A 2050 PICTURE OF KENT AND MEDWAY

KENT COUNTY COUNCIL

2018 UPDATE OF THE KENT AND MEDWAY GROWTH AND INFRASTRUCTURE FRAMEWORK

Contents

Texas Airport

01

SCENARIOS

Scenarios are plausible descriptions of how the future may develop, based on an analysis of key trends and driving forces. They are neither predictions nor forecasts, but narratives that explore plausible chains of cause and effect. Scenarios are used to inform a dialogue about possible futures, and to enable the formulation of effective strategies and responses.

La Defence, Paris

1.1 INTRODUCTION TO THE SCENARIOS

In exploring the many influencing forces shaping the future of Kent and Medway to 2050, two critical uncertainties (drivers that are both highly uncertain and highly impactful) were chosen to identify two axes: climate challenges and economic growth.

When crossed against each other, these two axes form a matrix of four quadrants. Each quadrant describes different contexts in which Kent and Medway may exist, to help identify critical decision points and strategic options so that the county's infrastructure is resilient to future challenges.

1.2 KEY ASSUMPTIONS

There are a number of assumptions that we have made in developing the scenarios communicated in this report. These are as follows:

- We have assumed that the population and employment trends reflected in national and KCC statistics are accurate and that housing development will be focused in the key areas named in the GIF.
- We have assumed that the projects in the GIF will have been delivered by 2031.
- Further climate challenges will continue to impact Kent and Medway to 2050.
- Brexit will impact the UK's economy, particularly in respect to patterns of international trade, immigration, demographics and cultural diversity.
- There will be continued growth in population and housing in Kent and Medway.
- An ageing population will continue, bringing about new and diverse needs for a range of elderly people (65-95+), some of whom will require high levels of specialist care and housing, while others will live more active lives.
- Proliferation of electric vehicles (EVs) and plug-in hybrids. No new petrol or diesel cars will be sold in the UK from 2040. Other drivetrain technologies may also exist, such as Hydrogen (H2) fuel cell. Therefore charging infrastructure will be required. Kent will be well-equipped to have people charge at home in low density areas.
- Car dependence in Kent will continue. There will be greater use of autonomous vehicle (AV) technology, both shared and private, as costs fall. There may also be no need to have a licence to drive them. AVs will play a role in social inclusion, by transporting a wider range of people including the elderly, those with visual impairment or children (including those with special needs).
- Greater use of robotics and automation will be seen in both industry and across society (e.g. automated social care etc.).
- Technological advancements in data analytics, artificial intelligence (AI), machine learning, Internet of Things (IoT) and sensor networks – leaving business and society more reliant on technology.
- Changing nature of work and new types of jobs: there will be more roles for people in jobs that require 'empathy' and people skills– e.g. nursing, childcare etc. – and less in single skill roles such as accounting or finance. Intangible or 'soft' skills that are difficult to teach, such as emotional intelligence, curiosity, creativity, adaptability and critical thinking will be highly valued.
- Changing employer attitudes to flexible and remote working will impact life/work behaviours and commuting patterns.
- Some peak spreading in transport could help mitigate congestion, but institutional factors such as school start / finish times will limit the extent.
- Kent's core challenges will largely remain – providing residents with effective access to jobs (jobs within the county and elsewhere), education (particularly the provision of secondary schooling) and affordable healthcare, combatting poverty and social exclusion, and maintaining a high quality local environment.

EVIDENCE BASE

POPULATION GROWTH

Assumption: Continued growth in population in Kent and Medway.

Evidence: In the UK, the population is expected to reach 70mn by 2030 and 77mn by 2050, by which time it will be the most populous country in Europe. This would mainly be a result of immigration and ageing populations. However, the projections do not take into account the political impact of Brexit or of migration as a result of climate events. In Kent and Medway, the population is expected to increase to 2.3mn in 2050, up from 1.8mn in 2015.

AGEING POPULATION

Assumption: An ageing population will lead to a diverse range of elderly people (65-95+), some of which will require high levels of specialist care and housing, and others who will live more active lives.

Evidence: In the UK, the proportion of the population aged 65 and older is projected to increase from 18% in 2015 to 25% by 2045. In addition, 1 in 3 babies born in the UK in 2013 will live to see their 100th birthday. Improved healthcare and lifestyles, especially for those aged 65 years and over, is the main reason for the increase in life expectancy. An ageing population may result in fewer people of working age to support those of pension age, and will also increase pressure on healthcare and housing. In Kent and Medway, the population over 65 is expected to increase 81.5% to reach 622,200 in 2050, up from 342,800 in 2015.

HOUSING CRUNCH

Assumption: There will be increasing pressure on housing availability and house prices, with demand outstripping supply. There will also be pressure to absorb the overflow from London.

Evidence: The number of households in England is predicted to rise by a quarter to 27.5mn by 2037. Around 220,000 new homes a year need to be built until 2031 in order to keep up with expected demand (almost double the current number). Around 55% of these would need to be in London and the surrounding area. This is largely due to a lack of house-building, with a declining number of small house-builders and a shortage of building skills adding to the shortfall. This is also causing home ownership to be out of reach of many people; on average, house prices are now seven times people's incomes. Currently only 1% of all land in the UK is used for housing.

The average house price in Kent during the first quarter of 2017 was £314,668, a 5.7% increase from the same period last year, however this is 14.8% below the average for South East England which was £361,181 during the same quarter. House prices ranged from £469,202 in Sevenoaks to £236,993 in Thanet.

CLIMATE CHANGE

Assumption: Kent and Medway will be impacted by climate challenges to 2050 and beyond. The scenarios explore both severe and limited impacts of climate challenges on the region.

Evidence: The effects of climate change are complex and wide-ranging, but there is an ever-growing body of evidence to suggest that there will be an increase in the frequency and intensity of extreme weather events. Changes in temperature, more intense storm activity and sea level rises may have important implications for infrastructure design, operation and maintenance. It is vital that governments consider how to improve the resilience of cities, infrastructure and public policies. The winter floods in the UK in 2015, for example, were estimated to cost between £3bn and £5bn. The UK Committee on Climate Change warns that climate impacts are likely to result in an increase in the frequency and magnitude of severe flooding events, and that flooding poses the greatest long-term risk to infrastructure performance from climate change. In addition, the number of households at significant risk of flooding will more than double to 1.9mn by 2050, if the global temperature rises by 4°C.

NEW ENERGY SOURCES AND DISTRIBUTION

Assumption: There will be a shift to renewable sources of energy, and a proliferation of electric vehicles (EVs), replacing petrol and diesel vehicles.

Evidence: The government announced in July 2017 that the sale of new petrol and diesel vehicles will be banned in the UK from 2040. New fuel technologies could reduce dependency on fossil fuels, helping to lessen CO2 emissions. To enable the transition to a new energy mix and to achieve the goal of global decarbonisation, storage technologies will be vital. While there are challenges to overcome, investment in new battery and storage technologies is large and growing. This will improve storage capacity and drive down the cost. New storage technologies could enable decentralised energy systems at both the small scale (domestic and business) and large scale (cities). There will be over 6mn new jobs in the renewable sector in Europe by 2050.

A 2013 AECOM study identified Kent as having the potential for wind and biomass technologies. Kent already has a competitive advantage as a location which supports the growth of an offshore wind industry, and has been recognised as one of six Centres for Offshore Renewable Engineering (CORE) in England.

ROBOTICS AND AUTOMATION

Assumptions: There will be greater use of robotics and automation, in both industry and society (e.g. automated social care etc.). This includes greater use of autonomous vehicle technology, both shared and private. With technological advancements in data analytics, artificial intelligence (AI), machine learning, Internet of Things (IoT) and sensor networks, the economy and society will become more reliant on technology.

