GWENT FUTURES

HORIZON SCAN SUMMARY

GWENT PUBLIC SERVICE BOARDS

Summary Horizon Scanning Report from Ash Futures

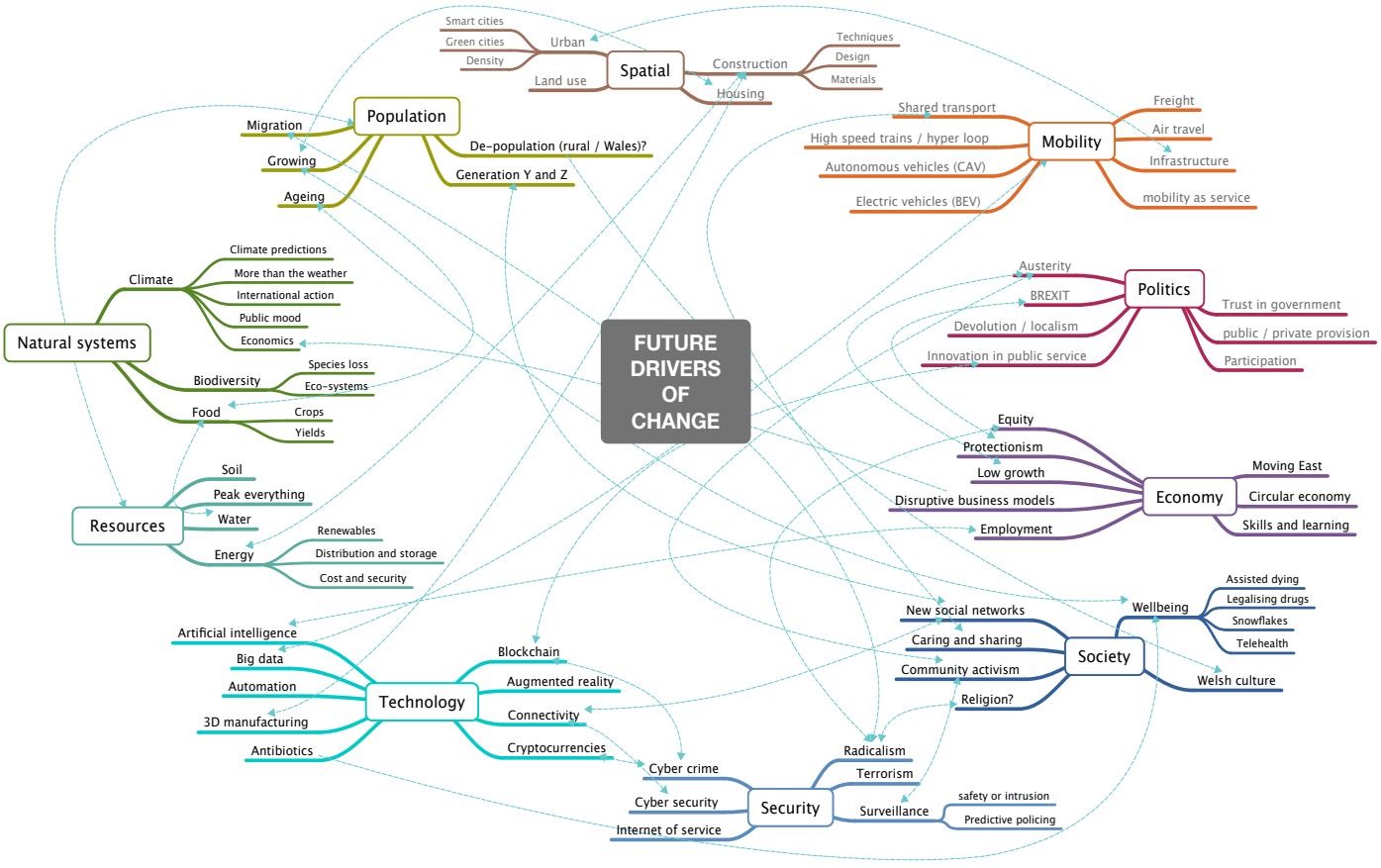
March 2018

INTRODUCTION

This project is to establish a set of future scenarios for the Gwent area Public Service Boards (PSBs). As part of the work, we undertook to prepare a detailed horizon scanning report which would identify a wide range of trends, potential disruptors and drivers of change. The full report is in a separate document, while this report sets out a more accessible summary of the issues and the implications for Gwent.

Coverage

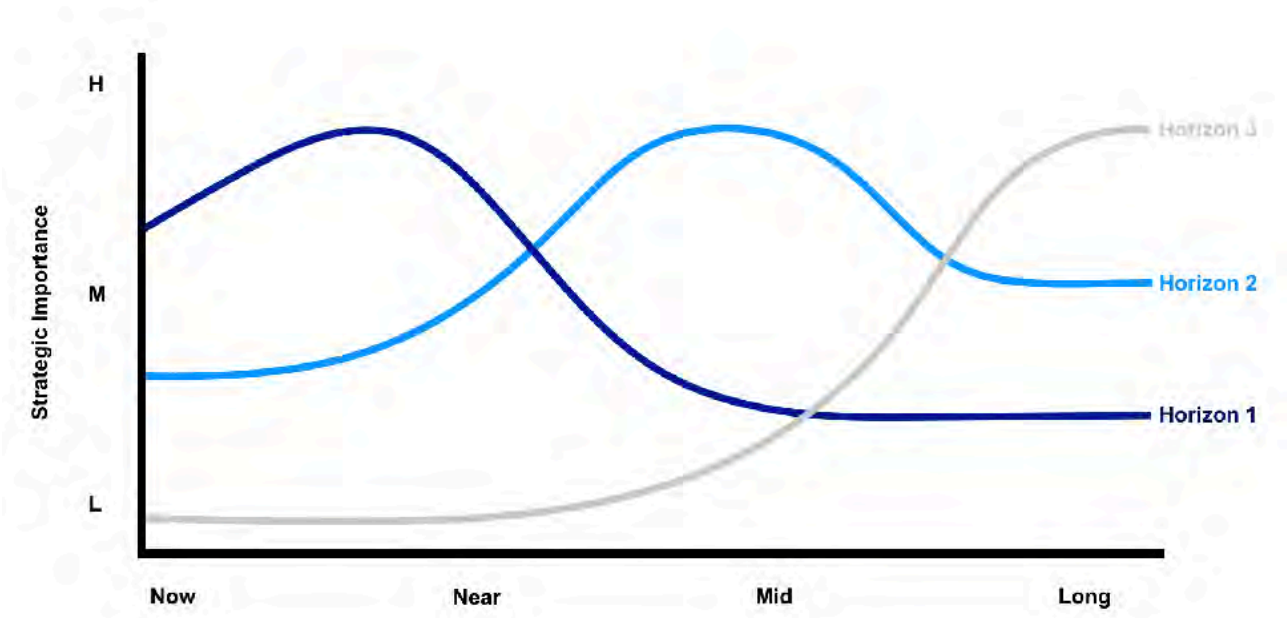
This summary report sets out headline issues and information regarding the ten key themes for our horizon scanning work. The themes cover the critical trends and forces that are likely to shape society over the next 10 to 20 years. Some have global scope while others are much more localised. However, they will all have consequences for the people, business and environment of Gwent. Some may offer tangible opportunities for the area, others may hold it back.



Being aware of these trends and their potential impacts on Gwent, will help the PSBs anticipate potential threats, identify new possibilities and consider strategic responses.

Time frames

The conceptual model that underpins our futures work is the three horizons approach, which defines three time frames for thinking about the external trends and developments which might impact on the needs of future generations:



Horizon 1 (H1) is the present and the near future. H1 issues are strategically important now. They are visible and well understood and are generally the issues that the organisation is already responding to. H1 issues are therefore the focus of current policy and strategy.

Horizon 2 (H2) is the less immediate future. H2 issues are less well characterised and the organisation may not yet be fully aware of them or their implications for policy and strategy. By their nature, horizon 2 issues are less urgent; so even when organisations do become aware of them, they may not respond immediately, preferring to wait and see how the issues develop.

Horizon 3 (H3) is the mid to long term future. H3 issues can be difficult to characterise in detail since they are the long run outcome of a range of factors, some of which may not be fully in play. Tracking horizon 3 issues is therefore important for organisations who want to spot emerging opportunities and threats and anticipate how to respond to them quickly.

Building the scenarios

The 'scans' will help us to identify and express the critical disruptors. These, together with our understanding of the drivers of change and trends will inform the emerging scenarios - ensuring that they are credible and grounded.

Summary

Each section of this summary report focuses on one of the key themes and contains:

- An infographic, to provide a visual summary
- A narrative introduction
- A table which provides a summary of each of the scans from the main report. The table also highlights which of the three horizons the issue falls within, and an indication of the potential impact on Gwent
- A list of strategic issues for Gwent to consider
- A brief assessment of the potential impacts of the overall theme on Gwent. **These are intended as provocations to provoke discussion - as horizon scans are inherently uncertain.**

This summary report also sets out a high level assessment of the 'State of Gwent' - highlighting a range of current issues and forecasts. The provides a starting point for building the future scenarios.

GROWING

UK population to reach 70 million by 2029 and 73 million by 2041. Global growth rate will halve.

2041

AGE

2039

The number of UK citizens over 65 will exceed 16 million. 50% of rural households in Wales will be > 65.

GENERATIONS

UK teenagers are among the most troubled in the world - yet are more altruistic

2018

POPULATION

International migration to provide 50% of population growth - even after BREXIT

2033

MIGRATION

2028

300,000 new homes needed annually in the UK for at least 10 years

HOUSING

Old-age dependency ratio increases from 0.27 to 0.4 by 2041

2041

PENSIONS

1. POPULATION

The most significant demographic phenomenon over the next few decades will be the gradual ageing of the population. In the next 15 years, the number of people aged 65+ will double to 1bn globally. This increase in the number of older people will have a profound impact on a wide range of public services. Many people are not saving enough and will need to work longer. Health and social welfare costs – already significantly challenged - will rise.

Ageing is not happening uniformly and is consequently changing the balance of regional economies across the globe. The impact of ageing may be particularly marked in Europe, with it becoming the 'oldest' global region. Dependency ratios – the number of those aged 65+ per hundred - place Europe (36), the US (33) and China (24) significantly ahead of Latin America (18), India (12) and Africa (7).

On a global basis, the rate of population growth is expected to halve from current levels between 2020 and 2050 (to 0.5% per annum from 1%), with the number of births peaking from 2020 onwards.

The UK's population is still expected to grow over the next 20 years. The UK population is projected to pass 70mn by mid-2029 and be 72.9mn in mid-2041, broadly equally driven by international in-migration and natural change. However, the latest projections are that growth will be slower than previously thought, 2mn lower in 2041 than previous modelling. This is due to lower assumptions about future levels of fertility and international migration, and an assumption of a slower rate of increase in life expectancy. Net internal migration has already fallen sharply after the EU referendum vote and the expectations are that there will be less 'speculative' inward migration over the foreseeable future. Migration will remain an important battleground between those with political and economic interests.

There may continue to be a trend towards the urbanisation of the UK population, driven by the younger population. This will mean that rural areas are ageing much more rapidly and, in some more peripheral areas, suffer from depopulation.

Generation Y and Z, like any generation before them, will present their own questions. Whilst they are more connected and technology-driven than any before, there is growing evidence that they are also more troubled. They have grown up with different expectations of how businesses, Governments and public service providers can meet their needs. A key question for these organisations will be how to meet the needs of the young, undoubtedly requiring technology-driven solutions.

Horizon 1

Healthy, wealthy and wise

By 2031, the number of people aged 65 and over will double to 1bn globally. Ageing is not happening uniformly across the globe and will consequently change the balance of power. Europe will be the oldest region by 2031. This will continue to raise concerns about the ability of existing fiscal systems to withstand the pressures of ageing. In the UK, the number of people at state pension age and older is set to swell almost a third by 2039 to 16.5m. The UK's dependency ratio will increase from 31 today to 37 by 2039. This will significantly strain public finances. This increase in the number of older people will have a profound impact on a wide range of public services. Many people are not saving enough and will need to work longer. Health and social care costs – already challenged - will rise.

The more the merrier

Based on current trends in fertility mortality and net migration, the ONS projects that the UK population will increase by 3.6mn (5.5%) over the next 10 years. The UK population is projected to pass 70mn by mid-2029 and be 72.9mn in mid-2041. However, there is now an expectation that population growth will be slower than previously projections, principally because of lower assumptions about future levels of fertility and international migration, and an assumption of a slower rate of increase in life expectancy. By mid-2041, the UK population is now expected to be 2mn lower than previous projections, still 6mn higher than current levels.

