno seilwaith gwefru cerbydau trydan</li> <li>• cyflwyno beiciau cronfa ar gampws YAC, a gwella ymhellach lwybrau beicio oddi ar y ffordd drwy safle YAC</li> </ul> <p><b>b) Cefnogi staff a myfyrwyr i ddewis teithio llesol</b></p> <ul style="list-style-type: none"> <li>• uwch arweinyddiaeth a modelu rôl gweladwy</li> <li>• annog yr holl staff i deithio'n llesol, er mwyn lleihau absenoldeb oherwydd salwch a chynyddu cynhyrchiant</li> <li>• asesu cyfleoedd ar adegau symud gweithle</li> <li>• annog myfyrwyr gofal iechyd i deithio'n gynaliadwy, fel arweinwyr iechyd y dyfodol</li> <li>• cefnogi gweithwyr sy'n paratoi ar gyfer ymddeol</li> </ul> <p><b>(c) Ymgysylltu â'n cymunedau lleol ynglŷn â manteision teithio llesol</b></p> <ul style="list-style-type: none"> <li>• cynyddu cyfathrebu sy'n annog ymwelwyr â safleoedd i ddefnyddio teithio llesol a thrafnidiaeth gyhoeddus</li> <li>• cytuno ar gyfathrebu cyson ar draws y sector cyhoeddus yn lleol</li> <li>• hyrwyddo a chyfranogi mewn diwrnodau di-gar wedi'u cydgysylltu ar draws y rhanbarth</li> <li>• negeseuon ychwanegol ar drawsnewidiadau allweddol, yn cynnwys rhieni newydd</li> </ul>

	<p><b>(d) Peidio ag annog teithio sydd ddim yn iach ac sy'n llygru</b></p> <ul style="list-style-type: none"> <li>• cyflwyno ceir cronfa allyriadau isel ar gyfer safleoedd mawr</li> <li>• sgopio cyflwyniad cerbydau allyriadau isel iawn i'r fflyd</li> <li>• adolygu prisiau meysydd parcio staff ar safleoedd gorlawn. Gallai newidiadau mewn codi tâl ariannu'n uniongyrchol welliannau mewn cyfleusterau teithio llesol a thrafnidiaeth gyhoeddus</li> </ul>
<p>Tîm Iechyd Cyhoeddus Lleol Caerdydd a'r Fro</p>	<p><b>(a) Blaenoriaethu hyrwyddo teithio iach yn y cynllun gwaith iechyd cyhoeddus</b></p> <ul style="list-style-type: none"> <li>• nodi hyrwyddo teithio llesol a mynd i'r afael a llygredd aer fel themâu sy'n croestorri yn y cynllun gwaith</li> <li>• cynnwys cyfeiriadau at a chymau gweithredu ar gyfer teithio llesol a llygredd aer yn Gwneud i Bob Cyswllt Gyfrif</li> <li>• cytuno ar ddangosyddion perfformiad addas i fesur cynnydd ac effaith</li> </ul> <p><b>(b) Gweithio gyda phartneriaid i hyrwyddo teithio llesol</b></p> <ul style="list-style-type: none"> <li>• gweithio gydag Iechyd yr Amgylchedd Iechyd Cyhoeddus Cymru i gynhyrchu mapiau daearyddol lleol ynglŷn â dod i gysylltiad â llygredd aer, yn cynnwys cysylltiad ar safleoedd ysgolion ac iechyd</li> <li>• gweithredu mewn ymateb i ganllaw sydd i ddod gan Lywodraeth Cymru ac Iechyd Cyhoeddus Cymru ar fynd i'r afael ag ansawdd aer yn lleol</li> <li>• gweithio gyda Chynlluniau Ysgolion Iach Caerdydd a'r Fro i adolygu lefelau llygredd aer o amgylch ysgolion, ymgysylltu mewn sgysiau gyda staff a rhieni ynglŷn â theithio llesol ac effaith dod â cheir at gatiâu ysgolion</li> <li>• cadarnhau a chryfhau cysylltiadau rhwng y tîm Iechyd Cyhoeddus Lleol ac adrannau cynllunio a thrafnidiaeth awdurdodau lleol, yn cynnwys datblygu Cynlluniau Datblygu Lleol a Chynllun Tymor Canolig Integredig y Bwrdd Iechyd,<sup>a161</sup> i gefnogi gweithredu ar deithio llesol a llygredd aer</li> </ul> <p><b>(c) Ymgysylltu â'n cymunedau a busnesau lleol ynglŷn â manteision teithio llesol</b></p> <ul style="list-style-type: none"> <li>• ymgysylltu â'r Rhwydwaith Cyflogwyr</li> <li>• cefnogi datblygiad a hyrwyddiad diwrnodau di-gar wedi'u cydgysylltu ar draws ein rhanbarth</li> </ul>
<p>Byrddau Gwasanaethau Cyhoeddus</p>	<p>Nodi gweithredu sy'n ymwneud â theithio llesol a llygredd aer a fyddai'n elwa o ddull cydlynol ar draws y bartneriaeth, e.e. cefnogaeth teithio llesol i staff, diwrnodau di-gar, caffael cerbydau allyriadau isel ar y cyd</p> <p>Cytuno ar negeseuon cyhoeddus allweddol ar draws y sector cyhoeddus yng Nghaerdydd a'r Fro ynglŷn â'r rhesymeg a manteision iechyd sy'n gysylltiedig â chynnydd mewn teithio llesol, lleihau defnydd o'r car a thrafnidiaeth allyriadau isel</p>