Evidence: Robotics and automation are playing an increasing role in the operation and maintenance of infrastructure. For example, it is projected that overall sales of drones and robotics in utility power grid inspection will generate US$9.6bn in revenue by 2025. The UK government has pledged to invest an additional £4.7bn by 2020 in robotics and AI. Intelligent robots will be used to inspect and maintain assets such as tunnels and bridges, and are already being used to repair and retrofit ageing water pipes. Crawling robots can test load-bearing cables and the tethers of bridges, elevators and cable cars. Unmanned aerial vehicle technology has advanced rapidly over the past few years. Drones are being trialled for a number of functions including monitoring infrastructure, traffic management and package delivery. Autonomous vehicles and drones will have implications for the movement of people and goods, as well as the design of infrastructure.

Organisations such as the Kent Police are already utilising drones for capturing footage at crime scenes and serious road accidents.

ADVANCED MATERIALS AND CONSTRUCTION

Assumption: Greater use of 3D printing in industry and beyond (e.g. medical science etc.). Use of new materials and construction techniques including more modular and off-site building.

Evidence: Advances in technology will lead to new materials that are lighter, stronger, smarter and greener. These advanced materials could have numerous applications and support completely new structures. Nanomaterials have been shown to demonstrate a huge range of useful properties including self-lubrication, creep resistance and self-organisation. Bio-based materials could enable more sustainable solutions with new properties and enhanced performance, and it is estimated that the market for bio-based materials will grow 300% over the next four years. Self-healing materials may lead to lower maintenance costs by extending the lifetime of structures and decreasing the need for repair. The 'Build 4' Sustainable Construction Demo Centre in Dover was launched in 2011, and is a space which showcases construction eco-materials, and encourages manufacturers and innovators of eco-materials to use the space for specialist training in the use of different materials.

EMPLOYMENT

Assumptions: The nature of work will change and there will be new types of jobs. There will be job losses in sectors such as logistics, due to AVs and other technologies, and major job losses in both skilled and unskilled jobs due to automation. This may be partly offset by new opportunities created by technology. There will be more roles for humans in jobs that require 'empathy' and people skills – e.g. nursing, childcare workers etc. – and less in single skill roles such as accounting or finance. Intangible skills that are tough to teach, such as emotional intelligence, curiosity, creativity, adaptability, resilience and critical thinking will be most highly valued. There will be changing employer attitudes to flexible and remote working, impacting on life/work balance and commuting patterns.

Evidence: The UK employment rate rose to 74.9% in 2017, the highest since comparable records began in 1971. However, while employment rates in the UK have been trending upwards, people are experiencing declining living standards as real pay falls. In addition, millions of people remain in low paid, insecure work. The rise of the gig economy (characterised by short-term contracts or freelance work as opposed to permanent jobs) means less job security, making it difficult to save and move up the economic ladder. Over the longer term, advances in technology and artificial intelligence could lead to a completely new employment landscape, with many of the jobs we do today subject to automation. Up to 30% of existing UK jobs are susceptible to automation by the early 2030s, but new types of jobs will be created.

1.3 BASELINE METRICS

The metrics set out in the table below provide an indication of a baseline we can expect in 2050. These have been calculated by extrapolating Kent County Council's projections for 2031, using the following assumptions:

- Households will rise at a similar rate as population (taken from the Kent 2050 population forecasts), with an adjustment made for declining average household size (trends taken from DCLG 2014-based household projections).

- Employment will rise at a similar rate as population, with no adjustment for changes in participation rates or the balance of commuting (instead, variant adjustments for these are made in each of the scenarios).

METRIC	2031	2050	2031-2050 INCREASE	2031-2050 INCREASE (%)
Population	2,127,000	2,347,000	220,000	10%
Households	922,000	1,061,000	139,000	15%
Jobs	976,000	1,075,000	99,000	10%

It should be noted that these baseline metrics are illustrative only and not based on detailed forecasting. They should therefore not be relied upon.

1.4 BASELINE INFRASTRUCTURE REQUIREMENTS

The table below outlines the infrastructure that may be required between 2031 and 2050 in order to meet the requirements of the key baseline assumptions set out in Section 1.2. Each scenario contains a similar table that outlines the additional infrastructure, above and beyond the baseline, that is required as part of that scenario.

INFRASTRUCTURE GROUP	INFRASTRUCTURE TYPE	SPECIFIC INFRASTRUCTURE REQUIRED
Housing and Employment	Housing	• Housing required to meet metrics. • Increased demand for specialist housing for older people – range of models including downsized properties, intermediate care, nursing care and specialist care (e.g. dementia). • Housing stock able to meet requirements for remote working (space, connectivity).
	Workplace	• Employment floorspace to meet metrics.
Transport	Transport (Motorways, Highways, Rail, Active Travel/Public Transport)	• Charging points for electric vehicles, alongside domestic charging, battery swapping stations. • Specific infrastructure for autonomous vehicles, depending on the specific technology and ownership model – could include drop off and set-down areas, reallocation of parking spaces for other means, stabling depots, maintenance depots and control centres. • AVs will use roadspace more efficiently (less signage, narrower lanes and the ability to travel in closer proximity to other AVs with increased safety). • Possible additional demand for travel by car may put more pressure on roadspace – congestion charging, differential pricing etc. may be needed to manage this.
Utilities and Natural Environment	Energy	• Increased electricity demand due to greater use of EVs and other technological advancements (see scenarios for infrastructure), though partly offset by demand management, improved energy efficiency and advances in materials.
	Water and Waste Water	• Increased demand on sources, networks and treatment due to population increase – likely to require new/upgraded: extraction points; storage (e.g. reservoirs); water and wastewater networks; and treatment plants. • Demand partly offset by continued demand management and reduction in waste (reducing leaks etc.) through technological and scientific advancement (e.g. new materials).
	Information and Communications	• Increased demand from IoT, remote working and remote service provision (e.g. telemedicine and remote care) may require additional data centres, masts, cables etc. 5G and 6G provision, especially to more rural areas will be a challenge.

Health and Social Care	Health (Local, Acute, Mental Health Services)	• Increased demand due to population growth and in particular the increase in the older population, set against more people living longer, healthier lives in later life. • Non-specialist provision less centralised in large hospitals and instead provided closer to communities through; prevention and self-treatment, home care/remote care and telemedicine, within GP surgeries, and in multi-service centres.
	Adult Social Care	• Increased demand – range of models including downsize properties, intermediate care, nursing care and specialist care (e.g. dementia).

1.5 FUNDING, FINANCE AND GOVERNANCE CONSIDERATIONS

Depending on Kent and Medway's economic growth trajectory, plus that of London (being an extremely significant employment base within access to many residents of Kent and Medway), and the impacts of the factors highlighted in Section 1.2, the area will face new infrastructure demands and challenges over the long-term to 2050. As well as creating demands for new types of infrastructure, there will likely be an appetite for different forms of governance, and for new models of funding and financing.

Some scenarios, for example, may be more likely to support devolution (and consequently more local funding and finance). Other scenarios may attract greater private sector investment.

In general, Kent and Medway could expect the following trends in a future of positive economic growth or relatively modest climate challenges:

- Greater fiscal autonomy allowing local authorities greater discretion over how much and where to invest.
- More investment in infrastructure from institutional investors.
- Central Government offering more local control for creative and innovative funding and finance mechanisms. This is likely to include more opportunity for development gain, land value capture, and tax increment finance (TIF).
- Economic stability leading to a longer-term approach to investment on behalf of local authorities.
- A higher proportion of foreign direct investment (FDI) from outside the EU (compared to the current proportion).