On a global basis, the broad consensus of population forecasts is that the world population will reach 8.6bn in 2030 and 9.8bn in 2050, increasing by about 0.5% per annum compared to the current rate of 1% (or 2% throughout most of the 20th Century.

Welcome home

In the UK, partly as a consequence of the impending Brexit, net migration has fallen and is expected to fall further. Net inward migration is now expected to decline steadily to 165,000 a year by 2023, significantly below levels seen in the past decade. Much of the decline in immigration is expected to be accounted for by EU citizens. There may be less 'speculative' immigration in the future, with less people travelling to the UK 'looking for jobs'. Immigration will remain an important policy battleground over the coming years. There remains a significant lobby to maintain levels of in-migration to ensure that important economic needs are met.

On a global basis, large-scale involuntary migration remains one of the most significant risks facing many countries in the next 10-20 years. Immigration will continue to be linked to populist voting in many countries, with a focus on rates of change as well as absolute levels.

Horizon 2

Flight from the countryside

The population projections for the UK and Wales expect that the population of many rural areas (including those in Gwent) will continue to decline over the next 20-30 years – extending the historical trend. There is currently a resurgence of population growth in cities which is partially reversing the long-term trend towards ruralisation. The 'life-cycle effect' (whereby young people move to cities for work and education, whilst older people and families move out to rural areas) is meaning that rural areas are ageing more rapidly than urban areas. This will have implications for public service delivery in rural communities. The 'liveability' of cities in the future will play a significant role in whether the cycle will continue. Rural areas are at cross-roads, they could simply shift more to being a commuter belt for cities, which will be the locus of economic dynamism.

Horizon 3

Generation Y and Z – handle with care

Young people entering the labour market today face far less favourable mobility prospects than their parents or grandparent did. There is a growing policy focus on intergenerational inequality. The concern is that all the old paths that allowed their parents to get ahead – careers with prospects, home ownership and decent pensions – are one by one being blocked off for Generation Y. Whilst today's young adults enjoy greater social, sexual and cultural freedom than ever before they are also a highly anxious generation. There is growing evidence that suggests that British teenagers are among the most troubled in the world. This evidence shows that there is a link between social media use within children and mental health issues such as depression and anxiety. However, the increasing use of technology can also be a power of good – creating cross-fertilisation of ideas, greater cultural fluidity and creativity. They are expected to continue to be at the forefront of the disruptive technologies that shape future economies, both as innovators and consumers.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Will divergent population trends between the urban and rural areas of Gwent continue? How will it balance the contrasting trends of significant demand for housing in the M4 corridor, whilst ensuring sustainability of communities in other areas which are losing population? How will rural voices still be heard in an increasingly urbanised world?
- ✓ How can the environment be protected in those areas (along the M4 corridor) where pressure for development remains the highest?
- ✓ How will public services be sustainable when there will be increasing 'dependence' on a shrinking working-age population to provide the necessary resources?
- ✓ How can public service providers develop new sustainable models that will remain effective in the context of a continuing ageing of society?
- ✓ How can public service providers help improve the 'life quality' of its population as it ages? How will it address the 'time bomb' of ageing accompanied with increased incidence of life limiting illnesses such as obesity, diabetes etc.? How will it meet the demand for increased palliative care?
- ✓ Should the need for greater mental health support be planned and developed now for the younger generations who are facing particular pressures?
- ✓ What help will Gwent businesses need to counter the potential loss of access to international labour?

SHORT-TERM	MEDIUM-TERM	LONG TERM
	The impact of 'population' will be:	
an **opportunity** in the short to medium if Gwent can utilise the dynamism and technology-related skills of Generation Y & Z	**limited** in the medium term if population growth can be easily accommodated, and new sustainable approaches to caring for the elderly are developed **challenging** in the medium to long term if the significant demand for new housing continues to be heavily concentrated on areas along the M4 corridor	potentially **damaging** in the medium to long term if new innovative and sustainable models of support are not developed to address the medical and care needs of an ageing society

LAND-USE

92% of UK population will be living in cities by 2030

2030

SMART CITIES

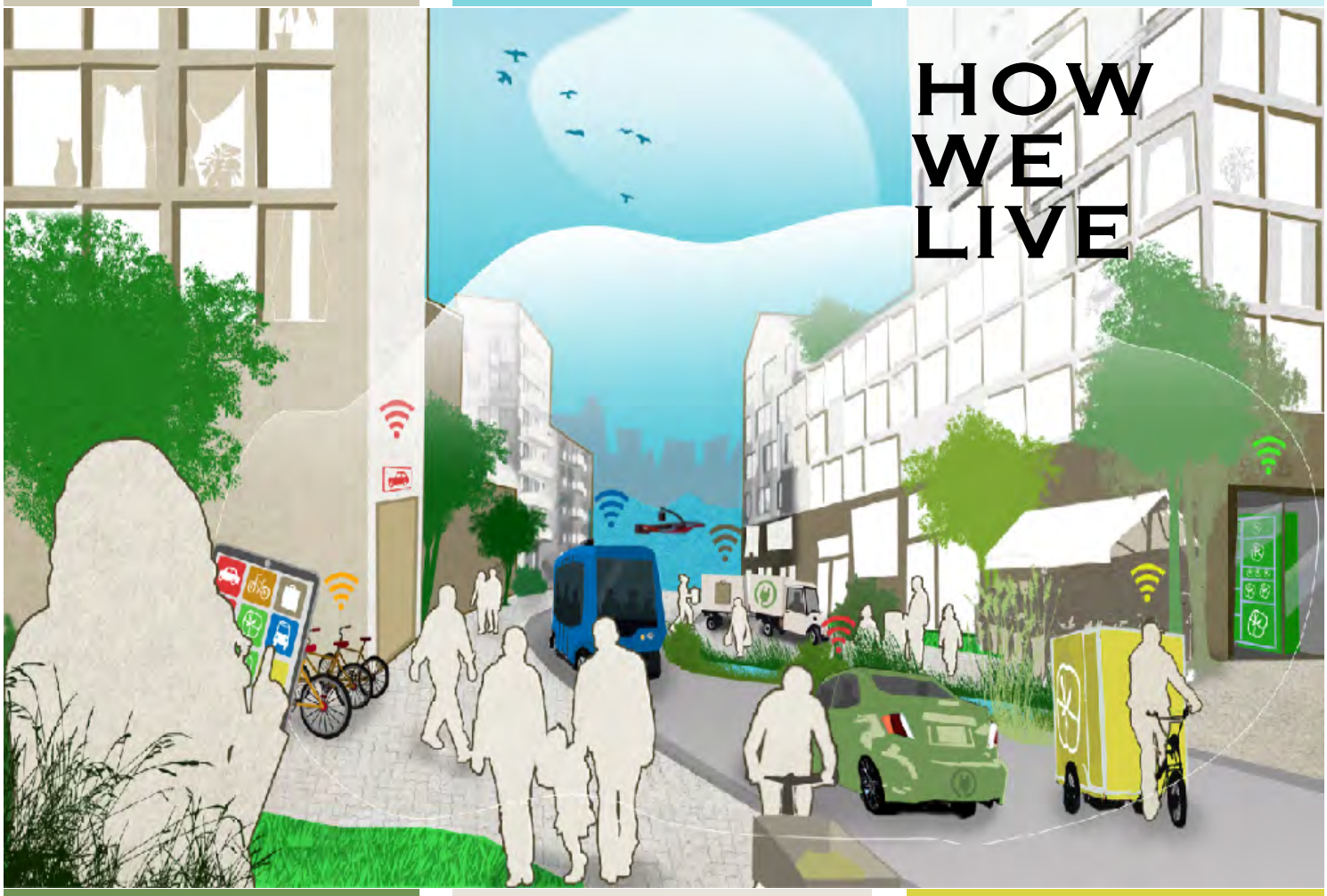
2020

By 2020, 10% of smart cities will use streetlamps as the backbone for a smart city WAN.

HOUSING

5 million more homes needed by 2040 because of ageing, immigration and smaller households

2035



HOW WE LIVE

Robots will take 600,000, or 1 in 3, construction jobs by 2040

2040

CONSTRUCTION

2039

Almost half of households in rural areas predicted to be aged 65 or over by 2039

RURAL DECLINE

Cities take up 2% of the earth's surface, yet consume 75% of resources

2018

URBAN FOOTPRINT

2. HOW WE LIVE - CITYSCAPES

Cities are growing. As more people move to cities to find employment, many of the world's largest cities will continue to expand, becoming megacities (over 10m people). By 2011, half the global population was living in urban areas; by 2030, it is forecast that the proportion will grow to 60%. The number of megacities is also growing - from 10 in 1990, to 28 in 2014, and 41 by 2030 - with the biggest growth in the developing world.

If properly planned, providing public transportation, as well as housing, electricity, water and sanitation for a densely settled urban population is typically cheaper and less environmentally damaging than providing a similar level of services to a dispersed rural population. However, cities are huge consumers of resources and their environmental footprint can be substantial.

As cities around the world struggle to cope with rapidly increasing populations, congestion, pollution, digital infrastructure and housing issues, a key response has been to explore the benefits of data analytics to help improve the way that cities are managed. Big data / data analytics is at the heart of a number of transformations.

Congestion is one of the biggest challenges in big urban areas where traffic jams cause chaos in rush hour and generate substantial noise and pollution.

According to a McKinsey and Co study, green districts within urban areas are economically viable, environmentally beneficial and improve the quality if life. They point to increasing interest around the world to try and harness these benefits.

The number of new homes required in the UK continues to grow, with current estimates that 210,000 per year needed until 2039. New properties will need to be designed and built to the highest environmental standards. Two distinct trends in construction are likely to emerge - one is about low impact buildings which use local material and skills to maintain the local vernacular; the other, driven by environmental and economic efficiencies, is to prioritise off-site, modular construction to the highest energy-saving levels.

New construction techniques, and the need to retrofit, will require new approaches to planning - which effectively prioritise different things. CO^2 absorbing concrete, green walls, smart bricks, robot construction, 3D printed buildings are among a range of technologies being explored which could transform construction.

Proximity to plants and green space has been proven to reduce stress and improve productivity. Plants can also provide natural air conditioning, improved air quality and shading. Roofs, public spaces and rooms can all be 'furnished' with more planting - improving conditions for the building occupants as well as mitigating carbon emissions.

In the UK, there remains a desire for more personal space and for suburban and peri-urban living. There is emerging thinking that smaller towns may become hubs of sustainable living in the future which will demand alternative approaches to service provision, such as transport, schools and hospitals.

Overall, the pressure on land is likely to increase as competing, critical uses - growing food, physical development, producing energy (non-food crops), dealing with waste, protecting eco-systems, providing amenity - vie for the best land.

Horizon 1

An eye on design

Efficient, green building design will become commonplace as the need to mitigate and adapt to climate change becomes more urgent. More offices, hotels and warehousing will be aiming for zero energy in the running of the buildings. There will be cross over between industrial and domestic designs to help ensure flexible use for buildings and so increase their effective life.

As 70% of current building stock will still be in use in 2050, retrofitting will be increasingly important.

Home is where the heart is

Over 200,000 homes were built in the year to June 2017, helping to meet the huge pent up demand for new housing. This is expected to rise to nearer 300,000 per year by 2030. But that's only part of the story, as the UK needs more affordable homes; more homes for different tenures and higher quality build standards.

The cost of land remains high which drives up prices; skilled labour is likely to be in short supply post BREXIT - so more companies are looking at the cost benefits modular construction and 3D printed homes.

Horizon 2

Everything will be connected

The IBM Smarter Cities for Smarter Growth report points to strong evidence that managing open data sources and sophisticated data analytics are now a prerequisite for any successful city - as they help to improve how urban areas are managed. Already over 70 UK cities have plans to implement smart city systems, with half of those already having some systems in place. Using data about the 'infrastructure, 'systems' and 'life' of the city - innovative companies are and will develop new tools to make cities more liveable and more efficient.

It ain't easy being green

Pressure to improve local environments, and reduce energy usage, is creating demand for green infrastructure - using the fabric of cities themselves to create gardens, power stations, forests. Experiments are underway to embed solar technology in roadways and cycle paths. Cities are mandating that new commercial building should have green or solar roofs. Vegetables and fruit are being grown across urban areas. All these eyes of green initiatives are shown to improve wellbeing for residents and workers.

Material world

Construction systems are evolving all the time. Emerging materials will bring new properties to the built environment - whether carbon absorbing concrete, new system bricks, smart windows or solar paint. Keeping costs down and helping to adapt to a greener future are at the heart of material technology.