	Darparu uwch arweinyddiaeth a modelu rôl gweladwy ar lefel Byrddau Gwasanaethau Cyhoeddus a threfniadol i hyrwyddo teithio llesol
Gweithredwyr bysiau a threnau presennol ac yn y dyfodol yng Nghaerdydd a'r Fro	<ul style="list-style-type: none"> <li>• Darparu gwasanaethau glân, aml a dibynadwy ar draws y rhwydwaith</li> <li>• Trawsnewid i fysiau allyriadau isel/trenau trydan</li> <li>• Darparu gofod fel mater o arfer ar gyfer cludo beiciau ar fysiau/trenau gan gynnwys llwybrau allweddol ar adegau prysur ac mewn ardaloedd gwledig</li> <li>• Cefnogi cyflwyniad gweithrediad tocynnau integredig ar draws dulliau teithio</li> <li>• Rhoi data ar gael i gefnogi gwybodaeth teithio amser real</li> </ul>
Iechyd Cyhoeddus Cymru (cenedlaethol)	<p>Cefnogi ymgyrchoedd lleol i gynyddu teithio llesol a lleihau llygredd aer drwy</p> <ul style="list-style-type: none"> <li>• deunyddiau hyrwyddo safonol</li> <li>• cefnogaeth i gynhyrchu proffiliau llygredd aer lleol gyda map o'r ardal yn amlygu ysgolion a chyfleusterau iechyd</li> <li>• parhau i gynnal arweinyddiaeth genedlaethol ar deithio llesol a llygredd aer fel materion iechyd</li> </ul>
Llywodraeth Cymru	<p><b>(a) Ystyried newidiadau polisi i gefnogi teithio iach</b></p> <ul style="list-style-type: none"> <li>• ei gwneud hi'n haws i breswylwyr ac awdurdodau lleol i gau strydoedd dros dro er mwyn annog plant i chwarae allan yn yr awyr agored</li> <li>• gwahardd ysgolion uwchradd rhag cynnig manau parcio ceir ar gyfer disgyblion sy'n byw o fewn 2km i'r ysgol, oni bai eu bod yn anabl</li> <li>• ystyried caniatáu i Fyrddau Iechyd Lleol gyflwyno ffioedd parcio cymesur ar gyfer staff pan fo dulliau trafndiaeth amgen ar gael, er mwyn cymell teithio llesol priodol a defnydd trafndiaeth gyhoeddus</li> <li>• adolygu polisiau treuliau teithio'r GIG i sicrhau eu bod yn hyrwyddo teithio llesol lle bo'n briodol, er enghraifft drwy beidio ad-dalu am bellteroedd &lt;2 km fel mater o drefn</li> </ul> <p><b>(b) Ystyried newidiadau deddfwriaethol pellach i gefnogi teithio iach</b></p> <ul style="list-style-type: none"> <li>• yflwyno gofynion cyfreithiol i weithredwyr trafndiaeth gyhoeddus i gyfranogi mewn rhaglenni tocynnau integredig ledled y rhanbarth</li> <li>• cyflwyno gofynion cyfreithiol i sefydliadau sector cyhoeddus mawr gael digon o ofodau parcio beiciau (e.e. isafswm benodol o ofodau fesul gweithiwr)</li> </ul> <p><b>(c) Ymgysylltu â dinasyddion ledled Cymru i annog teithio iach</b></p> <ul style="list-style-type: none"> <li>• cynnal ymgyrch cysylltiadau cenedlaethol i wella delwedd teithio llesol</li> </ul>

# Atodiad

## Crynodeb o strategaethau a pholisïau perthnasol

### Strategaethau a pholisïau rhyngwladol a chenedlaethol

<p>Cynllun y DU ar gyfer mynd i'r afael â chrynodebiadau nitrogen deuocsid ymyl y ffordd<sup>28</sup></p>	<p>Cynllun Defra a'r Adran Drafndiaeth i leihau allyriadau NO<sub>2</sub>. Mae'n cynnwys cynnig ar gyfer fframwaith Parth Aer Glân i Gymru, gan awgrymu y gallai Caerdydd fod yn un o'r ardaloedd cyntaf i'w weithredu, erbyn 2021; canllaw hefyd i'w gyflwyno i'r Cyfarwyddwyr Iechyd Cyhoeddus ac Awdurdodau Lleol i gefnogi cyflwyno'r cynlluniau LAQM; a chynlluniau i annog retroffitio bysiau a thacsis trydan. Hefyd mae'n ymrwmo bod Llywodraeth y DU yn 'dirwyn gwerthiant ceir a faniau petrol a disel confensiynol newydd i ben erbyn 2040'</p>
<p>Rheolau Allyriadau Gyrru Real</p>	<p>Gofyniad ar wneuthurwyr cerbydau i sicrhau bod allyriadau NO<sub>x</sub> byd real yn cael eu rheoli ar draws ystod o amodau gyrru o fis Medi 2017.<sup>28</sup></p>
<p>Grantiau Swyddfa ar gyfer Cerbydau Allyriadau Isel (OLEV)</p>	<p>Grantiau ar gael gan Lywodraeth y DU i awdurdodau lleol gefnogi gwefru ar y stryd,<sup>150</sup> ac i gyflogwyr, yn cynnwys y sector cyhoeddus, i gefnogi gwefru yn y gweithle <sup>151</sup> ar gyfer cerbydai staff a fflyd</p>
<p>Canllaw y Gymdeithas Cynllunio Gwlad a Thref: Cynllunio ar gyfer gwell iechyd a lles yng Nghymru<sup>98</sup></p>	<p>Datblygwyd y canllaw hwn mewn cydweithrediad ag Iechyd Cyhoeddus Cymru ac Uned Cefnogi Asesiad Effaith Iechyd Cymru. Mae'n nodi'r cyfleoedd i iechyd cyhoeddus weithio gyda'r adran cynllunio er mwyn i'r naill ddylanwadu'n gadarnhaol ar raglen waith y llall gan ddefnyddio eu maes arbenigedd.<sup>98</sup> Hefyd mae'n argymhell defnyddio Adroddiad Blyneddol y Cyfarwyddwyr Iechyd Cyhoeddus i fynd i'r afael ag amgylcheddau sydd ddim yn rhai iach.</p>
<p>Polisi y Sefydliad Brenhinol Cynllunio Tref (RTPI)<sup>152,153</sup></p>	<p>Papur polisi ar fuddsoddiad seilwaith trafndiaeth, yn cynnwys her i integreiddio cynlluniau er mwyn annog trafndiaeth rhyngfoddol</p>
<p>Canllaw Rheoli Ansawdd Aer Lleol (LAQM) Cymru 2017<sup>154</sup></p>	<p>Canllaw ar gyfer LAQM yng Nghymru yng ngoleuni Deddf Llesiant Cenedlaethau'r Dyfodol. Yn benodol, ni ddylid cynnal LAQM er mwyn ceisio cael atebion tymor byr; dylid ei gynnal mewn ffordd integredig i ganfod atebion i ganlyniadau perthynol yn cynnwys llai o allyriadau carbon a ffyrdd o fyw iachach. Hefyd argymhellir y dylai awdurdodau lleol ac iechyd cyhoeddus weithio gyda'i gilydd i leihau risgiau ac anghydraddoldebau iechyd; a dylid rhoi ystyriaeth arbennig i risgiau bod babanod a phlant yn dod i gysylltiad hirdymor â llygredd, gan gynnwys mewn cartrefi, ysgolion a meithrinfeydd a theithio rhwng y lleoliadau hyn</p>