In scenarios with slower economic growth or higher impacts from climate challenges, Kent and Medway could expect:

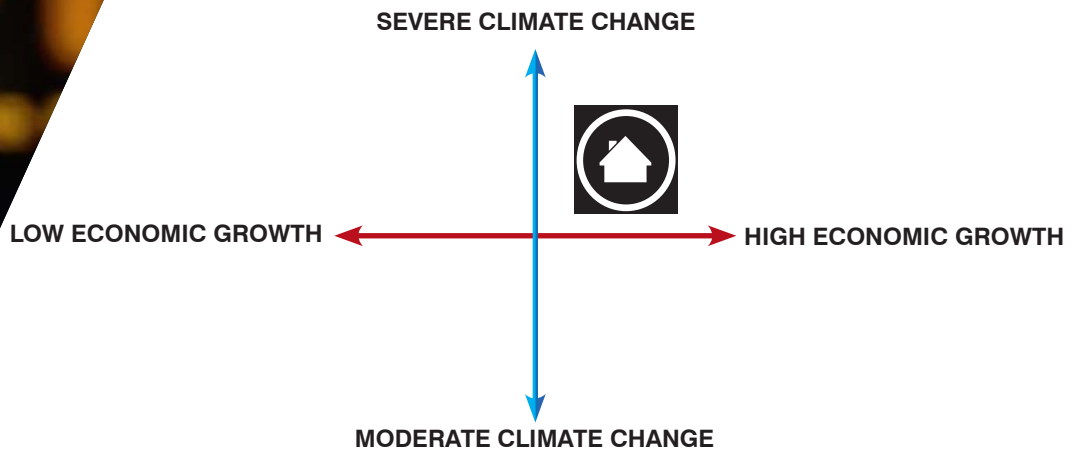
- More borrowing from central government and more dependence on bidding for grants from Whitehall departments.
- More Central Government control, in line with more reliance on specific grant programmes.
- Increased competition between investments for climate change adaptation and mitigation above and beyond business as usual investments.
- At the Local Government level, rationalising estates and selling off assets.
- Greater collaboration with other public bodies for shared services and co-investment.
- Shorter-term approach to investment, i.e. "putting out fires."
- Slower growth in foreign direct investment, potentially with more FDI being spread across the EU.

More detail is provided in each scenario to discuss the likely impacts of economic growth and climate challenges on funding, finance and governance of infrastructure in Kent and Medway.

02

SCENARIO A: HOT HOUSE

HIGH ECONOMIC GROWTH, SEVERE CLIMATE CHANGE



This scenario is characterised by strong economic growth coupled with severe climate challenges. Due to extreme levels of economic, environmental and political migration and coupled with the UK's buoyant economy as a pull factor, Kent receives a relatively high amount of immigration. There has been an increase in employment opportunities in London as well as in Kent and Medway due to a strong local economy, fuelled by increased entrepreneurial activity and business births. This has increased commuting both from within and without the area.

2.1 STEEP ANALYSIS

SOCIAL

- Kent is at the frontline for movement of people and goods by land and sea into the UK. Immigrants settle in both the immediate 'gateways' (e.g. Dover, Folkestone) and across the wider County.

- Increased migration has had the impact of slightly lowering the average age across the county, as well as slightly increasing the average household size (evidence suggests that immigrants are more likely to live in shared accommodation, or in extended familial households).

- Inequality has reduced, particularly the 'wealth gap' between the most and least wealthy in society across Kent and Medway. However, there is a growing distinction in housing equality – particularly between those who live in newer housing (which include environmental resilience measures) and those living in older, or less suitable housing.

- Whilst the population is ageing, healthier lifestyles and advances in medicine mean that more older people are

able to live relatively comfortable lives in their retirement. Also, pension provision is adequate for many people of pensionable age on account of the strong economy.

- Food is more expensive due to increased reliance on imports as well as increased regulation intended to manage the environmental impact of agriculture. Higher wages means that this increase is not as large in real terms.

TECHNOLOGICAL

- AI and machine learning have been embraced (above and beyond the baseline trends), creating new and high value jobs in sectors including nanotechnology, advanced biochemistry/pharmacology, and smart logistics. This replaces jobs lost in freight and logistics, and other industries due to automated vehicles.

- Robotics and automation are advanced, providing efficiencies in infrastructure operation and maintenance. Increased automation has led to more high value jobs that generate economic growth.

- Advanced, resilient materials and new construction methods are required to withstand the worst of the climate impacts, such as flooding.

ECONOMIC

- A buoyant commercial sector has led to an increase in the number of high quality local jobs in knowledge intensive business services (KIBS), now attracting skilled labour from other parts of the country and internationally.

- An enhanced culture of entrepreneurialism has led to a boom in the number of Small to Medium Enterprises being established locally, thereby creating jobs.

- Post-Brexit, customs/border controls have provided economic opportunities for freight forwarding, handling, processing, bonded warehousing, refrigeration, parking, asylum processing etc. This has provided new entry level jobs.

ENVIRONMENTAL

- Climate impacts have led to a number of environmental stresses, including sea level rise which is threatening coastal settlements and infrastructure.

- Accessible blue and green infrastructure has a dual purpose in providing residents and visitors with a pleasant environment for recreation and leisure, whilst also acting as mitigation measures against flooding, heat waves and drought.

- Green and blue infrastructure in towns help combat the urban heat island effect, lowering temperatures during periods of high heat.

- A move towards EVs has reduced air pollution, creating healthier and quieter urban environments.

- Severe climate challenges across the county, country and world have crystallised the importance of low carbon energy and clean technologies.

- The circular economy has been fully embraced, leading to a significant reduction in waste and resource use.

- Climate challenges have impacted on Kent's biodiversity, including the loss of some species and the welcoming of others. The agricultural sector has been negatively impacted due to shifting weather patterns, including more frequent, unseasonal weather (late frosts, early cold spells, volatile rain patterns etc.).

- New forms of precision agriculture using resilient, highly controlled and specialised environments are emergent.

POLITICAL

- A strong economy has helped bring about a more stable national and local political situation, with more decisions made with agreement across the political spectrum. A more equitable distribution of resources and wealth remains an important political topic.

- Moves towards regional and local devolution, with more decisions made at the South East, County and district levels – particularly in relation to infrastructure spending.

- Measures have been taken to improve the resilience of Kent and Medway to environmental and socio-economic shocks and stresses, including extreme weather events and cyber-attack.

- Local decision makers have successfully worked with regulators, asset managers and operators, developers, utilities companies and transport planners and operators to improve resiliency in the face of a wide range of shocks and stresses. Through this sustained multi-stakeholder engagement and cooperation, the county has shown that it is able to absorb, recover and adapt.

2.2 METRICS

The metrics set out in the table provide possible population, household and jobs figures for this scenario. (Please note, they should not be relied on).

METRIC	2031	SCENARIO A 2050	2031-2050 INCREASE	DIFFERENCE FROM BASELINE INCREASE
Population	2,113,000	2,355,000	242,000	10%
Households	940,000	1,090,000	150,000	8%
Jobs	970,000	1,079,000	109,000	10%

2.3 INFRASTRUCTURE REQUIREMENTS

The table below outlines the infrastructure that may be required as part of this scenario, above and beyond the baseline infrastructure to 2050 set out in Section 1.4.

INFRASTRUCTURE GROUP	INFRASTRUCTURE TYPE	SPECIFIC INFRASTRUCTURE REQUIRED
Housing and Employment	Housing	• High quality new green towns and villages and urban extensions, well serviced and with access to amenity and jobs. • Existing housing requires retrofitting to reduce housing inequality. • Policies to re-train and find new opportunities for those placed out of work through automation, particularly in the logistics industry.
	Workplace	• Brexit-related employment floorspace, close to 'gateways' (e.g. Dover, Folkestone). • New office space to support the knowledge economy – particularly smaller / flexible units suitable for small and growing businesses.
Transport	Transport (Motorways, Highways, Rail, Active Travel/Public Transport)	• Lower cost of AVs and economic growth leads to more congestion at key nodes, which could be mitigated by new technology and network management systems, and a move to shared AV use. • Infrastructure to support 'smart' transport modes and better choices – linking different modes of transport and creating choices that favour sustainable decision-making (journey planners, contactless payments, combined ticketing, cycle racks, safe and high quality public realm/pedestrian walkways), specific infrastructure for autonomous vehicles such as pick up/drop off points. • Dedicated induction charging points and lanes allowing road users to trickle charge on the move. • Focus on journey time savings – relationship with economic productivity. Stronger economy = time gains become less marginal. • Focus on customer experience – ability to 'work on the go', reduction in concentration/skill required (automated/semi-automated vehicles). • Upgrades/extensions to High Speed 1 and Crossrail made possible by robust economic growth. • Transport links to other parts of the country including an additional Thames Crossing. Improved links to South Coast e.g. Southampton, Portsmouth and Gatwick. • Parking is re-allocated on account of the rise in use of autonomous vehicles, opening up opportunities for green and blue infrastructure. • Permanent solution to Operation Stack through the use of multi-functional infrastructure • Enhanced customs and immigration infrastructure at transport gateways from the continent e.g. Dover, Folkestone and Ramsgate.