New techniques

The two biggest transformations in construction are emerging as robotic building and 3D (or AM) printed buildings. They offer the possibility of bespoke, less costly and rapid build. Locally, planning policy and incentives could boost key building technologies.

There are self-organising robots would work together to build structures and a brick-laying robot (SAM) that can lay a brick every 20 to 25 seconds. A Chinese company has demonstrated AM technology that can build 10 3D constructed houses in one day; and another is using the same technology to fabricate apartment buildings.

Horizon 3

The big squeeze

A major trend over the past 50 years has been the movement of people from the countryside and into cities - globally and in the UK. There is no sign of this stopping as two thirds of the global population will be living in cities by 2050. And cities are getting bigger as well.

While cities offer a less resource intensive solution to our growing population, it comes at a price of increasing density and shortage of land. This, in turn, is fuelling demand to more and higher skyscrapers.

A pressure cooker

The growing demand for food, fodder, fuel, and raw materials is increasing pressures on land and the competition for natural resources. At the same time, degradation is reducing the amount of productive land available. In a fragmented system, competing interests and parts of government make the case for specific uses for land. The UK government has a target for 12% of the UK to be wooded by 2060 (up from 9.5%). The country needs upwards of 4 million new homes by 2035. The Climate Change Committee have identified that more land is needed to offset the effects of climate change - such as managing floods and preserving peat bogs.

There is no clear overarching land-use policy that can help to balance these increasingly important needs.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ How to ensure that the post-industrial communities in the northern parts of Gwent will be able to capture some of the benefits of smart urban living
- ✓ The possibility of transforming the quality of life as well as creating new employment opportunities lies with proactively embracing new opportunities
- ✓ Gwent is the key gateway to southern Wales and needs to be an exemplar of a forward-looking county - showcasing new building techniques that will enhance wellbeing and sustainability.
- ✓ Being an early adopter of smart city principles - using open data platforms and data analytics - will help to manage waste, congestion, parking, health and pollution
- ✓ How will Gwent maximise the opportunities of being a part of the Cardiff Capital Region? There are great opportunities to integrate systems and boost mobility, digital infrastructure and innovative investments.
- ✓ Can Gwent find the investment to transform brownfield, post-industrial sites into new green uses - such as renewables or horticulture?

SHORT-TERM	MEDIUM-TERM	LONG TERM
The impact of 'how we live' will be:		
limited in the short term as there is likely to be insufficient investment from the public purse	an opportunity in the medium term if Gwent decides to make green living a priority and make the most of links with the Cardiff Capital Region on smart systems	potentially an opportunity in the long term as it could help transform the lives and wellbeing of Gwent citizens

ELECTRIC VEHICLES

All new cars sold in Europe to be BEVs.
10 million BEVs on UK roads.

2035

AUTONOMOUS VEHICLES

2035

1.5 million Connected Autonomous Vehicles in UK.
£50 billion UK market.

CHANGING INFRASTRUCTURE

Most vehicles will connect to the internet by road induction in 2035

2035

MOBILITY

The UK MaaS market will be worth £ billions per year by 2030

2030

MOBILITY AS A SERVICE

2030

25,000 charging points needed in UK by 2030.
Wireless charging for buses & vans.

HYPERSPEED

Electric drone taxis will be commonplace in cities by 2035

2035

PERSONAL TRAVEL

3. MOBILITY

Mobility is a critical economic factor, both in its own right and as the means of providing the goods and services we all consume. Mobility is also a critical societal factor, necessary for getting children to school, getting adults to work and connecting friends and family to each other and to the remote and local places that generate tourism income. And it is a critical environmental factor, challenging our relationship with the climate, with energy resources and with our health.

It is also likely to become - with technological development - one of the most important and potentially one of the most disruptive aspects of life in the future. The transition to a new model of mobility may not prove especially disruptive to travellers - who will mainly demand and receive more efficient and easy services - but it will be to the infrastructure suppliers, vehicle manufacturers and service providers who are innovating the travel experience.

Perhaps the key challenge for mobility in the future is simply that people are going to move in less predictable patterns and at less predictable times than they have in the past. As the location of work changes and becomes more mobile, the places where work happens will become more fluid. As more services - shopping, entertainment and leisure, for example - migrate online, distribution and delivery of goods and services will change. Innovation and effective design of mobility services will be key to business success and profitability and key to creating regional competitiveness as well as environmental and personal wellbeing.

The uneven state of current infrastructure and the level of investment required to create the mobility infrastructure of the future means that opportunity may mainly focus on cities. While this may not be what Gwent wants, it is inevitable given that the increase in urbanisation globally will increase average city density by 30 percent over the next 15 years and stretch existing systems. Urban planners, government and residents are putting liveability and sustainability higher on their agendas, demanding increased connectivity and multiple shared-mobility options. These are the demands which will shape global competitiveness over the next 25 years and which form the environment in which Gwent will need to make decisions about the mobility of its population.

Mobility - or, more accurately, the aspiration to become a world leader in shaping the future of mobility - is one of the four grand challenges in the UK Government's Industrial Strategy launched in Newport in 2017. The Strategy notes that the UK is *"on the cusp of a profound change in how we move people, goods and services around our towns, cities and countryside… Significant investments are being made in the electrification and automation of road vehicles, in the modernisation of rail services to deliver higher capacity, speed and connectivity, and in the development of autonomous aerial and marine transport. New market entrants and new business models, such as ride-hailing services, ride sharing and 'mobility as a service', are challenging our assumptions about how we travel."*

Mobility in the UK - like other counties in the world - is likely to change significantly over the next 25 years. The principle change will be less about where people and goods travel to than how they get there.

Horizon 1

Need a Lyft?

The public transport system in San Francisco - home of both Uber and Lyft – is limited, clogged and barely usable; which is why Uber and Lyft have grown. Lyft has now introduced a new service called Shuttle, which offers a fixed-fare, fixed-route trip in a shared vehicle. In other words, a private car acting like a bus. Some cities in North America now pay Uber or Lyft to provide public transport services. Innisfil in Ontario has signed a deal to subsidise the cost of Uber rides for residents, rather than pay for two new bus lines. Summit (New Jersey) subsidises Uber rides rather than spend $20m on a new parking garage next to the train station. Cities that are concerned about the Uber or Lyft business model have taken a third approach, launching their own on-demand, carpool app.

Freight trains

The UK Government has given the go ahead to trial 'platooning;' convoys of semi-automated HGVs that have acceleration, braking and steering controlled by the lead vehicle. Platooning road trials are already underway in Japan as part of the Japanese government's Future Strategy 2017. Road trials in parts of Europe are working towards being able to drive across Europe with platoons by 2023 and Daimler has been given permission to test the system in the US. The International Transport Workers' Federation suggest that 4.4m of the 6.4m professional trucking jobs in the US and Europe could be eliminated by autonomous technology - but the International Road Transport Union suggests that autonomous trucks will help the haulage sector deal with the current shortage of drivers in many parts of the world.

Horizon 2

Electric vehicles: Charging ahead

The UK Government's Industrial Strategy aims to support the development of infrastructure for electric vehicles (EVs) through £0.5bn investment in charging infrastructure and plug-in car grants. As the number of EVs rises so will the charging infrastructure requirements. 2017 data show that the UK added less than one new public charging point for every six new plug in vehicles. The figures make particularly grim reading for early adopters in Wales, where, despite having around half as many plug-in vehicles as Scotland does, it has just one tenth the number of rapid chargers. Of course, people can charge their cars at home but there are concerns about access to charging points and about grid capacity and stability.

Mobility as a Service

Since 2016, Helsinki residents have been able to use an app called Whim, heralded as the world's first Mobility as a service (MaaS) offering, to plan and pay for all modes of public and private transportation within the city - be it by train, taxi, bus, carshare, or bikeshare. MaaS offers users the promise of better journeys across intelligent transport systems that utilise technology to combine modes of transport seamlessly. 'Users' can be individual travellers or businesses moving goods. The UK government is looking at MaaS and Whim has been launched in the West Midlands. MaaS Scotland has created a new positioning document, outlining ideas to introduce Maas to Scotland. Wales seems to be lagging at the moment.

Autonomous Vehicles: Are we nearly there yet?

The Chancellor announced in the autumn budget 2017 that the government wants fully self-driving cars, without a human operator, on UK roads by 2021. Not everyone believes this to be a realistic timescale and even those who are optimistic are seeking to manage expectations. And it is not certain that the market is ready for AVs. Research suggests that trust in fully automated vehicles is declining, particularly amongst younger age groups. There are also safety concerns about driver disengagement from the driving task.

Less wait at the gate

While air travel is facing some disruption, there is little suggestion that demand will slow down any time soon. The focus is on utilising technology in the industry and, in particular, on improving the passenger experience. While there is some talk across the airline industry about pilotless planes, not everyone is on board with the idea and there is much greater interest in using technology to fix existing system issues and investing in technology ground and air side to smooth the passenger journey. Innovation is driving change elsewhere in the industry, too. Airlines are now accepting payment in Bitcoin, digital communities are anticipating customer need and flying taxis are already in use in Dubai.

Horizon 3

Changing Infrastructure: who pays?

The rise of connected and autonomous vehicles (CAVs) has significant implications for national infrastructure. AVs use information from on-board sensors and systems to understand their global position and local environment, enabling them to operate with little or no human input, connected vehicles have a driver but communicate with their surrounding environment to provide him or her with information that informs decisions about aspects of the journey such as route, travel conditions, destination details and so on. There are doubts about how quickly the UK can develop and put in place the technological infrastructure required for level 5 autonomy – particularly outside the cities. Not least - and not trivially - because of the weather.

What could be better than HS2...?

Hyperloop and maglev, according to the Institute of Directors (IoD). IoD believes that HS2 will be yesterday's technology by the time it is ready. It suggests that, instead of making incremental upgrades to infrastructure. The UK, IOD suggests, needs to invest in newer technology that will deliver much greater outcomes. One such technology - which the Virgin Group has invested in - is Hyperloop. Virgin has announced a preliminary agreement with the Indian state of Maharashtra to build a shuttle between the cities of Pune and Mumbai. Virgin Hyperloop One will travel at 240 miles an hour, shaving three hours from the current journey time between Pune and Navi Mumbai international airport. Who knows? If Virgin Hyperloop One really does - one day - transport people between London and Scotland in 45 minutes (or between London and Cardiff) the economic and physical geography of the UK could shift dramatically.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Is car sharing, either using apps or a third party provider such as Lyft? - a real and cost effective opportunity for Gwent?
- ✓ Are there safety concerns for autonomous vehicles or platooning convoys the Gwent needs to review? Or could it approach government to welcome the trial to the region?
- ✓ What can the region do to strengthen the network of rapid charging points in Wales? And will a failure to move quickly on this create reputational damage to the region?
- ✓ Mobility as a Service may be a quick and easy win (or, of course, may not!). Might it be worth exploring the feasibility of MaaS in more detail?
- ✓ Autonomous vehicles may not - despite UK Government statement - be a cost effective or attractive solution to less densely populated areas. While it will of course be important to keep a watching brief, AVs may be less important to Gwent in the short to medium term.
- ✓ Does Gwent have any influence over Cardiff airport's continued investment in technology? Does it matter; is employment more important?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
	The impact of 'mobility' will be:	
limited in the short to medium term: although poor charging infrastructure may affect the uptake of electric vehicles	**challenging** in the medium term if Gwent does not keep abreast of developments in mobility and develop its infrastructure accordingly	potentially **damaging** in the long term if other regions in Wales and the UK advance mobility solutions faster than Gwent

AUSTERITY

Recent improvements in inequality will be reversed between now and 2025

2025

PUBLIC SERVICE

2030

Innovation will change public service provision and skills by 2030

BREXIT

Political and financial impacts are likely to remain unclear until 2025 at least

2035

POLITICS

E-voting will increase participation to over 80% by 2035

2035

VOTING

2035

The model of public services being delivered by private companies will be reformed by 2030

PRIVATISATION

Devolution will slow over the next decade but be a significant political issue again by 2030

2035

DEVOLUTION

4. POLITICS

2018 is a difficult moment to suggest how the future will develop politically. Uncertainty is always a feature of political analysis but in the past it has generally been *known uncertainty* - that is , uncertainty about which party or political perspective will prevail or about how competing ideologies will balance each other out.