Llawlyfr Strydoedd <sup>155</sup>	Canllaw Adran Drafndiaeth y DU ar gynllunio strydoedd. Mae'n cydnabod hierarchaeth defnyddiwr sy'n gosod cerddwyr a beicwyr yn uwch na cheir, a esbonnir yn fanylach yn Making Space for Cycling. <sup>156</sup>
Confensiwn y Cenedloedd Unedig ar Hawliau'r Plentyn (UNCRC) <sup>157</sup> a Mesur Hawliau Plant a Phobl Ifanc (Cymru) 2011 <sup>158</sup>	Hawliau plant sy'n berthnasol o dan gyfraith ryngwladol a chyfraith ddomestig yng Nghymru. Erthygl 31: Mae gan blant yr hawl i ymlacio a chwarae, ac i ymuno mewn ystod eang o weithgareddau diwylliannol, artistig a hamdden eraill. Mae Erthygl 24 yn cynnwys yr hawl i amgylchedd diogel.
Amcanion Lles Iechyd Cyhoeddus Cymru <sup>159</sup>	Amcanion sy'n ofynnol o dan Ddeddf Llesiant Cenedlaethau'r Dyfodol. Un o'r 7 amcan lles yw 'gwneud y defnydd gorau o botensial ein hadnoddau naturiol a diwylliannol i hyrwyddo iechyd corfforol a meddyliol a llesiant a chyfrannu at Gymru garbon isel ac amgylcheddol gydnerth.' Nod arall yw rhoi cyfleoedd i blant chwarae a dysgu mewn amgylchedd iach a diogel.
Comisiynydd Cenedlaethau'r Dyfodol Cymru – Cynllun strategol drafft 2017-23 <sup>140</sup>	Mae'n nodi pedwar diben allweddol ar gyfer cyfnod y cynllun. Mae'n cynnwys amlygu'r materion pwysig sy'n wynebu cenedlaethau'r dyfodol - y cyntaf o'r pedwar yw newid hinsawdd, a'r ffocws ar gyfer hyn ddylai fod lleihau allyriadau a mynd i'r afael ag effeithiau.

## Strategaethau lleol a rhanbarthol

Byrddau Gwasanaethau Cyhoeddus – Amcanion a chynlluniau lles	Mae asesiadau a chynlluniau lles yn ofynnol ar gyfer pob ardal awdurdod lleol o dan Ddeddf Llesiant Cenedlaethau'r Dyfodol, wedi eu harolygu gan y Bwrdd Gwasanaethau Cyhoeddus Lleol. Yn y Fro mae'r amcanion sydd yn y cynllun lles drafft yn canolbwyntio ar bedwar maes blaenoriaeth, yn cynnwys rhoi'r dechrau gorau mewn bywyd i blant, diogelu, gwella a gwerthfawrogi'r amgylchedd a mynd i'r afael ag anghydraddoldebau. <sup>160</sup> Yng Nghaerdydd mae'r amcanion drafft yn cynnwys twf cydnerth, rhoi'r dechrau gorau mewn bywyd i blant, mynd i'r afael â thlodi a gofalu am bobl hŷn, (yn cynnwys mynd i'r afael ag arwahanrwydd cymdeithasol). <sup>161</sup>
Bwrdd Partneriaeth Rhanbarthol – Cynllun Ardal	Nododd asesiad anghenion, yn cynnwys arwahanrwydd cymdeithasol ac unigrwydd; dim digon o weithgarwch corfforol; a mynediad at ofod gwyrdd. Mae Cynllun Ardal yn cael ei ddatblygu i ymateb i'r asesiad.

<p><b>Cynlluniau Datblygu Lleol</b></p>	<p>Mabwysiadwyd Cynllun Datblygu Lleol Caerdydd yn 2016 ac mae'n cynnwys ymrwymiad i dros 40,000 o gartrefi newydd a nifer tebyg o swyddi newydd; <sup>162</sup> mae nodau penodol yn cynnwys lleihau dibyniaeth ar y car, drwy wella dewisiadau teithio ar gyfer cymunedau, teithio integredig, rhwydweithiau bysiau cylchol yn hytrach na rheiddiol a gwell diogelwch teithwyr. Disgrifir cyflawni rhaniad moddol 50/50 fel anghenraid ar gyfer y rhwydwaith trafndiaeth i ymdopi â thwf. Mae hefyd yn nodi cynlluniau i gadw a diogelu coed a seilwaith gwyrdd yn y ddinas.</p> <p>Mabwysiadwyd Cynllun Datblygu Ardal y Fro ym mis Mehefin 2017 ac mae'n cynnwys gwelliannau i seilwaith cerdded, beicio a thrafnidiaeth gyhoeddus (gan gynnwys llwybr beicio arfordirol arfaethedig, NCN 88, yn rhedeg o'r dwyrain i'r gorllewin drwy'r Fro), moderneiddio llinell rheilffordd y Cymoedd fel rhan o Metro Caerdydd, a nodi ardaloedd ar gyfer cynhyrchu ynni adnewyddadwy.<sup>163</sup></p>
<p><b>Cynlluniau Trafnidiaeth Lleol</b></p>	<p>Mae Cynllun Trafnidiaeth Lleol y Fro yn hyrwyddo symudiad o ddefnydd ceir i deithio cynaliadwy, yn cynnwys cynyddu nifer y llwybrau beic ac annog trafndiaeth integredig wrth i linell rheilffordd Bro Morgannwg gael ei thrydaneiddio. Lle bo teithio llesol yn anodd oherwydd natur wledig y Fro, caiff hygyrchedd trafndiaeth cyhoeddus ei wella.<sup>164</sup></p> <p>Mae Cynllun Trafnidiaeth Lleol Caerdydd yn hyrwyddo symudiad i ffwrdd o lwybrau bysiau prif ganolfan a lloerennau i system grid, sy'n cysylltu cymunedau'n well ac yn atal i bob traffig orfod mynd drwy ganol y Ddinas.<sup>165</sup></p> <p>Mae'r egwyddorion cynllunio meistr a nodir gan Gyngor Caerdydd yn argymhell datblygiad preswyl a defnydd cymysg dwyster uchel ar hyd coridorau trafndiaeth gyhoeddus; a darparu coridorau cerdded a beicio startegol.<sup>166</sup> Bydd strydoedd yn rhoi blaenoriaeth i gerddwyr a beicwyr, a dylai seilwaith alluogi rhyngnewid hawdd rhwng teithio llesol a thafndiaeth gyhoeddus. Bydd yr holl breswylwyr o fewn cyrraedd hawdd i lwybrau oddi ar y ffordd. Darperir coridorau agored gofod gwyrdd amrywiol.</p>
<p><b>Siapio ein Lles i'r Dyfodol</b></p>	<p>Mae strategaeth 10 mlynedd BIP Caerdydd a'r Fro yn blaenoriaethu atal fel thema allweddol, gan gadw pobl yn iach am yn hwy.81 Mae'n nod ganddi hefyd i gefnogi pobl i ddewis ymddygiadau iach a lleihau anghydraddoldebau iechyd; a hefyd bod yn gyflogwr ardderchog i weithio iddo. Cydnabyddir bod llygredd aer, gordewdra a gweithgarwch corfforol yn faterion allweddol yn y proffil poblogaeth yng nghynllun tymor canolig integredig y Bwrdd Iechyd.<sup>167</sup></p>