Utilities and Natural Environment	Energy	• Diverse sources of energy and low-carbon approach to wider infrastructure – nuclear, tidal, off-shore wind and solar. • Development of a tidal barrage in the Thames estuary, linked with enhanced flood protection for London (see flood defence). • Increase in localised sources of energy improves resilience - local generators, domestic generation (solar PV, geothermal, biofuels etc.). • Stronger systemic links with the circular economy – e.g. energy from waste, composting etc. • Growth in EVs increases demand for electricity. • Increased demand for heating and cooling, as a result of a changing climate– increasing energy demand, although partially offset by building regulations that optimise efficiency.
	Water and Waste Water	• Upgraded/new extraction and storage (e.g. reservoirs) required to prevent disruptions in water supply as a result of more extreme droughts and dry spells.
	Flood Defence	• Dual purpose, multi-functional infrastructure such as sunken recreation grounds that can be intentionally flooded. • Flood defences to mitigate for the impacts of climate change (e.g. sea level rise, storm surges) are expensive, so these are placed strategically in order to safeguard certain coastal towns and communities of particular socio-cultural and economic value. • Infrastructure in Thames Estuary to protect London from flooding (e.g. see options considered in Thames 2100). • Focus on sustainable drainage measures.
	Information and Communication	• Increased demand to serve economic growth.
	Natural Infrastructure	• Use of green and blue infrastructure to provide high quality environments for residents and workers. • Multiple benefits of green infrastructure in relation to climate change mitigation as carbon sinks, noise and pollution mitigation and more liveable communities (tree planting, allotments, multi-functional/interactive spaces etc.). • Carbon sequestration/carbon capture and storage infrastructure – both natural (tree planting) and climate engineered.
	Minerals and Waste	• Waste infrastructure provision more localised and more flexible – household-and community-level mechanisms to enable behaviour change (recycling, composting, education on re-use, re-use community networks, self-emptying public bins (Envac) etc.
Health and Social Care	Adult Social Care	• New technologies used in healthcare and social care (use of mobile technology to measure different attributes through photography/vibration, 'smart' drug delivery mechanisms, support networks through digital technology, robotic/AI care, telemedicine) – in order to improve the standard of care received and ensure that older people can live independently for longer.
Education	Early Years and Schools (primary and secondary)	• Upgrades to existing schools to ensure they are able to meet requirements of immigrant populations – both physical capacity and technological (e.g. tele-learning in order to teach partly in native tongues etc.).
	Further Education, Higher Education and Lifelong Learning	• Investment in training and lifelong learning and re-skilling opportunities to support entrepreneurial activity and provide a mixed, high-skilled workforce.

2.4 FUNDING, FINANCE AND GOVERNANCE CONSIDERATIONS

Severe climate challenges coupled with high economic growth could lead to infrastructure systems being placed under extreme pressure. Whilst new technology will likely lead to more efficient use of existing networks, increased housing and commercial development could put more pressure on transport and utilities infrastructure. And, if London's growth continues to spill over in addition to local growth, particular pressure on housing and schools could arise. A key challenge will be with the co-demands for infrastructure to allow for economic growth and adaptation to climate challenges.

In particular, the following trends could arise:

- Competing priorities for infrastructure funding, putting more demand on Local Government to attract Central Government funding, raise local tax revenue and to attract private investment.
- Pension funds and infrastructure funds may be more attracted to the infrastructure market, but may require government guarantees to mitigate the risks of climate impacts from some investments.
- Overall, there is an increased risk meeting local authority prudential borrowing limits, which could increase the requirement for private funding and finance (though tax increment financing and municipal bonds cannot be used to increase borrowing limits).
- More opportunity to develop Land Value Capture mechanisms, including development gain from property developers, business rates retention, and tax increment financing (TIF).
- Increased likelihood of bringing in more sophisticated forms of user charging to bring in sources of funding and to help the network better cope with the high level of infrastructure demands. Road user charging (personal and/or freight) is a particularly likely example.
- Increasing pressures on the Housing Revenue Account (HRA) for housing development.
- Revolving infrastructure funds (an infrastructure fund in which all funding that it releases should be repaid to it) might provide a particularly valuable funding source for Kent and Medway, especially for infrastructure which generates income streams.
- Public-Private infrastructure funding facilities (such as Public Private Partnerships, or PPPs, which bundle investment and service provision in a single long-term contract) and establishing development corporations (organisations set up by government to support development of an area) will become attractive vehicles for managing the high volume and cost of infrastructure investment required. Particular focus may need to be given to assets which require climate challenge mitigation or energy efficiency elements.

Ebbsfleet Garden City

CASE STUDY: MULTI-FUNCTIONAL INFRASTRUCTURE

Combined Storm Water and Leisure Urban Park
Rotterdam, Netherlands

Benthemplein Water Square, Rotterdam, is the city's first park designed to accommodate groundwater in the event of flash flooding or prolonged rainfall. Capable of retaining 1,700 cubic meters of rainwater, this innovative city park combines urban landscaping and public leisure facilities as part of a city-wide climate change resilience scheme. Although predominantly a dry space, the square incorporates two shallow and one deep basin that can fill with excess surface water, relieving sewerage systems and helping to prevent flooding.

Image: C40 Cities

CASE STUDY: LOCALISED SOURCES OF ENERGY

Solar Blinds Home Energy Generation System
Redwood City, CA

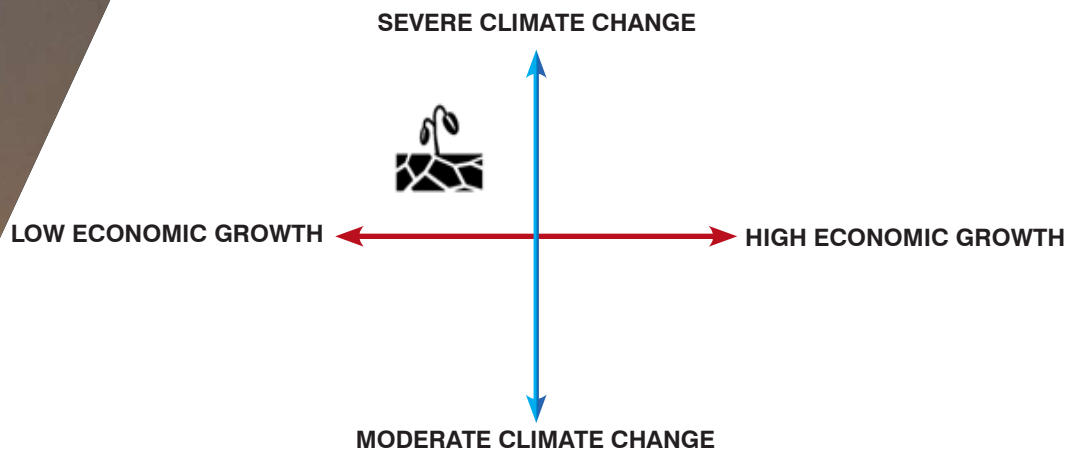
SolarGaps – a combination of motorised blinds and solar photovoltaic (PVs) – brings solar energy to homes where roof mounted panels aren't practical. The blinds automatically follow the sun to generate power and provide shade. The solar PV design fits on top of conventional windows and can generate up to 100w per square metre, or 50w if mounted on the inside of the window. An accompanying smartphone app allows users to monitor and control the blinds. The energy generated can be used to power domestic appliances.