That is not the case in this moment of history. Today's uncertainties are much more fundamental and much more unknown. At the UK level, what kind of Brexit deal Britain will secure is critical. So, too, is what kind of relationships Britain will have with other nations inside and outside Europe and whether we will be able to trade under favourable or unfavourable conditions. At the national/principality level, the answer to these questions will have implications for the relative prosperity and opportunity facing citizens; and therefore, for the future strength - or weakness of the UK as a whole.

Against all this uncertainty, one thing is perhaps clear - that the future success of local government will be predicated on changes in practice that are foresighted, systemic and innovative. Acquiring these characteristics in a local government context is not easy at the best of time, but we suggest it is a strikingly significant challenge for Gwent to take on.

Horizon 1

Carillion ripples

Carillion, Britain's second-largest construction firm, collapsed in January 2017with debts of about £1bn and pension liabilities of almost as much again. Carillion began as a construction company, then moved onto providing a wide range of services, almost all of which was outsourced to subcontractors. At the time of its demise, it had about 450 government contracts, constituting about a third of the company's revenues. Carillion bid ever more aggressively for public-sector contracts so that, when costs rose, many contracts quickly become loss-making. Government is not coming out of the collapse well, with questions asked about why it gave so many contracts to Carillion despite a series of prior warnings as to the continued viability of the company.

Trust in government: leave or remain?

In January 2017 Edelman a global communications marketing firm, published a separate UK-specific supplement to its annual trust barometer survey. The survey showed a sharp drop in levels of trust in the British government, from 36% pre Brexit referendum to 26% by the start of 2017. One year on, things have not improved much - and public trust in many institutions remains low. It's not only the public; one of the conclusions of the European Union (Withdrawal) Bill is that, whilst the Government has said that it plans to work with the devolved administrations to reach agreements on UK common frameworks, *"the devolved administrations have insufficient trust in the process for agreeing these future relationships and have, accordingly, indicated that they will withhold legislative consent from the Bill. The Government must improve engagement with the devolved administrations to resolve this deadlock."*

Divided we fall

The real winners from Brexit are likely to be the senior Civil Servants in Whitehall who will take the top jobs and power in the new constitutional order. One of the principle mechanisms will be a Joint Committee to be co-chaired by the Union and the United Kingdom which will be responsible for the implementation of Brexit. As well as settling disputes, the Committee will monitor and supervise daily political life and oversee implementation of the political promises and parliamentary legislation on relations with the EU. This will be - according to The Sunday Times - "a quiet coup [that] will transform British politics, representing an entrenchment of power by the civil service over parliament" and that "just as the EU curbed popular and parliamentary sovereignty before Brexit, the joint committee, and Whitehall, will limit it afterwards." It's a strikingly downbeat analysis.

Trust in government

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Changing politics

The high turnout amongst youth voters in the 2017 election was reportedly the highest in 25 years and is regarded as a key element in Labour's strong showing in the polls. The finding is the latest that suggests a growing divergence between the generations. It appeared in the 2015 vote for Scottish Independence (where 71% of the young voted Yes) and again in the 2016 Brexit vote (where 75% of the youth vote backed remain). Younger voters are more likely to be positive about multiculturalism and diversity, comfortable with immigration and in favour of Britain taking an internationalist, outward-looking approach to the world. Their views contrast with those of older voters, who are more likely to be sceptical of such things. Recent research by the LSE further suggest that today's politically engaged youth are not committed to any one ideology but are instead focussed on influencing young people's situation.

Horizon 2

Public service delivery: time to innovate

The New Zealand government is trialling an 'innovative lab' that provides a mechanism to bring together design, technology, information management and agile development for more rapid and targeted public service design and delivery. The lab involves highly skilled public servants from several agencies as well as private sector companies across different disciplines such as design and technology, information, policy and data science. The lab establishes a collaborative space, additional expertise and tools for service delivery teams to work differently in design and implementation. And Nesta is exploring how innovation can enhance problem solving in political administrations. The key to improved practice in public service delivery? Accelerate learning to create better decision making; work with citizens and stakeholders to ensure co-creation and collaborative ownership of new solutions; and lead change through processes that mobilise people, inspire action and ensure strategic outcomes.

Horizon 3

Independent thinking

The UCL (University College, London) Constitution Unit is exploring options for an English Parliament. Any move outside London would require relocation of English government departments and UCL proposes that a national competition might be the best way to resolve any jealousies over which city might be chosen as the location. Where - if the political institutions of the UK begin to change - might it end? An article in the FT in November 2017 imagining post Brexit London as a city state may (or may not) have been tongue in cheek but it follows a 2016 petition calling for Sadiq Khan to declare London independent. With public opinion on Welsh independence reportedly on the rise, odds on the long term survival of the UK may just be shortening.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Is local government procurement fit for purpose? How might changes in national procurement processes impact on local government projects?
- ✓ What might the implications of the UK parliament moving to Manchester be? How could Gwent capitalise on such a move?
- ✓ Trust in a different context. How trusted is local government in Gwent and what are the cultural challenges?

- ✓ Is lowering the voting age to 16 enough to engage young people in politics? Or are young activists a cohort that don't fully represent the cultural diversity of Wales?
- ✓ Still with young voters, should Gwent recognise that partisanship in youth politics relates to age rather than political colour. Does this mean nothing can be taken for granted?
- ✓ As innovation in local government accelerates, will Gwent be a leader or a follower? Will it matter? And if it does, what might the consequences be?
- ✓ Is current thinking on independence going anywhere? Might it be important for Gwent - or have the devolution wheels truly fallen off the wagon?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
The impact of 'politics' will be:		
challenging in the short term if Gwent does not continue to monitor developments and pick up early signals of change. This might be **limited** if Gwent public services bring innovation to their services	**challenging** in the medium term if Gwent fails to anticipate and rehearse its responses to shifts in political momentum post Brexit	potentially **damaging** in the long term if Gwent finds itself moving in a different direction from national or regional policy

PROTECTIONISM

Global trade growth to increase by 5% a year to 2031 - despite new tariff barriers.

2031

WEALTH AND POVERTY

2018

Increasing income inequality is seen as a top 5 issue worldwide. Richest 1% own 50% of global wealth

MOVING EAST

China and India overtake the USA as the largest economies.

2040

ECONOMICS AND INEQUALITY

Two-thirds of children entering primary school today will end up working in jobs that don't yet exist

2038

EMPLOYMENT

2020

Global growth rates to slow markedly after 2020, driven by lower growth in China.

LOW GROWTH

Two thirds of the global middle class will live in Asia-Pacific region by 2030

2030

SPENDING

5. ECONOMY

By 2050 the world economy is expected to have doubled in size, far outstripping population growth, due to continued technology-driven productivity improvements. In general, there is a long-term structural shift in the world economy, with population growth, urbanisation, and increased purchasing power driving emerging economies growth. There will continue to be a shift in global economic power away from established advanced economies, especially those in Europe, towards emerging economies in Asia and elsewhere. The European economy will become smaller in relative terms and less influential on global issues. The leverage in trade negotiation provided by its internal market could suffer.

Much of the UK's economic future depends on it being successful in the long run in developing its trade and investment links with faster-growing emerging economies, to offset a likely weakening of trade and investment links with the EU after Brexit. This transition is fraught with difficult in a world currently moving towards more protectionism, driven by policies of the new US President. The internal market of the EU, however, has protectionist tendencies (protecting the trade interests of the larger trading nations) and this stance will play out over the Brexit negotiations.

Determining these future trade relationships will take place in an era which is likely to continue to be highly 'disruptive' in economic development terms. The collision of massive technological change and significant socio-economic, geopolitical and demographic changes has (or will) lead to what some have called the 'Fourth Industrial Revolution'. Whilst this will present undoubted threats, it will also present opportunities. In terms of threats, there is a quickening shift to automation which will result in large-scale job losses in certain industries. In general terms, the service sector will experience a similar shift to automation that has been experienced in manufacturing. Occupations such as accountancy, legal and technical writing are expected to be affected.

However, it will also provide opportunities. Many of today's children will work in jobs that don't yet exist. These technological changes are being accompanied (facilitating) new disruptive business models which are quickly transforming a wide range of sectors. The empowered consumer and disruptive technologies have sent businesses scrambling to find new strategies and business models for creating consumer value. These momentous changes raise huge organisational, talent and HR challenges.

The challenge will be to ensure that the 'fruits' of future growth are more inclusive than they currently are. There is growing evidence that, in recent years, economic growth is accompanied with growing levels of inequality. The current model does not work for a vast swathe of communities, and there is a danger that a further deepening of wealth and assets held by the very few, will result in further polarisation. This may lead to growing social tension in many countries, including the UK.

Horizon 1

'New, lower speed limit'

Relatively low population growth and muted productivity growth has meant that lower growth has been experienced by more mature economies. These trends are expected to continue. The UK is already a low- productivity economy when compared to most of its competitors; it has 18% lower productivity than the average in the G7 countries. Productivity growth is highly uneven in the economy, while the top 1% of businesses have seen average productivity growth of around 6% per year since 2000, one-third of UK companies have seen no rise in productivity at all. Low productivity growth may prove durable. Some commentators argue that we have entered an era of more or less permanently subdued productivity growth for essentially structural reasons. Mark Carney, Governor of the Bank of England, calls this a "new, lower speed limit".

Post-BREXIT trade relationships and a new protectionist era?

Protectionism is on the rise everywhere. 60 of the world's largest economies have adopted more than 7,000 protectionist trade measures (on a net basis) since the financial crisis in 2008. Whilst the US takes the headlines in terms of the protectionist policies it has (and intends to) implement, it is argued that the EU has become harder for those non-member countries to trade within it - which could be bad news for those seeking a post-Brexit deal between the EU and the UK. The UK has a relatively high risk of being affected by protectionism implemented by other countries, having a 57% dependency on trade as a percentage of GDP. It is not certain whether these protectionist tendencies will continue over the longer-term, or are a product of the fall-out of the financial crisis. However, given the particular uncertainty in the UK of the post-BREXIT trading relationships, protectionism is a significant concern for UK businesses.

Disruptive business models continue to develop

There will be an unprecedented level of digital disruption that will affect entire systems of production, distribution and consumption. Digitalisation is transforming the way consumers discover, evaluate, purchase and use products and services. Consumers are increasingly demanding experiences, not just products, and have become active participants at every stage of the value chain – acting as innovators, marketers and even employees. Meanwhile, disruptive technologies (e.g. robotics, the Internet of Things, artificial intelligence) are driving a step change in business performance, and allowing businesses to offer once-impossible services. Consumer industries will change more in the next 10 years than in the last 40 – and at an ever-accelerating pace of transformation.

Shockwaves from disruptive technologies will be felt across society. Major societal impacts are expected to include factors such as the effect of physical retail evolution on communities, the transformation of the workforce, and the environmental consequences of last-mile delivery.

Horizon 2

A new world order – the dominance of the East

Over the next 30 years the seven most prominent emerging economies (E7) could grow twice as fast as advanced economies (G7) on average. As a result, six of the seven largest economies are projected to be emerging economies in 2050 led by China, India and Indonesia. Some economic projections expect that the EU's share of world GDP could fall below 10% by 2050. By 2030 it is expected that two-thirds of the global middle class will live in the Asia-Pacific region. After 35 years of extraordinarily rapid growth, the Chinese economy will continue to undergo a major transition from export-led growth to a one increasingly driven by consumption and services, with less emphasis on debt financed public investment. The potential slowdown in Chinese growth will be partially offset by strong growth elsewhere. Countries such as India, Indonesia and Mexico will grow quickly. India's dynamic and younger population will drive its economy. Closer to home, economies such as Poland and Turkey are expected to be some of the fastest growing in Europe.

An increasingly unequal society?

Social mobility and inequality are worsening in the UK and expected to worsen over the medium-term. Differences in income inequality are being accentuated by wealth inequality. Capital and assets are currently highly unevenly owned in the UK. The richest 10% own five times more wealth than the poorest half of society. The result is a widening of social and health outcomes, with children from the poorest communities having significantly lower life expectancies than those from more affluent areas. New models of capital ownership will be needed to ensure prosperity is broadened rather than a further concentration of wealth in the 'new economy'. Gwent already has relatively high levels of absolute and relative poverty, with pockets of severe deprivation. For many individuals and communities there is a sense that they have already been 'left behind'. There is a significant risk that further polarisation of communities will deepen social tensions.