<b>Strategaeth Trafnidiaeth Caerdydd</b>	<p>Mae Strategaeth Trafnidiaeth Caerdydd yn gosod nod uchelgeisiol i greu symudiad moddol i raniad 60/40 o deithio cynaliadwy o gymharu â defnydd car erbyn 2026, a flaenorir gan raniad 50/50 yn 2021.<sup>5</sup> Mae'r strategaeth yn cynnwys ymrwymadau i rwydwaith beicio ledled y ddinas, hyb parcio beiciau canolog, rhyngnewidfeydd trafndiaeth ar bwyntiau strategol ar draws y ddinas, technolegau bws gwyrdd, tocynnau integredig a chefnogaeth ar gyfer clybiau ceir. Mae hyn yn dilyn gostyngiad sydd i'w ganmol yn nhraffig canol y ddinas o un chwarter (26%) rhwng 2004 a 2014</p>
<b>Strategaeth Beicio Caerdydd<sup>110</sup></b>	<p>Mae'r strategaeth ddrafft yn nodi gweledigaeth o ddinas lle mae beicio yn normal, ymarferol a diogel ar gyfer teithiau byr, i bobl o bob gallu beicio, ac i ddyblu nifer y teithiau beic erbyn 2026. Mae'n nodi cynlluniau ar gyfer dau goridor prif lwybr yng Nghaerdydd - Gogledd/De a Dwyrain/Gorllewin; a hyrwyddo beicio mewn ysgolion, gweithleoedd, ac ar gyfer siopa.</p>
<b>Bargen Ranbarth Ddinesig</b>	<p>Cytunwyd ar Fargen Ddinesig gwerth £1.2 biliwn ym mis Mawrth 2016 ar gyfer 10 o awdurdodau lleol De Dwyrain Cymru, yn cynnwys buddsoddiad sylweddol mewn system trafndiaeth gyhoeddus integredig Metro Rhanbarth Prifddinas Caerdydd. Roedd y Fargen Ddinesig hefyd yn cynnwys ymrwymiad i drydaneiddio rhwydwaith reilffordd Llinell y Cymoedd erbyn 2023.<sup>5</sup> Mae manylion y Metro yn dal i gael eu trafod, ond mae'r cynnig yn cynnwys rheilffordd drydan; hybiau trafndiaeth integredig; cyfleusterau parcio a theithio; llwybrau cludiant chwim rheilffordd ysgafn a/neu fws; gwell integreiddio ar draws dulliau a gweithredwyr; ac ymyriadau teithio llesol.<sup>123</sup></p>

# Cyfeiriadau

Cyrchwyd pob URL a gyfeirir yma ddiwethaf ar 7 Medi 2017.

1. Yr Adran Drafnidiaeth (2017). Ystadegau TSGB0101. O: <https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons>
2. Wikipedia (2017). Tramffyrdd Corfforaethol Caerdydd. O: [https://en.wikipedia.org/wiki/Cardiff\\_Corporation\\_Tramways](https://en.wikipedia.org/wiki/Cardiff_Corporation_Tramways)
3. Wikipedia (2017). Trolibysiau yng Nghaerdydd. O: [https://en.wikipedia.org/wiki/Trolleybuses\\_in\\_Cardiff](https://en.wikipedia.org/wiki/Trolleybuses_in_Cardiff)
4. Llywodraeth Cymru (2017). Arolwg Cenedlaethol Cymru 2016-17: population health - lifestyle. O: <<http://gov.wales/statistics-and-research/national-survey/?tab=current&lang=en>>
5. Cyngor Dinas Caerdydd (2016). Strategaeth Trafnidiaeth Caerdydd – drafft. O: <https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/travel/Transport-Strategy/Pages/default.aspx>
6. Cyngor Bro Morgannwg (2017). Arolwg barn gyhoeddus 2016/17
7. Yr Adran Drafnidiaeth (2017). Gwariant Trafnidiaeth TSGB1308. O: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/602214/tsgb1308.ods](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/602214/tsgb1308.ods)
8. Yr Adran Drafnidiaeth (2017). Ystadegau Trafnidiaeth Prydain Fawr 2016. O: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/576095/tsgb-2016-report-summaries.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/576095/tsgb-2016-report-summaries.pdf)
9. Yr Adran Drafnidiaeth (2017). Ystadegau TRA0105. O: <https://www.gov.uk/government/statistical-data-sets/tra01-traffic-by-road-class-and-region-miles>
10. Yr Adran Drafnidiaeth (2017). Ystadegau VEH0105. O: <https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>
11. Cyngor Bro Morgannwg (2017). Aseiad lles. O: <http://www.valeofglamorgan.gov.uk/Documents/Our%20Council/Achieving%20our%20vision/Public-Services-Board/Well-being-Assessment/FINAL-ENGLISH-VERSIONS/Maximising-Opportunities-and-Attainment-Evidence-Report-Version-at-April-2017.pdf>
12. BIP Caerdydd a'r Fro (2017). Arolwg teithio i'r gwaith
13. Cyffordd Six Bells (2016). O: <http://www.sixbellsjunction.co.uk/50s/570713sl.html>
14. Wikipedia (2017). Dibyniaeth llwybr. O: [https://en.wikipedia.org/wiki/Path\\_dependence](https://en.wikipedia.org/wiki/Path_dependence)
15. BIP Caerdydd a'r Fro (2016). Adroddiad Blynyddol y Cyfarwyddwr Iechyd Cyhoeddus: Gordewdra – y darlun mwy. O: <http://www.cardiffandvaleuhb.wales.nhs.uk/sitesplus/documents/1143/Annual%20Report%202014%202nd%20copy.pdf>
16. Arsyllfa Llywodraeth Cymru (2017). Iechyd a'i benderfynyddion yng Nghymru: Hysbysu cynllunio strategol yng Nghymru
17. Hutchinson, J et al (2014). Differences in the social patterning of active travel between urban and rural populations: findings from a large UK household survey. *Int J Pub Health* 59: 993-998.
18. Awdurdod Llundain Fwyaf (2015). Health impact of cars in London. O: <https://www.london.gov.uk/what-we-do/health/health-publications/health-impacts-cars-london>