Image: SolarGaps

03

SCENARIO B: WITHERING GROWTH

LOWER ECONOMIC GROWTH, SEVERE CLIMATE CHANGE



This scenario is characterised by weaker economic growth and severe climate challenges. While immigration has increased, much of this is transient. This places pressure on the rental market as well as healthcare and schooling. Low economic growth has resulted in many falling below the poverty line, and has increased the wealth gap within Kent and Medway. Climate challenges have resulted in an increased frequency and magnitude of extreme weather events including heat waves, droughts and flash floods from surface water.

3.1 STEEP ANALYSIS

SOCIAL

- Poor economic performance means there is more competition for fewer jobs. Residents in Kent and Medway take any jobs that are available, sometimes involving long commutes across the County and into London. Some of these journeys are made by coach, as rail and travel by car is expensive.

- Immigration from regions impacted by severe climate challenges has resulted in a growing population. Some of these are undocumented climate refugees that have arrived by sea via mainland Europe.

- Many more migrants move through Kent and Medway to other parts of the UK in search of employment opportunities, and spend a limited amount of time in the county. This has led to a more transient population and housing market.

- There is an increased frequency and length of brownouts (reduction or restriction on the availability of elec-

tricity) and, in extreme cases, blackouts. Processes put in place to manage demand, e.g. automatic shut-off of non-essential appliances during brownouts, in order to protect essential energy uses.

- Housing construction is moving towards off-site and modular manufacturing to save costs.

- The changing climate has led to new diseases being introduced into the UK. The elderly and children are vulnerable to extreme heat.

- The impacts of climate challenges have been felt disproportionately, with coastal communities and less wealthy residents most impacted.

TECHNOLOGICAL

- While automation has created some efficiencies, it has also resulted in a loss of jobs. Many living in the county do not have the skills to transition to new roles in the digital and knowledge economy.

- The reduced cost of domestic solar electricity generation and water heating solutions results in mass roll-out.

ECONOMIC

- Wage stagnation is present both within Kent and Medway and across the country, coupled with an increase in part-time, less secure employment.

- Weakened economic identity of the county, as the economic base is further eroded through weak growth and decline in traditional sectors such as agriculture.

- Climate challenges have a major impact on agricultural inputs (including amount of pesticides and fertilisers required) and yields, making some forms of agriculture unviable in the county. Opportunities in other forms of agriculture are slow to replace the deficit.

- Domestic tourism experiences unforeseen growth as the cost of foreign holidays and short breaks increases relative to disposable income.

- The decreased proportion of relatively wealthy residents reduces overall contributions to the local economy (reflecting reduced spending power etc.).

- Emphasis on multi-functional, shared infrastructure (e.g. Operation Stack, healthcare provision within existing facilities such as community halls) – in order to economise in the face of reduced funds available. Greater cooperation between Local Government and utility companies exploit synergies that optimise new assets (e.g. broadband, energy and drainage corridors).

- Greater use of freight consolidation and movement of freight by rail and water (particularly by using the Thames to access London markets), to reduce road congestion and maintenance.

ENVIRONMENTAL

- Vulnerability of some locations in the face of increased extreme weather and rising sea levels, coupled with the increased cost of protection, has led to some 'managed decline'.

- There is increased risk of storm surges, impacting coastal communities and tourist destinations.

- Existing blue and green infrastructure is maintained, however lack of funding and investment means that very few new schemes are funded.

- The transient housing market and the increase in rented accommodation as opposed to owner-occupied accommodation has resulted in fewer existing properties being successfully retrofitted to improve their environmental impact and resilience.

POLITICAL

- Some climate change adaptation policies are put into effect, but the lack of funding makes implementation largely ineffective.

- Tax increases, particularly through local taxation, is required to pay for infrastructure requirements etc.

- Fewer centrally-available resources and capacity leads to increased devolution to areas increasingly expected to 'find their own solutions'.

3.2 METRICS

The metrics set out in the table provide possible population, household and jobs figures for this scenario. (Please note, they should not be relied on).

METRIC	2031	SCENARIO B 2050	2031-2050 INCREASE	DIFFERENCE FROM BASELINE INCREASE
Population	2,113,000	2,337,000	224,000	2%
Households	940,000	1,072,000	132,000	-5%
Jobs	970,000	1,054,000	84,000	-15%

3.3 INFRASTRUCTURE REQUIREMENTS

The table below outlines the infrastructure that may be required as part of this scenario, above and beyond the baseline infrastructure to 2050 set out in Section 1.4.

INFRASTRUCTURE GROUP	INFRASTRUCTURE TYPE	SPECIFIC INFRASTRUCTURE REQUIRED
Housing and Employment	Housing	• Modular homes and off-site construction. • 3D printed componentry.
Transport	Transport (Motorways, Highways, Rail, Active Travel/Public Transport)	• Limited highways upgrades to support increased off-site operations and modular manufacturing, alongside demand management measures such as freight consolidation. • Lower central funding pushes authorities towards funding mechanisms that target users/beneficiaries of the infrastructure, rise of 'pay as you go' mobility services.
Utilities and Natural Environment	Energy	• 'Smart' energy technologies to encourage sustainable use and therefore bring demand down (in-home meters, smart appliances, flexible power systems that allow businesses to store power and shift usage to less busy times of day, battery storage). • Centralised energy storage infrastructure. • Continued reliance on overseas energy (and therefore importance of gateways for this e.g. Project Nemo, Grain LNG terminal – though use of gas for power generation still expected to decrease). • However, some diversification of energy supply to try to increase resilience and counteract risk of brownouts – in particular Energy from Waste facilities which do not require inputs from overseas. • Growth in domestic solar electricity generation and water heating, made possible by reducing costs.
	Flood Defence	• Strategic flood defences mean that there is some 'retreat' from some areas of the county where it is not possible to protect against flood risk and storm surges.
	Natural Infrastructure	• Focus on improvements to current green and blue infrastructure provision, as opposed to expanding provision – particularly in efforts to increase multi-functionality.

Health and Social Care	Health (Primary, Acute and Mental Health Services)	• Increased use of 'top up' services above and beyond more basic levels of care – e.g. users pay extra to see a specialist or more local doctor. Non-UK naturalised residents pay at market rate for their healthcare at the point of use.
Education	Early Years and Schools (Primary and Secondary)	• Increased use of community 'hubs' that cover a range of functions such as childcare, primary healthcare, youth and adult social provision, library facilities etc. Shared and flexible spaces reduce land take needed for infrastructure and provide greater ease of access for residents. • Widening the role of current infrastructure, e.g. encouraging/safeguarding recreational use of school sports facilities.
	Further Education, Higher Education and Lifelong Learning	• Rationalised centres of further education to reduce costs – some students are therefore required to travel further.

3.4 FUNDING, FINANCE AND GOVERNANCE CONSIDERATIONS

Severe climate challenges coupled with low economic growth would mean that the focus of infrastructure investment is on climate change mitigation and adaptation measures, and making best use of the available infrastructure networks rather than investing in new infrastructure. This may mean more investment in retrofitting homes and businesses, investing in flood risk projects and increased pressures on either local renewable energy production or purchasing energy from overseas.

Due to a lack of local public funding and negative economic activity, citizens and businesses may be required to pay for services as they use them, though ability to pay could be a challenge. This could be used as a way of managing demand (especially at peak times), and generates additional revenue that can be used to offset costs. Road user charging is an example of this approach. Less healthy Local Government finances may mean that Central Government will need to step in to provide grant funding, which would likely come with more central control over investment prioritisation and programmes. However, Central Government is also likely to feel pressure on its budgets in this scenario, so although the share may increase, the overall amount may reduce.