Horizon 3

Automation and the need for labour

These are scenarios where applications increasingly draw on smart algorithms to replicate the judgment and experience of human workers. These trends are only just developing and once their accuracy and resultant productivity gains had been confirmed, a sharp leap forward in IT innovation will lead to significant disruption for traditional professions. There is a risk of the continued polarisation between 'lovely' jobs and 'lousy' jobs. Automation could increase the demand for work in creative, cognitive, planning, decision-making, managerial and caring roles, where humans still outperform machines. New jobs and ways of working, often in close partnership with machines, will emerge. However, some emerging technologies will risk reducing autonomy at work and intensifying exploitation. The quality of work should therefore be a key focus of policy. However, there are counter views that automation can be a power of good if managed correctly. Work will be transformed by automation, not eliminated. In this scenario, automation is likely to lead to the steady redeployment of labour over a period of decades, rather than a sudden and rapid elimination of employment.

Future skill requirements

The pace of change in the workplace is accelerating. As disciplines converge, so do the technologies. As almost every job becomes increasingly technology-related, there will be winners and losers. The spread of disciplines and jobs across sectors will also stimulate the hybridisation of skills.

Competition for the right talent is fierce. And 'talent' no longer means the same as ten years ago; many of the roles, skills and job titles of tomorrow are unknown to us today. If current trends continue, within the next decade China and India will account for 40% of all young people with a degree in G20 and OECD countries, while the US and EU countries will account for just over a quarter. These countries are also producing more graduates in STEM subjects. By 2030, if these trends continue, China and India will account for more than 60% of the OECD and G20 STEM graduates.. Government scope to invest in employment and education initiatives will be increasingly challenged by continuing fiscal pressures, with a trade-off between sustaining an ageing population and promoting opportunities for the young. As a consequence, there will continue to be a shift to the privatisation of education and training.

Severe, Significant, Relatively minor, Potentially positive

Implications for Gwent

- ✓ How can Gwent business prepare for the major geopolitical structural shifts that are expected to continue over the next 30 years? How can they take advantage of the continuing shift of global economic power to the Asia-Pacific region? How can Gwent businesses be helped to target emerging economies?

- ✓ How exposed are Gwent businesses if the world enters a protectionist period? Could certain sectors such as steel production be adversely affected and what impact will that have on Gwent?
- ✓ How can Gwent businesses better embrace the emerging innovative technologies? How can the benefits of automation be harnessed? How can the potential costs of automation be safeguarded against? How can the Gwent workforce be positioned to take advantage of trends in automation?
- ✓ How can the 'fallout' from these quickening changes be managed so that increased polarisation of communities does not occur? How can Gwent stakeholders avoid a 'paradox of plenty' where existing inequalities are reinforced by new forms of capital?
- ✓ Can 'picking winners' be done in an increasingly fluid and disruptive business world? Should Gwent policy makers even attempt a targeted approach?
- ✓ How can training provision be adapted so that it is fit for purpose in a modern economy?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
The impact of 'economics' will be:		
challenging in the short term as the uncertainties of BREXIT continue to impact on the economy	**limited** in the medium term if the Gwent workforce can quickly adapt to the skills requirements of the 'new economy' an **opportunity** in the medium term if Gwent's businesses and citizens can exploit emerging markets, geographically and sectorally	**challenging** in the medium to long term if global economic power continues to shift eastwards potentially **damaging** in the medium to long term if the benefits of economic growth continue to be unequally shared, leading to further polarisation of individuals and communities

SOCIAL NETWORKS

The global social media analytics market will be worth $8 billion in 2025

2025

WELLBEING

2025

Employee mental wellbeing will be a common theme in corporate reporting by 2025

RELIGION

The number of babies born to Muslim mothers will be more than to Christian mothers

2035

70% of 25-34 year olds will be in rented accommodation in 2030

2030

CO-LIVING

2030

The proportion of 65+ who use the internet is set to rise to between 85-90% by 2030

SOCIAL CONTACT

The Welsh Government target is for 14% of the population to be speaking Welsh daily by 2036

2036

WELSH CULTURE

6. SOCIETY

Britain seems to be a nation divided - certainly in opinion and perhaps in structure as well. The 2017 general election, the 2016 referendum on Europe and the 2015 Scottish referendum all returned narrow victories (and in the case of the general election, a hung parliament). At each election, there was higher than expected turnout - and greater division than before. Yes directly opposed to no; young with different aspirations to old; losers being disrespectful of winners and talking continuously about rerunning elections. Fears about political apathy have been displaced by worries about national unity.

For some, the country is divided into what author David Goodhart calls the 'anywheres' and 'somewheres'. 'Anywheres' are the degree-educated geographically mobile who embrace new people and experiences, and define themselves by their achievements. In contrast, 'somewheres' have an identity rooted in their hometown and find rapid change, such as that brought on by immigration, unsettling. There is a growing concern that the 'somewheres' are in danger of being left behind by the market economy and the inequalities driven by continuing austerity and the (at least perceived) loss of opportunity.

The stark split in voting behaviour by age in the recent general election - and in the EU and Scottish referenda (see Politics section)- has reignited discussion about whether we are seeing a clash of generations; contrasting baby-boomers - who have it all - against a 'lost generation left without secure jobs, good pensions or affordable housing. Perhaps that is why the 2017 British Social Attitudes survey found that 48% of Britons think the government should raise taxes and increase spending, - the highest proportion to support such a measure since 2004.

Perhaps that is also why there is a continuing loss of trust in politics and the political classes.

Horizon 1

The doctor will alert you now

A revolution in health care is coming, driven by AI that is putting health monitoring, diagnosis and disease management in the hands of the patient: watch straps contain medical grade sensors that detect arrhythmia; apps are being developed to diagnose a range of diseases from skin cancer to Parkinson's; research is under way to see if certain molecular biomarkers can be detected in sweat. In spring 2018, Apple's iOS 11.3 will launch Health Records, a new app that allows patients from participating hospitals to view their health records on their phone. In the long term, Apple and other tech firms are hoping to aggregate individual patient data in order to create AI diagnostics. As individual patients stream data, AI systems will aggregate it and (for example) provide automated medical diagnosis from changes in biomarkers, spot behavioural traits that suggest patients are depressed or identify patients who are at special risk of cardiac disease.

Hey Syri. Allwch chi siarad Cymraeg nawr?

The Icelandic language is one of 21 European languages under threat threat of digital extinction. An article written in February 2018 highlights that "as old, pure and inventive as it may be, as much as it is key to Icelanders' sense of national and cultural identity, Icelandic is spoken today by barely 340,000 people - and Siri and Alexa are not among them." In the age of Facebook, YouTube, Netflix, smartphones and voice recognition, Icelandic is sinking in an ocean of English. Although the number of people speaking Icelandic is less than the number of people speaking Welsh, what makes this alarming – from Wales' point of view – is that Icelandic is the official written and spoken language of the country.

Snowflakes

'Snowflake generation' is a derogatory term for those who have become adults in this decade and is meant to suggest a cohort that is less resilient and more prone to taking offence than previous generations. But snowflakes – millennials who have grown up connected through the internet to people their own age the world over and who have considerable empathy with viewpoints and cultures other than their own - value individuality and reject the casual racism, homophobia and transphobia which may have been a part of popular culture for preceding generations. They believe that respecting someone's identity trumps the right of others to make fun of it and they condemn films, books and individuals who try. Millennials suggest that feeling culturally dislocated from wider societal mores is a contributing factor to mental illness in the young. Certainly, Britain is in the grip of a mental health epidemic which disproportionally affects young people and where one in four deaths of young men between the ages of 20 and 34 is by suicide. Welsh men are three times more likely to kill themselves than women.

Horizon 2

Anti-social media

Recent concerns that social media companies have failed in their duty of care to children might actually lead to a change in practice. Not driven by government, necessarily, but by consumers themselves. There is a growing backlash among young people, adults are getting bored, the 'corporitisation' of social media influencers is turning people off and players such as Facebook and Google are losing users' trust. It's not helped by the fact that social media is rapidly becoming the channel of choice for broadcasting fake news. Or that social media firms are failing to tackle cyber bullying. No wonder investors are getting rattled.

Co-living

Co-living is an emerging trend. It started out as a way to create communities for start up and tech professionals but has broadened out geographically and sectorally. Residents have individuals rooms or apartments in a shared building, with communal spaces - quiet spaces you can work in through to open spaces to socialise in - are designed on each floor to bring people together. For some, these are commercial propositions alone; for others there is a strong and purposeful focus on shared values. Primarily aimed at millennials, co-living is attracting a lot investor interest.

Smart citizenship…

Most visions of the smart city put government or corporations in charge of the technology and infrastructure. Critics worry that cities may get too smart, "reducing people to data-points… surrounded by more and more circles of service that create bubbles of control." A number of initiatives are therefore focussing on how citizens can take more control, gathering data and using it to reshape the urban environment to meet their needs. Detroit's Sensors in a Shoebox project, for example, puts sensors in the hands of local teenagers to engage them in identifying problems in their community and working on solutions. Edmonton's BetaCity project uses wifi connected sensors to gather data and inform citizens about the quality of the urban environment. Smart Citizen, an independent environmental monitoring network is now live in Manchester. The Smart Citizen Kit gathers data about CO, NO2, temperature and noise and streams data over WiFi to the Smart Citizen network. As the project evolves, Smart Citizen plans to extend community engagement into new areas.

Legalise drugs? What's the harm?

In September 2017, the Duke of York visited a charity in London that supports recovering addicts and asked them if they thought the law on illegal substances should be changed. "It feels like a question I have to ask," the Duke is reported to have said. The UK is the leading country in Europe for deaths from drug overdoses, and many believe that the current drug policy is not working. Criminalisation appears to have failed – but efforts to cultivate fresh thinking are getting nowhere. A 2016 study argued that cannabis legalisation and regulation is 'now inevitable' and called on the UK to emulate the market-based approaches emerging in North America. A legal cannabis market could be worth £6.8bn in the UK and net as much as £1.05bn for the Treasury.

Horizon 3

Religious movement

Recent press coverage of religion has, regrettably, been for the wrong reasons. Religious hate crime increased by 35% in England and Wales between 2016 and 2017. The actual figure might be higher since the number of race hate crimes over the same period increased by 27%– and many victims of race hate may be targeted for their religious beliefs as well. Christianity is in decline in the UK. Those with no religious belief now make up 48.6% of the British population. Anglicans account for 17.1%, Catholics 8.7%, other Christian denominations 17.2% and non-Christian religions 8.4%. Islam, however, is on the rise, and while the timescale for it to become the world's largest religion is long term, the trend is clear.The decline of religion overall means that some Christians now believe that freedom of religion is under attack.

Assisted dying

In November 2017, the Australian state of Victoria became the nation's first state to legalise assisted dying. Doctor-aided voluntary euthanasia will be allowed for terminally ill patients from mid 2019. The legislation has 68 safeguards, including new criminal offences to protect vulnerable people from abuse and coercion, and a special board to review all cases.In March 2018, India's Supreme Court upheld a landmark verdict that permits the removal of life-support systems for the terminally ill or those in incurable comas. Physician assisted dying is legal in six US states. Canada, Belgium, the Netherlands, Luxembourg and Switzerland also allow physicians to assist in the death of patients. Hawaii and New Zealand are currently exploring legislation. The UK Parliament voted against the right to die in England and Wales in 2015 but the debate continues and there has been a steady number of cases brought to the High Court.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Are some parts of society at higher risk of being economically or socially isolated than in the past? Or is Gwent doing OK? How can Gwent harness innovation to enhance services?
- ✓ What are the opportunities for co-living in Gwent? Commercial, community or affordability?
- ✓ How can technology facilitate Gwent's engagement with citizens? Can communication only be one way? Or can Gwent build online communities that are engaged with purpose?
- ✓ Is Gwent using social media effectively for communication and service delivery? With even HMRC (for example) introducing innovative apps for self assessment, how might social media facilitate service delivery in Gwent?
- ✓ Do people in Gwent want to contribute to society or do they want local government to do everything on their behalf? Does local government have the kind fo relationship with the community that it needs and wants?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
	The impact of 'society' will be:	
limited in the short term, although Gwent should track changes in society to spot emerging opportunities or threats	**challenging** in the mid term as society begins to address a range of difficult and uncomfortable issues and societal norms and expectations change	an **opportunity** in the long term if Gwent anticipates and adapts to changing societal behaviour; but **damaging** if it does not

CYBER SECURITY

State-sponsored cyber attacks are projected to increase

2030

SURVEILLANCE

2018

There are up to 5.9 million CCTV cameras in the UK - the most per head in the world

TERRORISM

The current Islamist phase of terrorism may end by 2031

2031

Violent extremist groups will tend to splinter into narrow factions, with less visibility

2025

RADICALISM

2035

The dark web in the ‘20s will grow from non-criminal users hiding from government

DARK WEB

25% of the Dubai police force will be robots by 2030

2030

POLICING

7. SECURITY

Whether by choice or not, all regions are players in the connected global economy. While this might have been a stable - even a predictable - position for the UK in the late 20th and early 21st century, the transition out of Europe will create a degree of turbulence and distraction that some groups may seek to exploit. Security will remain a highly important aspects of life in the next 25 years. There are two areas of threat that need to be watched particularly closely.