19. Institute of Health Policy, Management and Evaluation, University of Toronto, et al (2015). Sedentary Time and Its Association With Risk for Disease Incidence, Mortality, and Hospitalization in Adults: A Systematic Review and Meta-analysis. *Ann Int Med* 162(2):123-132
20. Sefydliad Iechyd y Byd (2013). What are the health consequences of being overweight? O: <http://www.who.int/features/qa/49/en/>
21. Cronfa ddata QOF (2017). Dangosyddion QOF ar gyfer BIP Caerdydd a'r Fro, 2016. O: <https://www.gpcontract.co.uk/browse/262/Diabetes%20Mellitus/16>
22. Cyfadran Iechyd y Cyhoedd et al (2016) Local action to mitigate the health impacts of cars: a briefing statement. O: [http://www.fph.org.uk/more\\_cycling\\_and\\_walking%3B\\_less\\_driving%2C\\_needed\\_for\\_our\\_health\\_and\\_economy%2C\\_says\\_new\\_fph\\_report](http://www.fph.org.uk/more_cycling_and_walking%3B_less_driving%2C_needed_for_our_health_and_economy%2C_says_new_fph_report)
23. Wikipedia (2017). Deddf Aer Glân 1956. O: [https://en.wikipedia.org/wiki/Clean\\_Air\\_Act\\_1956](https://en.wikipedia.org/wiki/Clean_Air_Act_1956)
24. Llywodraeth Cymru (2015). Deddf Gwasanaethau Cymdeithasol a Lles (Wales) 2014. O: <http://gov.wales/topics/health/socialcare/act/?lang=en>
25. Torjesen, I (2015). Even low levels of air pollution are linked to more deaths in over 65s, study finds. *BMJ* 2015;350:h3043
26. Russell-Jones, R (2017). Air pollution in the UK: better ways to solve the problem. *BMJ* 2017;357:j2713
27. The Guardian (2017). Air pollution more harmful to children in cars than outside, warns top scientist. O: <https://www.theguardian.com/environment/2017/jun/12/children-risk-air-pollution-cars-former-uk-chief-scientist-warns>
28. Llywodraeth y DU (2017). Cynllun ansawdd aer ar gyfer nitrogen deuocsid (NO<sub>2</sub>) yn y DU (2017). O: <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>
29. Fforwm Ansawdd Aer Cymru (2015). Llygredd Aer yng Nghymru 2015. O: [http://www.welshairquality.co.uk/documents/reports/507161019\\_AQ\\_wales\\_2015\\_v12\\_Press.pdf](http://www.welshairquality.co.uk/documents/reports/507161019_AQ_wales_2015_v12_Press.pdf)
30. Defra (2017). Ardaloedd rheoli ansawdd aer. O: [https://uk-air.defra.gov.uk/aqma/local-authorities?la\\_id=394](https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=394)
31. Grey, E (2016). The big stink: how much do trains really emit? O: <http://www.railway-technology.com/features/featurethe-big-stink-how-much-do-trains-really-emit-4807131/>
32. Partneriaeth Cerbydau Carbon Isel (2016). The low emission bus guide. O: <http://www.lowcvp.org.uk/projects/bus-working-group/lowemissionbusguide.htm>
33. Good, N et al. (2016). The Fort Collins Commuter Study: impact of route type and transport mode on personal exposure to multiple air pollutants. *J Expo Sci Environ Epidemiol* (2016). 26(4):397-404
34. The Guardian (2017). London air pollution: which mode of transport has the highest exposure? O: <https://www.theguardian.com/environment/video/2014/aug/12/london-air-pollution-public-transport-video>
35. de Nazelle, A (2017). Comparison of air pollution exposures in active vs. passive travel modes in European cities: A quantitative review. *Environ Int* 99:151-160
36. Cepeda, M et al (2017). Levels of ambient air pollution according to mode of transport: a systematic review. *Lancet Pub Health* 2:e23-e24

37. Castres, P et al (2017). Most London hospitals and clinics exceed air pollution limits. *BMJ* 2017; 357:j2855
38. Holgate, S et al. (2017). Air pollution – a wicked problem. *BMJ* 2017;357:j2814
39. Public Health England (2014). Estimating local mortality burdens associated with particulate air pollution. O: <https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>
40. Coleg Brenhinol y Ffisegwyr a Choleg Brenhinol Pediatreg ac Iechyd Plant (2016). Every breath we take: the lifelong impact of air pollution. O: <https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution>
41. NICE (2017). Air pollution: outdoor air quality and health. Canllaw NG70 NICE. O: [nice.org.uk/guidance/ng70](http://nice.org.uk/guidance/ng70)
42. Cyfadran Iechyd y Cyhoedd (2017). Damweiniau Ffyrdd ym Mhrydain 2015. O: Public Health Today – summer 2017  
[http://www.fph.org.uk/uploads/PHT%20Summer%202017\\_PHT%20Summer%202017.pdf](http://www.fph.org.uk/uploads/PHT%20Summer%202017_PHT%20Summer%202017.pdf)
43. Taylor MC et al (2000). The effects of drivers' speed on the frequency of road accidents. O: <https://trl.co.uk/reports/TRL421>
44. Comisiwn Datblygu Cynaliadwy (2011). Fairness in a car-dependent society. O: <http://www.sd-commission.org.uk/publications.php?id=1184>
45. Sampasa-Kanyinga, H et al (2017). Associations between meeting combinations of 24-h movement guidelines and health-related quality of life in children from 12 countries. *Public Health* 153:16-24.
46. Chwarae Cymru (2012). Chwarae: Iechyd a Lles. O: <http://www.playwales.org.uk/eng/playhealth>
47. Llywodraeth Cymru (2017). Arolwg Cenedlaethol Cymru: prif ganlyniadau Ebrill 2016 - Mawrth 2017
48. Partneriaeth Iechyd a Gofal Cymdeithasol Integredig Caerdydd a'r Fro (2017). Asesiad anghenion poblogaeth Caerdydd a Bro Morgannwg. O: <http://www.cvihs.co.uk/about/what-we-do/population-needs-assessment/>
49. Hart J et al (2008). Driven to excess: impacts of motor vehicles on the quality of life of residents of three streets in Bristol, UK
50. Steptoe, A et al (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *Proc Natl Acad Sci* 110:597-5801
51. Tîm Adolygiad Marmot (2011). The Marmot Review: goblygiadau ar gyfer cynllunio gofodol. O: <https://www.nice.org.uk/media/default/About/what-we-do/NICE-guidance/NICE-guidelines/Public-health-guidelines/Additional-publications/Spatial-planning/the-marmot-review-implications-for-spatial-planning.pdf>
52. HelpAge International (2016). Ageing and the city: making urban spaces work for older people. O: <http://www.helpage.org/what-we-do/ageing-cities/>
53. Llywodraeth Cymru (2015). Datganiad Polisi Adnoddau Naturiol.
54. Llywodraeth Cymru (2012). Mapio sŵn Cymru. O: <http://data.wales.gov.uk/apps/noise/#lat=51.4893&lon=-3.3646&zoom=11&time=den&theme=road>
55. Van Kempen E et al (2012). The quantitative relationship between road traffic noise and hypertension: a meta-analysis. *J Hypertens* (2012) 30(6): 1075-86