Additional impacts include increased demand for education, skills and training facilities from local residents seeking employment locally or further afield.

The Withering Growth scenario is likely to see the following:

- Less demand for non-climate adaptation related infrastructure overall.
- Lower levels of private sector funding may fuel demand for public funding programmes, specifically those supporting climate change mitigation and adaptation.
- Increased budgetary pressure to implement pay-as-you-go services, with implications for those with less ability to pay.
- Slower growth and climate risk may impact on future local authority credit ratings (should Kent and Medway choose to become rated before 2050) and ability to borrow or attract private investment.
- Low growth may impact ability to capture land value uplift or developer contributions, of which the focus would be on climate-related or green and blue infrastructure.
- Mechanisms like bonds or revolving infrastructure funds would likely need to include broader areas in the South East and/or London to mitigate risk and attract investors.
- Pressure to find cross-functionality of infrastructure to meet multiple needs with one piece of infrastructure, such as parks that double as fluvial run-off areas or schools which also provide community and health services.
- Less traditional funding availability leads to more local, low cost grass-roots led solutions, and a growth in sources such as crowdfunding.
- Pressure for more user-charging to manage existing networks more efficiently and to generate revenue. This is less politically acceptable because of lower ability to pay.

CASE STUDY: AFFORDABLE HOUSING CONSTRUCTION

No-Frills Affordable Housing Project
London, UK

The Naked House initiative, supported by the Mayor of London, aims to tackle the city's lack of affordable housing by reducing the cost of designing, building and buying a home. By selling a basic house 'shell' without internal walls, floors or fittings, this project aims to provide affordable housing, encouraging owners to fit out and expand each home to meet their needs. If successful, the idea could be replicated not just across London, but in any city with a shortage of affordable housing.

Image: Naked House

CASE STUDY: RENEWABLE ENERGY STORAGE

Solar and Wind Energy Storage Project
North Queensland, Australia

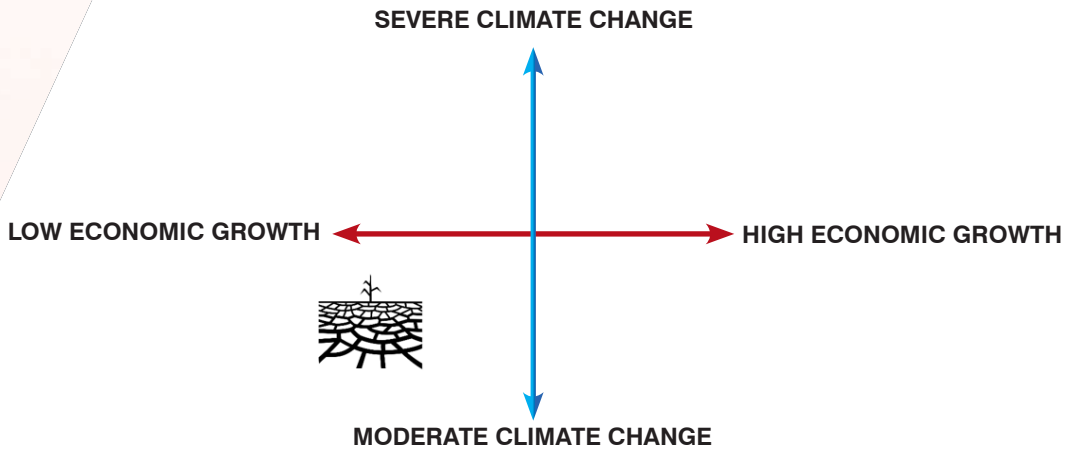
Tesla's commercial lithium-ion batteries, called Powerpacks, will soon be installed at a renewable energy farm in Australia. Once completed, the Kennedy Energy Park is planning to combine solar and wind energy to generate enough electricity to power 35,000 average Australian homes. As solar and wind need specific circumstances to generate energy, it is important to be able to store the energy generated at peak hours to supply the grid at non-peak times. The aim is to create sustainable energy solutions that lower the cost of energy.

Image: Tesla, PowerPack

04

SCENARIO C: LYING FALLOW

LOWER ECONOMIC GROWTH, MODERATE CLIMATE CHANGE



This scenario is characterised by lower economic growth, and moderate (less severe) climate challenges. Poor economic performance combined with technological advancement has led to fewer jobs. There is also limited funding for infrastructure, creating further congestion and poor service provision. This combination of hardships leads to social unrest, heated public opinion and heightened political activism.

4.1 STEEP ANALYSIS

SOCIAL

- Automation and AI impacts not only blue collar but also white collar work – impacting a larger swathe of the population.

- Lower growth in other economic sectors coupled with the availability of cheap, accessible land and country-side or coastal location has led to an increase in purpose-built homes and facilities for incoming older people, serving the wider South East. This has increased demand for health and social care, and has boosted em-ployment in this growth sector.

- New models of housing have emerged, including co-housing students with the elderly (free accommodation for students in return for hours of social care and companionship).

TECHNOLOGICAL

- Technological advancements focus on making best use of existing assets and infrastructure, in particular use of existing airfields for non-vertical take-off technologies (e.g. passenger drones).

ECONOMIC

- Brexit has led to barriers to the streamlined movement of people, vehicles and goods through the County, and the solutions to these are sub-optimal (e.g. continuation of Operation Stack, temporary border control centres and holding bays etc.).

- Lower growth in smaller, high value SMEs – employment in the county characterised by large national/international firms.

- There is a rise in young professionals moving out of London to take advantage of more affordable property prices, many of whom work in the global 'Gig Economy' (characterised by short-term contracts or freelance work as opposed to permanent jobs).

- Agricultural sector is characterised by lower levels of investment and more traditional technology and inputs, rather than making use of advanced, precision techniques.

- Less economic activity has slowed growth on highways and rail networks, but demand continues to outstrip supply. Lack of funding for capacity upgrades has led to increased congestion.

ENVIRONMENTAL

- There is less focus on the maintenance of existing and the delivery of new, blue and green infrastructure.

- Moderate climate challenges have provided an opportunity to increase agro-forestry, in particular a move towards fast-growing trees for paper, pulp, biofuels etc. Careful management has resulted in environmental benefits such as increased habitats, improved soil structure, increased shading etc.

POLITICAL

- Investment continues in other parts of the country (Northern Powerhouse and Midlands Engine along the High Speed 2 route), while the South East is viewed as having 'overheated' and so receives lower levels of central investment. This reduces the amount of funding available for new infrastructure in Kent and Medway. Further to this, continued austerity on the national and local scales increases the funding gap for new infrastructure.

- A greater emphasis is made on the inter-relationship between businesses, universities and politics – creating a 'Local Enterprise Partnership-plus'. There is also a move towards working with neighbouring authorities, Central Government, and other countries, in order to share resources and infrastructure and exploit synergies.

4.2 METRICS

The metrics set out in the table provide possible population, household and jobs figures for this scenario. (Please note, they should not be relied on).

METRIC	2031	SCENARIO C 2050	2031-2050 INCREASE	DIFFERENCE FROM BASELINE INCREASE
Population	2,113,000	2,333,000	220,000	0%
Households	940,000	1,075,000	135,000	-3%
Jobs	970,000	1,059,000	89,000	-10%

4.3 INFRASTRUCTURE REQUIREMENTS

The table below outlines the infrastructure that may be required as part of this scenario, above and beyond the baseline infrastructure to 2050 set out in Section 1.4.