The first is the rise of non-state actors. These may be terrorist groups such as ISIS or criminal gangs that are gaining influence through organised crime; and while such groups may be organised globally, their impact will be felt locally - as the surge in county lines exploitation shows.

The second is the complex nature of the competition between nation states that are vying for political and economic superiority as the world transitions. At present it seems chaotic and hard to read: the refugee crisis is challenging state control in Europe and throwing the frailty of intergovernmental structures into sharp relief; right-wing populism is gaining ground; the role of the United States in international security remains a source of uncertainty and contention; there is no clear political solution in sight to the continuing tensions in eastern Ukraine; Russia's leadership increasingly looks East for politico-economic ties; and North Korea remains an unknown entity. Other disputes in the South and East China Seas are far from resolved.

The internet has opened up a new frontier in the fight for security and this will continue as the technology develops further. Once everything is networked, small groups and individuals working from remote computers or labs can achieve disproportionate effects. Every future conflict will have a cyber element, and some may be fought entirely in cyberspace.

Managing these dynamics will require governments, institutions, the private sector and citizens to work together to build strong national and international relationships that will re-establish trust in governance, build greater social cohesion and improve the accountability of leaders and institutions for global - and, critically, for local - security.

Horizon 1

Cyber (in)security

Increased connectivity has increased the need for cyber security. Once everything is networked, small groups and individuals working remotely can launch covert attacks, stealing (for example) personal information from customer databases, distributing and activating malware or carrying out botnet distributed denial of service (DDoS) attacks. Organisations may come under cyber attack from individuals, criminal groups or hostile nation states. It is now accepted that all future conflicts will have a cyber element and that some may be fought entirely in cyberspace. No surprise then that demand for cyber security skills is expected to surge; but tackling the issue will also require all workers to become cyber aware – and, governments and business to maintain up to date security software. But the public sector is not performing well in cyber security and is - according to a survey of its own senior IT managers - way behind private sector practice.

From IoT to IoS nightmare

There is now a move is towards the Internet of Services (IoS) which leverages the same technology behind IoT devices but with a different business model. Where IoT revolves around selling smart devices, IoS offers a service which comes with a free device. This new paradigm for how consumers interact with technology will pose legislative challenges as well as technical ones. Consumers will need legal protection against companies who harvest data from their devices but fail to secure it. These issues already exist - as Facebook knows - meaning that without the the right rollout, IoS could become a security nightmare.

Home alone…

The international community is increasing its efforts to organise and co-ordinate the international fight against terrorism. Europol, the European Police Office, opened the International Centre for Counter-Terrorism in The Hague in 2015 to improve information exchange and identify the links between terrorism and other criminal sectors. However if Britain goes for a no Brexit deal, the UK and Europe face the possibility of homeland data flows, and police and judicial cooperation, being turned off within hours. This would give free rein to terrorists, traffickers and organised criminals.

Horizon 2

America first?

America's new National Defence Strategy (NDS) makes inter-state competition rather than terrorism the primary concern for US national security. Its aim is to restore America's competitive military advantage to deter China and Russia. The strategy seeks to strengthen US power globally, to avoid loss of cohesion among allies and partners and reduced access to markets "that will contribute to a decline in our prosperity and standard of living". The NDS envisions modernising the "nuclear triad" of US strategic forces, as well as cyber systems and missile defences – treating both space and cyberspace "as war fighting domains." When it comes to conventional forces, the buzzword is "agility" – in operations, deployment, basing and logistics alike. China, at least, appears to see no conflict with continuing trade relations.

Surveillance: safety? Or intrusion?

The surveillance commissioner has warned the public against becoming complacent about encroaching surveillance and urged public bodies to be more transparent about how they are increasingly using smart cameras to monitor people. Others argue that the loss of privacy is the cost of increased personal (and public) safety and that the real issue is to put in place the laws, obligations, rights and procedures required to use the fact of surveillance responsibly and for the right reason

Predictive policing

Predictive policing uses predictive analytics to tie crimes to people or places. The techniques are moving beyond existing approaches such as CCTV-based pattern analysis and surveillance towards algorithms that forecast where crimes are likely to occur and who might commit them; and that then make recommendations for allocating police resources. Responses are granular and directed. Patrols are sent to a specific city block rather than to a whole neighbourhood and crime data are added daily to generate predictions for each shift

The dark web

The dark web is a segment of the internet used as an online black market for illegal trade in illegal goods and services such as drugs, fake passports, child pornography, weapons and software exploits (computer hacking services). The dark web is accessed through specialist software such as the Tor browser which conceals the user's location and dark web use. But other, less nefarious users are beginning to use Tor and the dark web for legitimate purposes in order to benefit from the ability to remain hidden from prying eyes - whether law enforcement, marketers or nosy neighbours. Policing the dark web is challenging.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ What does Gwent need to do to improve cyber security? Is it investing in its own skills? And - as a fairly massive aside - is the Gwent business base up to speed in the cyber security arena?
- ✓ What are the implications for Gwent if it is excluded from international cooperation on terrorism?
- ✓ How can Gwent utilise new technologies such as surveillance and predictive policing to counter crime and keep people safe - while also maintaining civil liberties. Does public debate in these sensitive areas need to be more open and more sophisticated?
- ✓ Is Gwent mentoring local activity on the dark web? Can it link to any policing agencies?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
The impact of 'security' will be:		
challenging in the short term if public service and businesses fail to address security issues	**challenging** in the medium term unless Gwent public services strike the right balance between personal liberty community safety	**damaging** in the long term if public service organisations do not maintain their investment in cyber security

ARTIFICIAL INTELLIGENCE

AI could increase spending power in Welsh households by £2,400 per year, by 2035

2035

CONNECTIVITY

2035

5G will contribute $2 trillion to global GDP, adding 7% to growth

CRYPTO-CURRENCIES

Cryptocurrency ‘mining’ uses 56% more power than the Netherlands

2018

TECHNOLOGY

Global VR content will grow from $250 million to over $40 billion in next 7 years

2025

VIRTUAL REALITY

2035

Most councils and public service providers could be paid using blockchain by 2035

BLOCKCHAIN

One third of all jobs currently needing a degree will be automated

2030

AUTOMATION

8. TECHNOLOGY

Digital connectivity permeates all aspects of daily life, from the way people interact with each other, buy their shopping and organise their social lives, to the economic landscape, political decision-making and the skills they need to get a job. At the same time, increasing digitisation is driving industries from product-based to service-based offerings. While these offerings are highly automated and standardised, they are also personalised through software. The seamless integration of the physical and digital worlds through networked sensors, actuators, embedded hardware and software will change industrial models.

These words - taken from the introduction to the Word Economic Forum's (WEF's) WEF report Deep Shift: Technology Tipping Points and Societal Impact are as relevant today as when they were written in 2015. The report aimed *"to capture some of the deep shifts occurring in society as a result of software and services, and to encourage everyone to think about the impact of these changes on our society and how to prepare for the changes ahead."*

Three years on, it is clear that a number of technologies are converging in a way that is going to change the going to change the nature of work, jobs and wealth creation. Artificial intelligence and robotics in particular will drive significant changes in the jobs market and generate significant productivity gains and economic growth.

Change will create opportunity but it will also change the nature of work. Technologies are going to change jobs rather than destroy them and the key challenge for governments in the future will be will be to build cultural acceptance of that change throughout the economy and then to work with employers and educators to provide the skills of the future.

Nesta, a UK innovation foundation, suggests that seven in ten people in the UK are currently in jobs that are likely to need redesigned. This is a key point; rather than simply replace jobs wholesale (although this is likely to happen to low skill jobs), artificial intelligence, robotics and smart devices will perform the repetitive element of any job, freeing up skilled workers to perform higher value tasks. This means that some jobs requiring high levels of education - doctors, surgeons, lawyers and teachers, for example - will be redesigned. The 2020s will be a decade of redeployment rather than unemployment.

Horizon 1

Adopting blockchain

Blockchain is the technology that has underpinned cryptocurrencies – but its application is much wider than that. Companies in financial services, medicine, energy, media, insurance, shipping and more are looking at ways blockchain can improve efficiency in business processes and create new business opportunities. A November 2017 report, The future of public service identity: blockchain, suggests blockchain has the potential to enable radical public services transformation by giving citizens control over how their information is shared with public services. In this model, citizens access their public service identity via an app on their smartphone, and control what data they share with government to access public services.

Use with care

Drug resistance has becoming a global issue because of inappropriate use of antibiotics in humans and in animals - helping to increase resistance in the bacterial population leading to the rise in superbugs that cannot be treated. This has caused concern that the world is heading to a post-antibiotic era in which common infections will once again kill people across the developed (and less developed) economies. Failure to tackle the problem could lead to 10 million deaths every year globally by 2050. Encouraging responsible prescribing by doctors and informed use by patients is critical.

Horizon 2

Securing a share of the AI pie

A report published by the UK Government in October 2017 suggests that artificial intelligence (AI) could add an additional £630bn to the UK economy by 2035, increasing the annual growth rate of GVA from 2.5 to 3.9%; AI could increase spending power per household in Wales by up to £2,300 a year by 2030. Capturing this requires a programme of action to help 'the broad UK public sector, including Devolved Administrations and the local public sector' to become AI ready and to transform public services through improving the flow of information and analysis, improved decision-making in complex areas, managing new and increasing data resources and improving the efficiency, effectiveness and usability of services for users.

Making the leap

Apple believe augmented reality (AR) to be a more profound technology than virtual reality (VR). A number of big players (including some of the leading players in VR) agree with Apple that the future is more likely to be one where technology augments our interactions with people and our environment rather than one where we retreat to artificial environments. The big game changer for AR will be how users access it. Magic Leap, one the most eagerly watched tech companies in this space launched its AR goggles, Magic Leap One, in December 2017. While there is still a long way to go before the goggles look more like glasses, AR is beginning to look a credible prospect for the future of education, tourism, construction and healthcare.

Following the money

Cryptocurrencies such as Bitcoin provide a secure system for storing and exchanging money on the internet. Cryptocurrencies are not regulated or controlled by any bank, government or centralised financial authority, and offers users a range of advantages over traditional banking (anonymity, secure transactions, low transaction fees and no forgery - to name a few). A number of leading retail websites accept cryptocurrencies and they are now beginning to be accepted in the physical world too. There is even a small but growing network of Bitcoin ATMs in the UK, with 2 in Cardiff. Running counterintuitively (perhaps) to the provenance of cryptocurrencies, the Bank of England is currently investigating the possible introduction of a cryptocurrency linked to sterling.

Connectivity: finding the right space

The UK wants to be a global digital player, but the latest figures show it has lower 4G speeds than countries such as Mexico, Lebanon, Romania, Lithuania and Serbia. Ofcom's 2017 Connected Nations report found that while 97% of the UK's population can receive a 4G signal, actual geographic coverage is much worse - with only 40% of the country by area able to get a signal. Connecting remote or rural environments using existing technology isn't practical or commercially attractive but innovative approaches - such as TV white space technology or leftover wireless spectrum from digital TV switchover - are being used to connect communities in the highlands and islands.

Horizon 3

Jobs lost, jobs gained

AI and robotics are more likely to alter jobs than to eliminate them. Many tasks remain outside the scope of machines to deliver; particularly those demanding manual dexterity and deeper forms of creativity and communication. A more important question is how AI and robotics will alter the substance of the many jobs that remain in place. Seven in ten people in the UK are currently in jobs that are likely to need redesign and workforce retraining. This doesn't mean that one third of these jobs will disappear – but that one third of the constituent activities of most jobs will go. These changes will challenge current educational and workforce training models. Mid-career job training and worker redeployment will be essential

Betting on big data

Additive manufacturing (AM) is the collective name for technologies and process that build 3D objects by adding layers of material. AM is gaining a lot of publicity for high profile projects such as the 3D printed house that can be built in one day at low cost and Arup's collaboration with CLS Architects in Europe. Future developments mean that houses will likely move from concrete to advanced hybrid materials. Designers are experimenting with smaller scale processes and using it it to develop the technique. The next wave of AM is exploring how to combine both structural and functional materials in the manufacturing process to create intelligent systems; and AM is likely to move into new industries such as agrochemicals, pharmaceuticals and electronics. Current research is exploring the use of AM to print human tissue. Siemens is building a 3D printing facility in the West Midlands in 2018 which will develop the technology to print metal parts for the aerospace, automotive and power generation sectors (amongst others).