56. Asiantaeth Diogelu Iechyd (2009). Environmental Noise and Health in the UK (stafft ar gyfer sylwadau). O: [http://webarchive.nationalarchives.gov.uk/20100716121707/http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1246433634856](http://webarchive.nationalarchives.gov.uk/20100716121707/http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1246433634856)
57. Prifysgol Caerlŷr (2015). State of our countryside: land use map of the UK reveals large-scale changes in environment. O: <https://www2.le.ac.uk/offices/press/press-releases/2015/june/state-of-our-countryside-land-use-map-of-the-united-kingdom-reveals-large-scale-changes-in-environment>
58. Gilbert, N. (2016). Green space: a natural high. *Nature* 531: S56-S57
59. Cox DT, et al (2017). Doses of Nearby Nature Simultaneously Associated with Multiple Health Benefits. *Int J Environ Res Public Health* 9;14(2). pii: E172
60. Cyfoeth Naturiol Cymru (2016). Crynodeb o Adroddiad ar Sefyllfa Adnoddau Naturiol. O: <https://naturalresources.wales/evidence-and-data/research-and-reports/the-state-of-natural-resources-report-assessment-of-the-sustainable-management-of-natural-resources/?lang=en>
61. Sefydliad Iechyd y Byd (2016). Urban green spaces and health: a review of evidence. O: <http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2016/urban-green-spaces-and-health-a-review-of-evidence-2016>
62. Llywodraeth Cymru (2017). Gohebiaeth bersonol, Huw Brunt
63. Fecht, D et al (2015). Associations between air pollution and socioeconomic characteristics, ethnicity and age profile of neighbourhoods in England and the Netherlands. *Env Pollution* 198: 201-210
64. Canolfan Ynni Cynaliadwy (2013). Distribution of Carbon Emissions in the UK: Implications for Domestic Energy Policy. O: <http://www.jrf.org.uk/publications/carbon-emissions>
65. Glasgow Centre for Population Health (2017). Active travel in Glasgow: what we've learned so far. O: [http://www.gcph.co.uk/publications/702\\_active\\_travel\\_in\\_glasgow\\_what\\_we\\_ve\\_learned\\_so\\_far](http://www.gcph.co.uk/publications/702_active_travel_in_glasgow_what_we_ve_learned_so_far)
66. Mackett, RL and Brown, B (2011). Transport, physical activity and health: present knowledge and the way forward. O: <https://www.ucl.ac.uk/news/pdf/transportactivityhealth.pdf>
67. Pwyllgor ar Newid Hinsawdd (2017). UK Climate Change Risk Assessment 2017. Synthesis report: priorities for the next five years
68. Godlee, F (2014). Climate change. *BMJ* 2014;349:g5945
69. Haines, A et al (2014). Health risks of climate change: act now or pay later *Lancet* 384: 1073-1074
70. Defra a Llywodraeth Cymru (2012). Asesiad o risgiau newid hinsawdd i Gymru. O: <http://gov.wales/docs/desh/publications/120126climateriskassessen.pdf>
71. Llywodraeth Cymru (2017). Tueddiadau'r Dyfodol. O: <http://gov.wales/statistics-and-research/future-trends/?lang=en>
72. Tong, S (2017). Flood-related displacement and mental health. *Lancet Plan Health* 1:e124-e125
73. Sefydliad Iechyd y Byd (2014). Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. O: [http://apps.who.int/iris/bitstream/10665/134014/1/9789241507691\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/134014/1/9789241507691_eng.pdf)
74. Bwrdd Iechyd Prifysgol Aneurin Bevan (2015). Adroddiad blynyddol Cyfarwyddwr Iechyd Cyhoeddus. Iechyd cynaliadwy ar gyfer cenedlaethau'r dyfodol

75. NHS Highland (2014). Adroddiad blynyddol Cyfarwyddwr Iechyd Cyhoeddus.
76. Sefydliad Iechyd y Byd (2017). Climate change and health. O: <http://www.who.int/mediacentre/factsheets/fs266/en/>
77. Y Gymru a Garem (2015) Adroddiad Y Gymru a Garem. Adroddiad ar ran cenedlaethau'r dyfodol. O: <https://www.thewaleswewant.co.uk/sites/default/files/The%20Wales%20We%20Want%20Report%20ENG.pdf>
78. Llywodraeth Cymru (2017). Allyriadau Cymru. O: <http://gov.wales/topics/environmentcountryside/climatechange/welsh-emissions/?lang=en>
79. Y Swyddfa Ystadegau Gwladol (2017). Cyfrifon Amgylcheddol y DU 2017. O: <https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2017>
80. Pwyllgor ar Newid Hinsawdd (2016). Meeting carbon budgets – 2016 progress report to parliament. O: <https://www.theccc.org.uk/publication/meeting-carbon-budgets-2016-progress-report-to-parliament/>
81. BIP Caerdydd a'r Fro (2016). Siapio ein Lles i'r Dyfodol. O: <http://www.cardiffandvaleuhb.wales.nhs.uk/sitesplus/documents/1143/10%20-%20UHB%20Shaping%20Our%20Future%20Wellbeing%20Strategy%20Final.pdf>
82. NICE (2012). Gweithgarwch Corfforol: cerdded a beicio. Canllaw Iechyd Cyhoeddus PH 41. O: <https://www.nice.org.uk/guidance/ph41/chapter/1-Recommendations>
83. Designed to Move (2015). Designed to Move: Active Cities report. O: <http://www.designedtomove.org/resources>
84. Sustrans, Cyfadran Iechyd y Cyhoedd et al. (2008). Take action on active travel: why a shift from car-dominated transport policy would benefit public health. O: [http://www.fph.org.uk/uploads/Take\\_action\\_on\\_active\\_travel.pdf](http://www.fph.org.uk/uploads/Take_action_on_active_travel.pdf)
85. Llywodraeth Cymru (2017). Gwneud gwahaniaeth: lleihau risgiau iechyd cysylltiedig â llygredd aer traffig ar y ffyrdd yng Nghymru (drafft)
86. Cyngor Dinas Caerdydd (2016). Strategaeth Beicio Caerdydd 2016-2026 drafft.
87. Heesch, KC et al (2016). The usefulness of GPS bicycle tracking data for evaluating the impact of infrastructure change on cycling behaviour. Health Promot J Austr. doi: 10.1071/HE16032
88. Bicycle Dutch (2012). Sustainable safety. O: <https://bicycledutch.wordpress.com/2012/01/02/sustainable-safety/>
89. Sefydliad ar gyfer Ymchwil i Ddiogelwch Ffyrdd, Yr Iseldiroedd (2012). Ffeithlen SWOV: cefndir y pum egwyddor diogelwch cynaliadwy. O: [https://www.swov.nl/sites/default/files/publicaties/gearchiveerde-factsheet/uk/fs\\_sustainable\\_safety\\_background\\_archived.pdf](https://www.swov.nl/sites/default/files/publicaties/gearchiveerde-factsheet/uk/fs_sustainable_safety_background_archived.pdf)
90. van der Knaap, P (2015). Sustainable safety: the Netherlands' vision and strategy for a safe traffic system: ambitions, results and new challenges. O: [http://www.vsv.be/sites/default/files/day\\_1\\_-\\_24-08\\_-\\_presentation\\_peter\\_van\\_der\\_knaap\\_-\\_part\\_1.pdf](http://www.vsv.be/sites/default/files/day_1_-_24-08_-_presentation_peter_van_der_knaap_-_part_1.pdf)
91. Song Y, et al (2017). New walking and cycling infrastructure and modal shift in the UK: A quasi-experimental panel study. Transp Res Part A Policy Pract. 95:320-333
92. Christensen, J, et al (2012). Evaluation of the cycling city and towns programme: qualitative research with residents. O: <http://eprints.uwe.ac.uk/30579>