INFRASTRUCTURE GROUP	INFRASTRUCTURE TYPE	SPECIFIC INFRASTRUCTURE REQUIRED
Housing and Employment	Housing	• Housing growth through redevelopment, infill and smaller extensions, including in the Green Belt. • New models of housing to meet specific requirements of population.
Transport	Transport (Motorways, Highways, Rail, Active Travel/Public Transport)	• Limited improvements to highways network – 'patches' to alleviate congestion and impacts of Brexit on movement. • Limited improvements to rail network, but no new lines or major upgrades.
Utilities and Natural Environment	Energy	• New generation of bioenergy generation infrastructure.
	Flood Defence	• Increased tree cover (through agroforestry) may reduce river flood risk in some locations.
	Natural Infrastructure	• Reduction in maintenance of, and therefore reduced quality of, blue and green infrastructure.
Health and Social Care	Health (Primary, Acute and Mental Health Services)	• New technologies used to improve healthcare and social care (mobile phone apps, use of mobile technology to measure different attributes through photo/vibration, 'smart' drug delivery mechanisms, support networks through digital technology) – in order to reduce costs, in particular physical infrastructure costs. • Greater availability and provision of elderly care homes, both state-run and private, servicing the South East.
Education	Early Years and Schools (Primary and Secondary)	• Increased focus on community-level and community-led infrastructure to reduce pressures on strategic provision – including new wave of childminders (no physical infrastructure required).

4.4 FUNDING, FINANCE AND GOVERNANCE CONSIDERATIONS

In a similar way to "Withering Growth", the "Lying Fallow" scenario represents a challenging financial environment for Kent and Medway to attract funds.

This scenario will likely see low levels of investment, and increased competition for investment against other regions. The area may become more dependent on Central Government funding and look to find new ways of attracting private investment through public-private partnerships or asset sales.

The "Lying Fallow" scenario is likely to experience the following:

- Increased need for traditional funding sources such as Whitehall grants and prudential borrowing, particularly through the PWLB, although Central Government affordability will also be stretched in this scenario.
- Pressure for more user-charging to manage existing networks more efficiently and to generate revenue. This is less politically acceptable because of less pressing or visible infrastructure demands, and the reduced ability to pay.
- Demand for increased value generation from existing assets.
- Housing investment may still continue facing infrastructure challenges, in line with current trend, which would still require additional housing funding and HRA levels.
- Pressure for finding cross-functional infrastructure investments.
- Incentives to learn more from other places to find efficiencies and use technological solutions to reduce the cost or increase the lifespan of projects.

CASE STUDY: NEW HEALTHCARE TECHNOLOGIES

GiraffPlus Home Healthcare Sensor Platform
Örebro, Sweden

This home healthcare platform integrates robotic telepresence, networked sensors and empathetic user interaction to provide long-term monitoring and tailored care solutions for elderly patients. The system consists of a network of in-home environmental and physiological sensors that continuously track a patient's vital signs, blood pressure, temperature, body position and other data. Medical anomalies or emergencies such as falls are instantly reported to a caregiver network. The interactive focus of the system is the Giraff telepresence robot, which allows relatives and caregivers to virtually visit patients in their home.

Image: Giraff Robot

CASE STUDY: NEW HOUSING MODELS

Co-housing Students with the Elderly
Deventer, Netherlands

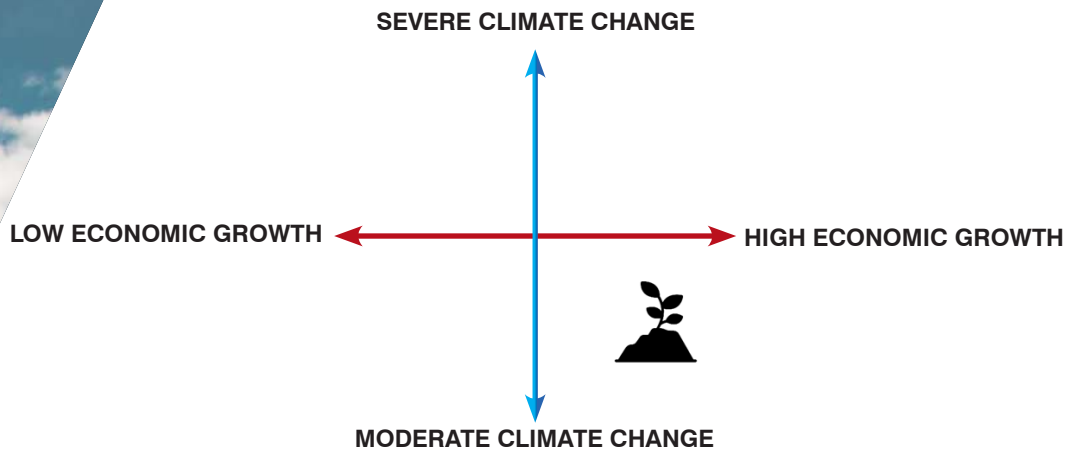
At the Residential and Care Center Humanitas in the Netherlands, students stay for free in rooms in the care centre in exchange for 30 hours of volunteer work per month. As part of their volunteer agreement, students teach residents new skills, like email, social media and art. As research has linked loneliness to mental decline and increased mortality, the regular social interaction with students aims to improve wellbeing in the elderly. This arrangement has proved to be mutually beneficial to both students and care home residents.

Image: Inhabitat

05

SCENARIO D: FERTILE GROUND

HIGH ECONOMIC GROWTH, MODERATE CLIMATE CHANGE



This scenario is characterised by strong economic growth and only moderate climate challenges– of the four scenarios, it is therefore the most desirable. Kent has capitalised on its identity as the 'Garden of England', focusing on cultural identity, natural beauty and attractiveness as a tourist destination. Kent competes successfully for skills, investment and talent. The buoyant local economy creates new revenue streams to fund infrastructure, while new technologies are embraced to create efficiencies in service provision and delivery.

5.1 STEEP ANALYSIS

SOCIAL

- Town centres are revitalised – there is more pedestrianisation, more green infrastructure, with more shared autonomous transport (public and private). Towns across Kent and Medway have benefited from better utilisation of space previously needed for parking. This has created quieter, safer, healthier, more attractive towns and higher levels of civic pride and engagement. Local businesses thrive, offering more employment opportunities for local people.

- Kent's proximity to London and relative affordability also enables more people to live in the County and work in the capital, especially since many employers in the capital have embraced flexible work patterns. Whilst there is increased remote working, this trend has led to greater levels of commuting and overall demand on rail links. However, peak spreading has occurred such that rail demand is high for longer periods in the morning and afternoon/evenings.

- There has been a knock-on effect of gentrification on well-connected towns – particularly those on fast connections (e.g. Ashford) or on the coast (e.g. Margate).

- Kent and Medway are strategic partners to Central Government in managing the challenge of immigration.

- It is successful in attracting the best immigrants to the opportunities in the county, whilst managing the impact on local infrastructure demands.

- The strong economy has renewed focus on high quality education, in particular in developing skills required for a rapidly changing business landscape.

- Big data is used to monitor and better understand public health, happiness, wellbeing etc., in order to improve public services such as healthcare.

TECHNOLOGICAL

- Shared autonomous vehicles/autonomous shuttles have been embraced (beyond baseline), dramatically reducing some types of journey – e.g. commuting to train stations, the transport of older people, those with visual impairment or school children etc.

- New transport investment links Kent with other growth areas in the South East, including London, Surrey (Guildford), Essex (Chelmsford), and Oxford-Milton Keynes-Cambridge.

- Intelligent and smart infrastructure, predictive maintenance and advanced materials (e.g. self-healing etc.) increases the lifespan of infrastructure and reduces maintenance costs.

ECONOMIC

- Kent and Medway have developed and maintained a strong economic identity, through strong growth in sectors including professional services, advanced manufacturing, tourism and precision agriculture.

- Whilst moderate climate challenges have brought about adverse impacts, it has also brought some economic opportunities within the food and beverage sector, particularly in viticulture. Advanced, precision agriculture has been embraced (above and beyond the base case), leading to productivity gains and growth in this sector.