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Blockchain may start coming in really fast as the new standard. More than just an infrastructure, blockchain is likely to drive an important cultural shift towards citizens owning and being in control of their own data. Trust - as well as processes - will be important. How trusted is local government in Gwent and what are the cultural challenges?
- ✓ What does Gwent need to do to be AI ready? Does it matter?
- ✓ As AR develops in the future, many sectors will want to develop AR content. Is there role for local government to support this?
- ✓ How will cryptocurrencies develop in the future and how many service providers will use them? Are there implications for local taxation as well as local service provision? Could citizens pay council tax in bitcoin in the future?
- ✓ What can Gwent learn form the Scottish Highlands and Islands approach to connecting remote areas?
- ✓ Re-skilling will not be an option in the future and - despite the gloomy predications - there will be opportunities for many of the labour force. But…there needs to be early and visible communication about changing work. Followed up by skill building.
- ✓ How can Gwent use big data to improve services and governance? And, as a first step, can it commit to early investment in the data science skills and capacity it needs to do so?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
The impact of 'technology' will be:		
an **opportunity** in the short term if it can be an early adopter of technology in public services and promote technology in business	**challenging** in the mid term if it fails to adopt technology and fails to address cybersecurity issues in public services	potentially **damaging** in the long term if Gwent does not invest sufficiently in new technologies and practices in service delivery

PEAK EVERYTHING

Viable reserves of some industrial metals may peak by 2030

2030

GLOBAL FOOTPRINT

2018

We need the equivalent of 1.6 planets to provide our resources - three planets for the UK.

WATER

England, Scotland and Wales to be in water deficit of 5-16% of demand by 2050

2050

Renewables expected to provide 51% of global power generation by 2040

2035

ENERGY

2035

UK energy demand expected to fall by 3% by 2025 ; then rise by 3% by 2035

REDUCING DEMAND

Costs (LCOE) of new onshore wind and solar to be less than oil and gas by 2025

2025

COST

9. RESOURCES

It's an old quote - that we only have the one planet. However, globally we are using up the equivalent of 1.6 planets to provide the resources we use, and to absorb our waste. At current rates of population and economic growth, we will be using two planet's worth of resources each year by 2030. In the UK, we use the equivalent of 3 planets.

Of course this is completely unsustainable.

A sustainable resource is one that is not used up faster than it can be replenished. It is one where we can live off the interest rather than the capital.

Unfortunately, many of our most important non-renewable resources are being used far faster than their replenishment rate - and so they are under real pressure. Perhaps the best known is oil. Like all fossil fuels, the beds of oil were laid down millions of years ago - yet within 150 years of the first serious drilling happening, we are now believed to be approaching a 'peak' of supply. While new finds and new technologies help to eke out reserves, the cost of extraction is less and less viable. At the same time, we are also approaching a 'peak' of demand - as new technologies and regulations (to address climate change and air quality) shift consumption from oil to electricity.

As it is with oil, so it is with many other resources and key commodities. Some commentators think that fresh water, fertile topsoil, minerals, uranium, phosphorus and some rare earths are approaching their 'peak'. Some increasingly scarce resources could be replenished, given urgent action - such as fish stocks and fertile topsoil.

The impact on communities and economies cross the world is already felt. However, while some substitution will occur and technologies will be developed to lessen these impacts, new ways to manage declining resources are urgently needed. The situation is likely to get worse over time.

It has been estimated that at least 18 international conflicts have been fought over resources since 1990. Some nations have managed a different strategy. The UK, USA and China, for instance, have each bought bought agricultural land in 30 countries.

With changing climate and warming overall, the pressure on fresh water across the globe continues to grow. Almost 2 billion people rely on glacial meltwater to feed their water supplies - yet almost all major mountain ranges are seeing rapid decrease in glacier coverage. Upward demand from increased population, intensive agriculture and industrial uses have seen groundwater tables dramatically lowered and aquifers drained.

Parts of the UK are now regularly under water stress and new ways to store and distribute water and reduce demand are being planned, and Gwent, may be in a position to supply water to major urban areas.

Globally, energy demand is expected to peak around 2030 and, by 2050, half of energy supply will be from renewables. Already wind and solar have reached price parity with hydrocarbons in many countries. In the UK, 52% of power already comes from low carbon sources (includes nuclear), reducing the Grid's carbon intensity. Increasingly issues of continuous supply are being managed by the rapid improvement in energy storage technologies, with consequential price savings.

However, in the UK, the investment in renewables had dropped for the last two years as subsidies have been withdrawn and support for fossil fuel production continues. It is hard to forecast the levels of financial, regulatory and planning support that will be in place in the future, but the

operational framework will need to be more supportive - even as the economic case becomes less relevant.

The role of traditional utility companies and major generation plants is diminished as smaller, decentralised generation and micro grids become more prevalent. A convergence of technological, economic and environmental forces are pushing micro-grid development forward rapidly. The perceived vulnerability of centralised electrical grids to extreme weather, terrorism and other disruptive events are making micro-grids an attractive option.

Horizon 1

Renewables
The means to generate near-zero carbon energy are already with us - and the technologies are becoming more efficient and cheaper, and the will to install them is growing. Until the various renewable industries mature, they are likely to require some form of public subsidy. However, efficiency improvements and scale is bringing price parity with gas much closer.

Energy - cost and security
As costs for installing renewable energy systems continues to fall (as technology improves), investment is outstripping that for conventional energy plants - across the world. Forecasts show that onshore wind, hydro, geothermal and biomass will deliver cheaper energy than most fossil fuels. Even Saudi Arabia recognises the need to move away form oil as primary source of income - and is selling shares in state-owned Aramco.

In the UK, energy security is becoming a bigger issue. A combination of the closure of old, uneconomic plants; new plant taking longer than expected to come on stream; abrupt changes in government energy policy and frailties in parts of the grid infrastructure will lead to a reduction in capacity.

Horizon 2

Peak everything
Most natural resources are finite and, as demand increases with economic and population growth, there is increasing pressure on what reserves are left. Some fuels and metals are closer to their 'peak' - where the reserves are not economic to recover. In particular, several rare earths are vital to the digital and green economy and alternatives have not yet been found.

As resources become scarce, there will undoubtedly be some substitution but there will also be economic impacts and conflict.

Mud, mud, glorious mud
Half of the worlds fertile topsoil has been lost over the past 150 years, and the quality of much that remains has been degraded. Looking forward, as the world needs to feed 2 billion more people, there is an urgent need to replace the soil structure, nutrients and fertility in many areas.

At the same time the availability of quality land, and soil, for agriculture will be compromised by reduced water availability, less fertile soils and desertification from changes in the climate.

And not a drop to drink
More than half of the world's population will be living in water-stressed areas within 10 years. With changing climate and warming overall, the pressure on fresh water across the globe continues to grow. Parts of the UK are now regularly under water stress and new ways to store and distribute water and reduce demand are being planned. By 2030, 27 of the water zones are forecast to be in supply / demand deficits, and there could be a 10% reduction in water available for public use

Energy distribution

Micro-grids are beginning to transform the energy sector in the industrialised and developing world. Micro-grids can serve as backup power sources to organisations also connected to the grid or can be operated independently, allowing homes or businesses to operate off the grid. Increasingly as power generation becomes more widely distributed, the older centralised grid systems are less efficient.

Combining data analytics and local renewable energy and storage offers the chance to fine tune energy supply and demand. The increasing efficiency and lower cost of battery storage overcomes the issue of intermittent supply. Batteries enable a micro-grid to store energy tapped during sunny or windy times of the day and save it for use during times when those weather conditions don't exist.

Horizon 3

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Public bodies and citizens in Gwent will be affected by changing and volatile energy markets. Making sure that there is enough energy and that it is resilient will be critical.
- ✓ Gwent has huge potential to exploit the rapidly falling costs of renewable energy production and storage to kick-start new energy industries where mining once existed. Once carbon pricing is adopted more widely, the economics of renewables will be transformed.
- ✓ Will Gwent utilise, with others, the predictable power of the Severn - using tidal range, tidal stream, wave and offshore wind power. Bringing these nascent technologies to commercial use represents a major opportunity for business and job creation.
- ✓ Micro-grid and smart grid technologies could offer more sustainable options for managing power within the more remote and valley communities.
- ✓ Given the predicted water shortages by the middle of the century, the geography of Gwent presents some opportunities to create reserves for its own citizens and for export.
- ✓ As a variety of commodities become scarce, and more expensive, industry and public bodies will need to find ways to mitigate their use and adapt to any changes - through substitution, efficiencies and new innovations.
- ✓ How will Gwent's public bodies enable the structural and infrastructural changes; find the investment; and create the planning policies that may be required?

SHORT-TERM	MEDIUM-TERM	LONG-TERM
The impact of 'resources' will be:		
limited in the short term as the major impacts are still to come; and an **opportunity** to capitalise on the natural advantages of Gwent geography for extensive renewable energy production.	**challenging** in the medium term as public services wrestle with how to afford the new infrastructure that may be needed	**damaging** in the long term as resource shortages lead to scarcity and volatile prices

CLIMATE

Average global temperature increase of 4°C by end of the century

2100

BIODIVERSITY

2100

30% of global species to become extinct if temperatures rise by 4°C

FOOD

More intensive grain, horticulture and fruit production; less meat and diary

2050

NATURAL SYSTEMS

More intense rainfall, increased likelihood of heat waves, more wind storms.

2050

EXTREME WEATHER

2100

Sea level rise of 1.46m predicted, submerging the homes of 150 million people.

SEA LEVELS

Wetlands drying out; forests under stress; migration of new pests and diseases into UK

2040

ECO-SYSTEMS

10. NATURAL SYSTEMS

We are faced with a number of human-induced environmental threats which are greater than any that humanity has faced before. Environmental systems are complicated and small changes can create tipping points that accelerate changes.

Given that we have caused these issues, or at least made them considerably worse, it falls to us to find ways to mitigate their effects and to adapt to any changes that arise. However, despite better scientific knowledge of the issues and despite political and commercial commitments to change, the situation continues to decline, and at a faster rate.

The planet's average surface temperature has risen about 2.0 degrees Fahrenheit (1.1 degrees Celsius) since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere. Most of the warming occurred in the past 35 years, with 16 of the 17 warmest years on record occurring since 2001.

Climate change is predicted to exaggerate extremes weather events - forming bigger hurricanes, increasing the intensity of heat waves and droughts, and causing more rainstorms and flooding.

No part of life will be immune. Every industrial sector will be impacted and will have to find ways to respond. Whether it will be about using different materials; drastically reducing energy usage; being more efficient with construction, distribution and production processes; creating different business models; responding to public opinion or dealing with storm and flood damage - every company will have to consider how it will restructure its business. Although some of these issues may be rather more distant, others will require more immediate responses.

There is likely to be business advantage to taking early action, rather than waiting until forced to do so. Costs may well be lower, finance more readily available and there are public opinion benefits to be captured.

The public sector has a key role to play in the understanding of these issues and in developing the technological and system responses that will help to deal with the multiple and linked threats. They will need to be seen supporting change and finding solutions. It follows, therefore, that they will also need to be seen to be walking the walk and demonstrating change through their own actions. Recent fossil fuel divestment protests have caught a few councils napping.

Population pressures, over-fishing, and intensive, industrial agriculture are already leading to massive loss of biodiversity and protected environments across the world. As the loss in rainforest cover and rich savannahs increases, there are consequent threats to water management, carbon sinks and indigenous cultures. There was a 28% loss of species populations globally between 1970 and 2008. Climate change scenarios point to an extinction of over 30% of terrestrial species if average temperature increases reach 4^{o}C, and slightly greater loss for freshwater and marine species.

The UK has a relatively stable species population. However, as habitats come under threat from development, intensive agriculture and warming, some species are vulnerable. Climate change is likely to extend the range of many plant and animal species and so bring 'foreign' species into conflict with indigenous ones - with unpredictable consequences.

Pressure on land will intensify, with competing demands - for agriculture, forestry, industry, mining, housing, recreation and amenity use. At the same time the availability of quality land, and soil, for agriculture will be compromised by reduced water availability, less fertile soils and desertification from changes in the climate.

Horizon 1

Biodiversity - ecosystems

As a result of growing cities, industrialisation, intensive agriculture and climate change, natural habitats are threatened across the world and in the UK. Consequently, some animal and plant species dependent on this habitats are under threat. The natural environment provides us with many of the necessities of life - the resources we consume, dealing with waste and pollution, cultural benefits and natural processes such as pollination. The impact on even economic systems is profound.