93. Public Health England (2016). Working together to promote active travel. A briefing for local authorities. O: <https://www.gov.uk/government/publications/active-travel-a-briefing-for-local-authorities>
94. Rissel, C et al (2012). Physical activity associated with public transport use – a review and modelling of potential benefits. *Int J Environ Res Public Health* 9(7): 2454-2478
95. Russell-Jones, R (2017). Air pollution in the UK: better ways to solve the problem. *BMJ* 2017;357:j2713
96. Defra (2017). Cynllunio gweithredu LAQM: astudiaethau achos. O: <https://laqm.defra.gov.uk/action-planning/case-studies.html>
97. Koohsari, MJ et al (2016). Built environmental factors and adults' travel behaviours: role of street layout and local destinations. *Prev med* 96: 124-128
98. Y Ddeddf Cynllunio Gwlad a Thref (2016). Cynllunio gwell iechyd a lles yng Nghymru. O: <https://www.tcpa.org.uk/healthyplanning>
99. Living Streets (2017). The UK's top walking cities. O: <https://www.livingstreets.org.uk/what-you-can-do/the-uks-top-walking-cities>
100. Jones SJ and Brunt, H (2017). Twenty miles per hour speed limits: a sustainable solution to public health problems in Wales. *Epidemiol Community Health* doi:10.1136/jech-2016-208859
101. Living Streets (2013). The pedestrian pound. The business case for better streets and places. O: [https://www.livingstreets.org.uk/media/1391/pedestrianpound\\_fullreport\\_web.pdf](https://www.livingstreets.org.uk/media/1391/pedestrianpound_fullreport_web.pdf)
102. Walk Score (2017). O: [www.walkscore.com](http://www.walkscore.com)
103. Stockton, JC et al. (2016) Development of a novel walkability index for London, United Kingdom: cross-sectional application to the Whitehall II Study. *BMC Public Health* 16:416
104. Chwarae Allan (2017). O: <http://playingout.net/>
105. Cyngor Gwarchod Natur (2016). Planting Healthy Air. O: <https://global.nature.org/content/healthyair>
106. Coombes, R (2017). Every breath we take. *BMJ* 2017;357:j2892
107. CNN tech (2017). China's dockless bike sharing could be coming to a street near you. O: <http://money.cnn.com/2017/07/05/technology/startups/china-bike-sharing-global/index.html>
108. YoBike (2017). O: <https://yobike.co.uk/>
109. Carplus (2017). Bike sharing. O: <https://www.carplusbikeplus.org.uk/what-is-shared-mobility/bike-sharing/>
110. CleanSpace (2017). O: <https://store.cleanspace/>
111. Awdurdod Lleol Abertawe (2015). Cwestiynau cyffredin cynllun gweithredu ansawdd aer Abertawe. O: <http://www.swansea.airqualitydata.com/cgi-bin/faqs.cgi?1014>
112. Volvo Cars (2017). Volvo Cars to go all electric. O: <https://www.media.volvocars.com/global/en-gb/media/pressreleases/210058/volvo-cars-to-go-all-electric>
113. Zap Map (2017). London street lights converted to EV charge points for trial. O: <https://www.zap-map.com/london-street-lights-converted-to-ev-charge-points-for-trial/>
114. Transport for London (2017). Cleaner greener taxis. O: <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/cleaner-greener-taxis>

115. Llywodraeth y DU (2017). Creu 1,000 o swyddi mewn ffatri newydd gwerth £325 miliwn ar gyfer tacsis trydan. O: <https://www.gov.uk/government/news/1000-jobs-created-at-new-300-million-factory-for-electric-taxis>
116. Ymddiriedolaeth Sefydliad GIG Gofal Iechyd Northumbria (2015). Northumbria's switch to Nissan electric vehicles enables thousands of pounds to be invested in patient care. O: <https://www.northumbria.nhs.uk/news/northumbria%E2%80%99s-switch-nissan-electric-vehicles-enables-thousands-pounds-be-invested-patient-care>
117. Gwasanaeth Ambiwllans Gogledd Orllewin Lloegr (2017). Ambulance service set to save millions with introduction of electric vehicles. O: <http://www.nwas.nhs.uk/news/press-releases-and-statements-2017/24-february-2017-ambulance-service-set-to-save-millions-with-introduction-of-electric-vehicles>
118. Engadget (2017). Royal Mail is going greener with all-electric vans. O: <https://www.engadget.com/2017/08/23/royal-mail-arrival-electric-vans/>
119. The Guardian (2017). Electric cars are not the answer to air pollution, says top UK adviser. O: <https://www.theguardian.com/environment/2017/aug/04/fewer-cars-not-electric-cars-beat-air-pollution-says-top-uk-adviser-prof-frank-kelly>
120. MacKay, DJC (2009). Sustainable energy – without the hot air. UIT Cambridge.
121. BRE (2016). Solar car parks: a guide for owners and developers. O: [http://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/BRE\\_solar-carpark-guide.pdf](http://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/BRE_solar-carpark-guide.pdf)
122. Bws Caerdydd (2017). Bws Caerdydd yn lansio 10 bws uwch dechnoleg gwerth £1.7 miliwn. O: <http://www.cardiffbus.com/english/feature-article.shtml?articleid=7425>
123. Llywodraeth Cymru (2015). Rhoi'r Metro ar waith fesul cam. O: [gov.wales/metro](http://gov.wales/metro)
124. Network Rail (2017). Cynllun moderneiddio rheilffordd Caerdydd a'r Cymoedd. O: <https://www.networkrail.co.uk/running-the-railway/our-routes/wales/cardiff-and-valleys/>
125. CityMapper (2017). CM2 – Night Rider, our first commercial bus route. O: <https://medium.com/citymapper/cm2-night-rider-our-first-commercial-bus-route-d9d7918be899>
126. Asiantaeth Priffyrdd (2014). Preparing the strategic road network for electric vehicles: a research programme
127. Cynnal Cymru (2017). Cynhadledd Dyfodol Caerdydd, 11 Gorffennaf 2017
128. VentureBeat (2017). Self-driving car timeline for 11 top automakers. O: <https://venturebeat.com/2017/06/04/self-driving-car-timeline-for-11-top-automakers/>
129. The Guardian (2017). Driverless pods plot new course to overtake humans. O: <https://www.theguardian.com/technology/2017/apr/25/autonomous-car-projects-plot-course-uk-driverless-future>
130. Uber (2017). Self-driving Ubers: the world's first Self-Driving Ubers are on the road in the Steel City. O: <https://www.uber.com/cities/pittsburgh/self-driving-ubers/>
131. Celis-Morales, CA et al. (2017). Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *BMJ* 2017;357:j1456
132. Journal of Transport and Health (2016). The influence of the built environment on transport and health. *Journal of Transport and Health* 3:423-425
133. Reiner, M et al (2013). Long-term health benefits of physical activity – a systematic review of longitudinal studies. *BMC Public Health* 13:813.