- The tourism sector flourishes, particularly within the coastal towns and rural areas; but also 'mega attractions' such as the Swanscombe Peninsula. This is fuelled in part by the strong local economy and improved connectivity to other parts of the UK and beyond.

- Strong economic centres develop as the local economy thrives. Kent's employment centres compete successfully, not just nationally but globally for skills, investment and talent – acting as centres of economic activity, advanced manufacturing and innovation.

- Kent is seen as the strategic gateway to the continent, and has developed a burgeoning services sector which benefits from the proximity to Europe.

- The UK and South East's strong economic performance has resulted in the expansion of Gatwick Airport (new runway and terminal), alongside Heathrow's third runway.

ENVIRONMENTAL

- New open spaces, green and blue infrastructure are created and maintained, providing multiple socio-economic and environmental benefits.

- Kent and Medway is leading R&D in advanced precision agriculture, combining technology, organic principles and resilience against environmental stresses and shocks.

POLITICAL

- The strong economy has allowed for new revenue streams to fund infrastructure without risking viability of businesses etc., including road user pricing and local infrastructure taxing.

5.2 METRICS

The metrics set out in the table provide possible population, household and jobs figures for this scenario. (Please note, they should not be relied on).

METRIC	2031	SCENARIO D 2050	2031-2050 INCREASE	DIFFERENCE FROM BASELINE INCREASE
Population	2,113,000	2,355,000	242,000	10%
Households	940,000	1,093,000	153,000	10%
Jobs	970,000	1,077,000	107,000	8%

5.3 INFRASTRUCTURE REQUIREMENTS

The table below outlines the infrastructure that may be required as part of this scenario, above and beyond the baseline infrastructure to 2050 set out in Section 1.4.

INFRASTRUCTURE GROUP	INFRASTRUCTURE TYPE	SPECIFIC INFRASTRUCTURE REQUIRED
Housing and Employment	Housing	• The greatest pressure on housing of any scenario. • New housing via high quality new green towns and villages and urban extensions, as well as redevelopment and infill. Housing well served by transport links, in particular rail travel in to local towns and London. • Additional housing in order to counter-act gentrification – affordable and/or safeguarded for local residents.
	Employment	• Buoyant local economy, coupled with proximity to expanding Gatwick, results in multiple sectors including professional services and advanced manufacturing. Growth in office and industrial floorspace required. • Growth in A Grade office accommodation at 'gateways', particularly at Dover.

Transport	Transport (Motorways, Highways, Rail, Active Travel/Public Transport)	• Focus on walkability – new paved routes and spaces, including some retrofitting of existing infrastructure. • Increased rail capacity into London – both through additional services/rolling stock and upgrades to stations (e.g. increasing platform length/depth and gates at smaller stations). Secondary hubs developed at locations such as Ashford and Ebbsfleet. • New Maglev rail links to other growth areas in the South East. • New transport links to other growth areas in the South East. • Rise of 'demand responsive public transport' – e.g. fewer fixed routes and timetables, more flexible services to better meet needs. • Longer lifespans for transport infrastructure – less maintenance. • 'Smart' and joined-up transport modes to aid worker movement along the major channels through Kent linking Europe to London and also employment locations in the area that support businesses linked with 'through traffic' (contactless payments, combined ticketing, location of services in close proximity to transport hubs). • Expansion of cruise services at Dover and ferry services at Dover, Folkestone and Ramsgate – new and upgraded terminals and passenger services, plus car parking.
Utilities and Natural Environment	Water and Waste Water	• Agricultural sector growth leads to increased demand for water for irrigation – could be networked or localised (e.g. private boreholes or ponds).
	Information and Communications	• Data centres and communications network (masts/cables) required to facilitate big data.
	Natural Infrastructure	• Traditional, less multi-functional open space.
	Minerals and Waste	• 'Traditional' waste systems – share of recycling slowly increasing but residual waste still going to incineration.
Education	Early Years and Schools (Primary and Secondary)	• Secondary schools form new relationships with universities in the county, embedding higher education and sharing facilities.
	Further Education, Higher Education and Lifelong Learning	• Growth in higher education – existing universities, new providers, and 'campuses' for London-based universities requiring more space. • Learning and research in advanced agricultural techniques.

5.4 FUNDING, FINANCE AND GOVERNANCE CONSIDERATIONS

The Fertile Ground scenario represents the most attractive infrastructure investment environment for Kent and Medway. The area could see growing economic clusters, thriving coastal towns, a tourism boom and housing growth in garden villages and urban extensions. All of these will create more tax income and local assets to support investment, with less pressure on climate change mitigation and adaptation (at least compared to the "Hot House" or "Withered Growth" scenarios).

As a result, this scenario will see more private investment attracted to the area, more local control of investments and more opportunities for new and innovative funding and finance mechanisms. Under the "Fertile Ground" scenario, Kent and Medway may see the following:

- Increased demand for infrastructure overall, meaning that a greater volume of funding is needed. Nevertheless, strong economic growth will mean that more sources are available to meet these requirements.

- Rising property prices create more opportunities for land value capture mechanisms, including developer contributions, TIF and other mechanisms supporting infrastructure investment directly related to new development.

- As a result of greater use of local sources of funding, decreased pressure on Central Government grants, but increased pressure from HM Treasury to support higher levels of prudential borrowing and to underwrite local investments.

- Potentially, greater acceptability of user charging, especially if higher levels of prosperity go hand-in-hand with increased demand for transport and utility infrastructure. Road user pricing and investment for upgrades from utilities and telecoms companies can more easily be accepted if they lead to improved service quality.

- Bonds and revolving infrastructure funds may attract more co-finance from public and private (institutional) investors. Pension funds and infrastructure funds may view infrastructure projects as less risky and more attractive overall, with more certain income streams.

- Housing demand will create additional challenges for the property market and HRA borrowing limits. Though this could be partially-offset through land value capture mechanisms from commercial and residential development.

CASE STUDY: DEMAND RESPONSIVE PUBLIC TRANSPORT

Beeline crowdsourced bus services
Singapore

Beeline is a crowdsourced bus services app, run by the Government Technology Agency in Singapore, that allows commuters to suggest routes to their destinations. Commuters can join the route if they're going to a similar destination, or they can suggest a new route to see if there are enough people who want to reach the same destination. The Government has released the app's code to the public so that it can be adapted or improved upon, or used to launch new services.

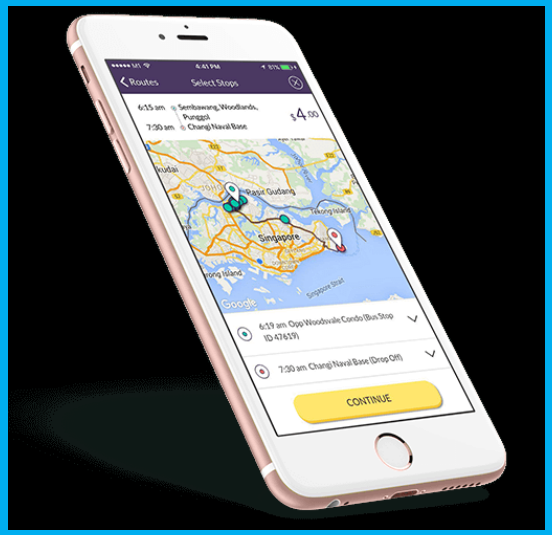


Image: Beeline Singapore

CASE STUDY: GREEN INFRASTRUCTURE AND ACTIVE TRANSPORT

Hamburg "Green Power 2030" Strategic Plan
Hamburg, Germany

Hamburg plans to implement a citywide network of green spaces by 2030, linking the city's outer ring with its dynamic centre through a series of walking- and cycling-friendly regenerated habitats. The plan aims to achieve 40% green space throughout the city by 2030. The changes will be far more than aesthetic; the green spaces would allow Hamburg to meet the challenges of climate change by providing flood mitigation, relief from urban heat island effects, improvements in air quality and other health benefits.

Image: Hamburg

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