Horizon 2

Climate Change - public mood

Given the widespread and challenging consequences of climate change, the public mood is changing. Well over 60% of people across the world feel that climate change is a very serious problem. On the back of these concerns, a number of powerful lobby groups and protest organisations have sprung up, using the power of social media to mobilise action across the world. Polls show that, in the UK, the public are overwhelmingly against fracking and pro renewables. Further afield, protests have concentrated on coal power, tar sands and gas pipelines. As the impacts of climate change are increasingly apparent, citizen action is likely to become entrenched.

Climate Change - economics

Since the Stern Review, it is clear what the economic costs of climate action and inaction will be. One market mechanism that is becoming more common is a carbon tax. Nations and major cities are starting to put a price on carbon as a way to move away from use of fossil fuels. Many large firms are running shadow carbon accounts as they believe that some sort of formal carbon tax will be introduced soon.

Biodiversity - species and habitat loss

The UK has a relatively stable species population. However, as habitats come under threat from development, intensive agriculture and warming, some species are vulnerable. Climate change is likely to extend the range of many plant and animal species and so bring 'foreign' species into conflict with indigenous ones - with unpredictable consequences.

Climate Change - international action

Although the impact of climate change have been understood by the scientific community for decades, it has taken much longer for the political and commercial worlds to catch up. The Paris accord marked the biggest step forward in international action. There is still a gap between the political promises and actual delivery For instance, fossil fuels are still receiving more public subsidy around the world than renewable energy.

Most of the agreements are continuing despite the temporary set back arising from the Trump administration.

Food - we are what we eat

It is an enormous challenge to work out what land will be needed to grow the food to feed 9.5 billion people, by 2050. New, and old, techniques for growing food are being tested and some commentators expect there to be an increase in vertical gardening, in hydroponics, in aquaculture and sustainable farming and a reduction in high input regimes and a significant slowdown in the consumption of meat. As meat production takes approximately 2-3 times more land to 'grow' a Kg of protein than grains, which in turn can take several times more than soya bean and other legumes, changes in western diets are increasingly likely.

Pressure on land will intensify, with competing demands - for agriculture, forestry, industry, mining, housing, recreation and amenity use. At the same time the availability of quality land, and soil, for agriculture will be compromised by reduced water availability, less fertile soils and desertification from changes in the climate.

Horizon 3

Climate Change - a taste of what's to come

All the current data shows that the pace of climate change is accelerating. It may become impossible to hold global average temperature rises to a 1.5°C or 2°C level - with serious consequences. Globally, 2016 was the hottest year on record - and 16 of the hottest years have occurred this century. Ice sheets and glaciers are melting faster than predicted - and the climate risks feedback loops that will accelerate the process.

Climate Change - it's not just about the weather

The impacts of climate change will be complex and varied. Sea-level rise of up to 2 metres by 2100 will threaten coastal communities; changing rainfall patterns will disrupt food production and increase flood risks; and water scarcity will increase. Parts of Africa and southern Europe will become too hot and dry to sustain the population, forcing millions to move north. Natural systems will be disrupted and new pests and diseases will move into warmer regions threatening local species and human health.

Severe, Significant, Relatively minor, Potentially positive

Some strategic issues for Gwent to consider

- ✓ Gwent will be subject to many of the same pressures as a result of climate change as any other part of the UK.
- ✓ Gwent's very low lying coastline on the Severn Estuary (with a very high tidal range) will mean that it is more exposed to sea level rises and storm surges.
- ✓ Higher rainfall is likely to affect the Eastern Brecon Beacons and the Valleys - so catchment management will become increasingly important.
- ✓ As food and energy production, and carbon sequestration, become more important, the potential of the Valleys and uplands to provide these commodities is improved. Significant sites have been identified for solar, wind and hydro power; and better management of upland habitats such as blanket bog, grassland and heath could bring substantial carbon savings.
- ✓ Globally, growing enough nutritious food to feed a rapidly growing population is one of the critical challenges of the coming decades. That challenge will affect the UK, which will need to grow more of its own food and shift production from meat and dairy towards fruit, vegetables and grains.
- ✓ Managing that shift for the farming community and for individual diets will involve most public bodies. Again, the previously used land in many of the mining communities may prove useful as locations for innovative farming methods.

SHORT-TERM	MEDIUM-TERM	LONG-TERM
The impact of 'how we live' will be:		
Limited in the short term as the wider impacts of climate change will not be felt for some time. However, managing coastal and river flooding may be **challenging**	**challenging** in the medium term if Gwent struggles to adapt fast enough to the changing climate and the need to protect important habitats	potentially **damaging** in the long term as global temperature rises trigger major changes to habitats, food production, migration, storm and sea-level rise.

11. GWENT 2018

There are a number of issues that can be drawn from a review of the available evidence and previous analysis undertaken in each of the Gwent Local Authority areas. Whilst some of these issues are broadly consistent across Gwent, others can be specific to one Local Authority or local authorities with more similar characteristics.

It is not feasible, or practical, to detail all the issues identified in the evidence – such as those identified in each of the respective Well-being Assessments – but this summary document outlines some key issues which have a particular relevance to understanding future implications; they provide the overall context. The issues below are presented in no particular order of priority or importance.

- In common with many places elsewhere in the UK, the population of working-age people is falling as a proportion of total population. This fall in working-age population is projected to continue over the next 20 years and beyond, with the pace of decline quickening.
- Associated with this changing demographic profile, the increasing proportion of the population that will be over retirement age is projected to continue. Again, the pace of change is expected to quicken as medical advances continue to support an ageing society. For example, the number of people aged 65+ in Monmouthshire is projected to increase by 61% by 2039. In particular, the proportion of very elderly (aged 85 and over) is projected to increase markedly. However, the improvement in 'healthy life' expectancy is not increasing at the same pace as life expectancy. For example, the number of people with dementia is expected to double by 2035. *Therefore, there are implications in terms of the level of care required of an ageing society and the amount of people who are able to provide sufficient tax resource to publicly provide this care. The current pressure that the social care operates under will only increase.*
- In some areas, such as Torfaen, the overall population is stagnating, or in absolute marginal decline, whilst in other areas in Gwent population growth has been relatively robust. In northern parts of Gwent, there tends to be the out-migration of young people from the area, although house price differences between areas do place constraints on mobility.
- There is evidence of significant polarisation of communities with all of the Gwent local authority areas. The incidences of deprivation are concentrated in certain communities and differences in indicators such as health quality and standard of living are marked between those communities and other more affluent communities. Gwent has some of the most deprived communities in Wales. Broadly, more severe deprivation is found either in city centre locations (Newport), or those post-industrial communities located in the northern parts of local authority areas – most distant from the M4 corridor. The levels of economic inactivity and long-term sickness continue to remain a particular problem in Valley communities. Some communities in the Valleys are classified as some of the most deprived areas in the UK and Europe. Childhood poverty is embedded in many households. *This has implications in terms of increasing levels of social fragmentation and further deterioration in cohesiveness within wider communities.*
- As with much of the UK, whilst employment levels and measures of unemployment have recovered since the recession, there is a concern about the quality of jobs that have been created. There is an increasing policy focus on 'poor economic growth'. Many people are trapped in low-value pay activities (often temporary and/or part-time) and, as a

consequence, it appears that the relationship between (un)employment and poverty has broken down. In-work poverty is at historically high levels. This fits within a wider context of increasing concern across the developed world that the 'trickle down' effect of benefits flowing from economic growth, simply does not function effectively. Economic growth over the past 20-30 years has not been to the benefit of all. Alongside this, the past decade has seen the rise of the 'gig economy' – often associated with poor quality jobs which provide little long-term security. *This breakdown in relationship between work and poverty may require new ways of thinking about what type of economic model suits those most deprived communities and individuals.*

- Following on, the increased financial insecurity of the younger population – set alongside higher costs such as housing – has resulted in evidence across Gwent that very few are making any provision for the longer-term. The savings ratios are at historically low levels in the younger population, and are lower in Gwent than the Welsh average. In places such as Caerphilly, one-third of the adult population have no savings (compared to 25% in Wales as a whole).
- The proportion of population that have higher level qualifications has increased over recent years; in some areas, 35% of the population have NVQ4+ qualifications. However, the growth in number of high quality jobs has not matched this and there are concerns that there are limited suitable employment opportunities for those with higher qualifications. *There is a concern that this situation will only worsen through the impact of factors such as automation.*
- Average wages tend to be lower in Gwent than in other areas of Wales, and particularly against UK averages. Measures of productivity are also lower – there is a 'productivity gap' between Gwent and other parts of the UK. There remains a relatively high proportion of the workforce engaged in the public sector, despite the austerity-led squeeze on the public sector in recent years. There remains an over-dependence on the public sector in some areas, *which potentially results in a future vulnerability if public finances continued to be squeezed.*
- There is a growing incidence of obesity within all Gwent local authority areas, alongside associated illnesses such as Type II diabetes. Adult obesity has grown by a third in the last decade, a faster rate of increase than in Wales as a whole. Of particular concern are the relatively high (and growing) incidences of childhood obesity, with 1-in-4 4-5 year olds classified as obese. Incidences of obesity and associated illnesses are significantly higher in more deprived neighbourhoods. *The inter-generational health problems that this presents will provide much of the context for future health service delivery – the 'ticking time bomb'.*
- In broad terms, all local authority areas within Gwent have experienced declining levels of biodiversity and natural capital. This is despite of the wide extent of protected/conserved areas. This may present future problems – for example, in the decline of pollinators, or the well-being that residents derive from the surrounding environment. In general, there is a relatively low level of forested area in Gwent. Coastal squeeze is an issue for the salt marsh of the Severn estuary and there is history of chemical use in these areas.
- There continues to be an unmet need for affordable housing. In most areas of Gwent there remains a considerable waiting list for affordable/social housing, with many young people continuing to find it difficult to enter the housing ladder. Problems such as insecure employment, poor health etc. means that many cannot raise the necessary mortgage finance. Housing development tends to be concentrated along the M4 corridor, with

developers responding to the stronger demand in that area. There is more limited demand for housing development in the northern parts of Gwent. As a consequence, the housing stock in many areas in the northern part of Gwent is ageing and of a deteriorating standard. For example, 90% of housing in the northern part of Caerphilly 90% of housing is pre-1914 terraced housing. *This may have future implications in terms of issues such as energy efficiency, fuel poverty, health, out-migration, further polarisation of communities etc.*

- Individuals and communities in rural areas tend to spend a higher proportion of their incomes on heating their home, as well as transport costs – just over 40% of rural households spend more than 10% of their income of home heating, compared to just over 22% in urban areas. Gwent – outside of Newport – is a predominantly rural area.
- The relatively lower levels of housing development also extends into a wider private investment agenda, with lower levels of private investment flowing into the northern part of Gwent, affecting factors such as commercial development. Whilst the respective Local Development Plans have spatial policies in place to address this historical imbalance, there is limited evidence that this is positively influencing relative investment flows. In broad terms (recognising the complexity of the area) there is a broad imbalance between the northern parts of Gwent and those communities along the M4 corridor. However, continued demand for development in the M4 corridor brings environmental problems, the area has limited capacity for further development without causing environmental harm. *The future implications are that differences in relative performance (economic, social, health etc.) will continue to diverge, and environmental pressures from development will continue to grow in the southern part of Gwent.*
- Transport connectivity is seen as key in addressing these imbalances both in terms of improvements to the strategic Head of the Valleys road, and connectivity down towards the M4 corridor and the urban areas in SE Wales. Overall, there is an emphasis in each of the Well-Being Assessments for a more integrated, sustainable and accessible transport system. However, it is recognised that there are significant topographical constraints to developing the 'optimal' transport system. *It is not clear whether new and future forms of transport may be able to address these topographical constraints.*
- There has been historical development on land prone to flooding – 12% of Wales's former floodplain and coastal level habitats have been developed on. The risk of flooding differs across Gwent, with fluvial flooding more prone in places like Monmouthshire. Coastal flooding risk is concentrated around Newport, with just over 4% of properties considered having a medium risk to flooding (compared to 2% in Wales).
- In very broad terms, the socioeconomic and demographic make-up of Monmouthshire differs from the rest of Gwent (accepting that it also has pockets of deprivation). It generally has an older and more affluent population, in more rurally dispersed communities. It has higher life expectancy, and with large internationally and nationally designated landscapes. However, many of the same issues (as highlighted above) exist but, for some factors, exist at a different scale, or in a different form, than in some other parts of Gwent.