134. Llywodraeth Cymru (2015). Deddf Lles Cenedlaethau'r Dyfodol (Cymru) 2015. O:  
<http://gov.wales/topics/people-and-communities/people/future-generations-act/?lang=en>
135. Llywodraeth Cymru (2013). Deddf Teithio Llesol (Cymru) 2013. O:  
<http://gov.wales/topics/transport/walking-cycling/activetravelact/?lang=en>
136. Llywodraeth Cymru (2016). Deddf yr Amgylchedd (Cymru) 2016. O:  
<http://gov.wales/topics/environmentcountryside/consmanagement/natural-resources-management/environment-act/?lang=en>
137. Senedd y DU (2017). Deddf Iechyd Cyhoeddus (Cymru) 2017. O:  
<http://www.legislation.gov.uk/anaw/2017/2/contents/enacted>
138. Comisiynydd Cenedlaethau'r Dyfodol Cymru (2016). Llythyr i Carwyn Jones
139. Comisiynydd Cenedlaethau'r Dyfodol Cymru (2016). Datganiad i'r wasg: Angen gweithredu ar frys i ddiogelu cymunedau rhag newid hinsawdd meddai Comisiynydd Cenedlaethau'r Dyfodol
140. Comisiynydd Cenedlaethau'r Dyfodol Cymru (2017). Cynllun strategol drafft 2017-23. O:  
<https://futuregenerations.wales/wp-content/uploads/2017/02/Draft-Strategic-Plan-ENG-1.pdf>
141. Comisiwn Ewropeaidd (2016). Cytundeb Paris. O:  
[https://ec.europa.eu/clima/policies/international/negotiations/paris\\_en](https://ec.europa.eu/clima/policies/international/negotiations/paris_en)
142. BBC News (2017). High Street shopping fighting back in Wales, figures show. O:  
<http://www.bbc.co.uk/news/uk-wales-39321828>
143. Yr Adran Drafnidiaeth (2017). Ystadegau VEH0131. O:  
<https://www.gov.uk/government/collections/vehicles-statistics>
144. Cyngor Bro Morgannwg (2017). Greenlinks. O:  
<http://www.valeofglamorgan.gov.uk/en/living/transportation/greenlinks.aspx>
145. Tîm Iechyd Cyhoeddus Lleol Caerdydd a'r Fro (2017). Gohebiaeth bersonol
146. Arden Pope, C et al (2009). Fine-particulate air pollution and life expectancy in the US N Engl J Med 360:376-386
147. Prifysgol Bryste (2016). Outdoors and active: delivering public health outcomes by increasing children's active travel and outdoor play. O: <http://playingout.net/wp-content/uploads/2015/04/Bristol-University-Outdoors-And-Active-Evidence-Briefing.pdf>
148. Prifysgol Bryste (2016). Playing out preliminary evaluation. O: [http://playingout.net/wp-content/uploads/2014/05/playing-out-evaluation\\_Angie-Page.pdf](http://playingout.net/wp-content/uploads/2014/05/playing-out-evaluation_Angie-Page.pdf)
149. Nieuwenhuijsen MJ et al (2016) Car free cities: Pathway to healthy urban living. Environ Int 94:251-62
150. Swyddfa ar gyfer Cerbydau Allyriadau Isel (2016). Grants to provide residential on-street chargepoints for plug-in electric vehicles: guidance for local authorities
151. Swyddfa ar gyfer Cerbydau Allyriadau Isel (2016). Workplace Charging Scheme – Guidance Document for Applicants, Chargepoint Installers and Manufacturers
152. Y Sefydliad Cynllunio Trefol Brenhinol (2014). Transport infrastructure investment: capturing the wider benefits of investment in transport infrastructure. O:  
[http://www.rtpi.org.uk/media/816110/capturing\\_the\\_wider\\_benefits.pdf](http://www.rtpi.org.uk/media/816110/capturing_the_wider_benefits.pdf)
153. Y Sefydliad Cynllunio Trefol Brenhinol (2014). Planning Horizons: promoting healthy cities. O:  
[http://www.rtpi.org.uk/media/1119674/rtpi\\_promoting\\_healthy\\_cities.pdf](http://www.rtpi.org.uk/media/1119674/rtpi_promoting_healthy_cities.pdf)
154. Llywodraeth Cymru (2017). Rheoli ansawdd aer lleol yng Nghymru: canllaw polisi. O:  
<http://gov.wales/topics/environmentcountryside/epq/airqualitypollution/airquality/guidance/?lang=en>

155. Yr Adran Drafndiaeth, Llywodraeth Cymru (2007). Llawlyfr Strydoedd. O:  
<https://www.gov.uk/government/publications/manual-for-streets>
156. Making Space for Cycling (2017). A guide for new developments and street renewals. O:  
<http://www.makingspaceforcycling.org/>
157. Unicef (2017). A summary of the rights under the Convention of the Rights of the Child. O:  
[https://www.unicef.org/crc/files/Rights\\_overview.pdf](https://www.unicef.org/crc/files/Rights_overview.pdf)
158. Senedd y DU (2011). Mesur Hawliau Plant a Phobl Ifanc (Cymru) 2011. O:  
<http://www.legislation.gov.uk/mwa/2011/2/contents>
159. Iechyd Cyhoeddus Cymru (2017). Amcanion Llesiant. O:  
<http://www.wales.nhs.uk/sitesplus/888/page/92105>
160. Cyngor Bro Morgannwg (2017). Cynllun Lles (drafft)
161. Cyngor Dinas Caerdydd (2017). Asesiad Caerdydd o les lleol a chynllun lles lleol
162. Cyngor Dinas Caerdydd (2016). Cynllun Datblygu Lleol a Fabwysiadwyd. O:  
<https://www.cardiff.gov.uk/ENG/resident/Planning/Local-Development-Plan/Pages/default.aspx>
163. Cyngor Bro Morgannwg (2017). Cynllun Datblygu Lleol. O:  
[http://www.valeofglamorgan.gov.uk/en/living/planning\\_and\\_building\\_control/planning\\_policy/local\\_development\\_plan/Local-Development-Plan.aspx](http://www.valeofglamorgan.gov.uk/en/living/planning_and_building_control/planning_policy/local_development_plan/Local-Development-Plan.aspx)
164. Cyngor Bro Morgannwg (2015). Cynllun Trafnidiaeth Lleol 2015-2030
165. Cyngor Dinas Caerdydd (2015). Cynllun Trafnidiaeth Lleol Caerdydd 2015-2020
166. Cyngor Dinas Caerdydd (2013). Fframwaith Cynllunio Meistr Cynllun Datblygu Lleol Caerdydd
167. BIP Caerdydd a'r Fro (2017). Cynllun Tymor Canolig Integredig. O:  
<http://www.cardiffandvaleuhb.wales.nhs.uk/page/78840>
168. NICE (2007). Behaviour change: general approaches. Public health guidance 6 (PH6). O:  
<https://www.nice.org.uk/Guidance/ph6>

Cydnabyddiaeth llun Swyddfa Dociau'r Barri a ddefnyddiwyd o dan Creative Commons (CC BY-SA 2.0) © Hawlfraint Gareth James



