THEME 5 – ECONOMY, BUSINESS AND INDUSTRY

Overview

Glasgow City Region is the economic powerhouse of the Scottish economy, home to a third of Scotland's population and contributing a third of Scotland's Gross Added Value. The city region has a vision to create a strong, inclusive, competitive and outward-looking economy, sustaining growth and prosperity with every person and business reaching their full potential. A number of plans and strategies support this vision (Box 9). The activities associated with each of these will need to be reviewed with current and future climate risks and opportunities in mind.

Box 9. Glasgow City Region plans and strategies that relate to the built environment

- Glasgow City Region Economic Strategy and Action Plan
- Strategic development plan
- Local economic development strategies
- Glasgow City Region Tourism Strategy

Key climate related risks and opportunities

Climate change will affect the city region's economy, business and industry by:

- **Increasing business disruption due to extreme weather events, flooding, coastal erosion, and sea level rise**. Infrastructure disruption may affect the ability of employees to access sites, prevent them working remotely whilst higher temperatures may reduce productivity or even stop work completely.
- **Disrupting wider supply chains and business productivity**. Small businesses make up the majority of businesses in the city region. They are particularly at risk as they are less able to prepare, respond and recover than larger organisations.
- **Impacting business productivity due to water scarcity** which could impact certain manufacturing sub-sectors that are water-intense, such as chemical products, basic metals, paper products, food and beverages.

Box 10. Economy, business and industry related risks and opportunities for Glasgow City Region

Ref	Risk / Opportunity Description	Urgency Score
Risks		
BI1	Risk to new and existing business sites from river, surface water and coastal flooding.	More action needed
BI2	Risks to business operations from water scarcity	Sustain current action
BI3	Risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments	Build capacity and understanding
BI4	Risks to business from disruption to supply chains and distribution networks	More action needed
Opportunities		
BI5	Opportunities for products and services to support adaptation to climate change	More action needed
BI6	Increased tourism revenue from increased temperatures	Sustain current action

- **Increasing tourism related opportunities** due to warmer temperatures and improved average climate. This city region's forestry and woodland could benefit significantly, increasing the numbers of activities available for tourists, such as walking and cycling.

- **Providing opportunities for developing new products and services to support adaptation**. The city region is already selling goods and services and innovating. Improving economic development policy could ensure the city region has a leading role in a strategic opportunity for Scotland in a similar way to the low carbon economy, helping secure economic benefit whilst improving local adaptation and resilience.

The key risks and opportunities related to the economy, business and industry, and their urgency score are shown in Box 10.

Next steps to creating a climate-resilient economy, business and industry

- Continue to deliver flood risk reduction projects to reduce the risk to existing non-domestic premises, and future investment locations.

- More direct support to businesses (and particularly SMEs) to understand how climate hazards will affect their business and to adapt. This includes understanding risks to premises, productivity and supply chain risks due to floods, heat, and wider hazards.

- Analyse how business supply chain disruption may be experienced in the city region, and support businesses to improve their supply chain resilience.

- Continue to develop the tourism offer of the city region to make the most of a future climate.

- Provide economic development support to the adaptation economy, to ensure the city region seizes the small but strategically important sector capturing the associated economic uplift and expertise.

- Review how the various Glasgow City Region plans and strategies that relate to the economy, business and industry (see Box 5) as well as national plans applied locally address future climate projections.

Sector Context

Glasgow City Region is the powerhouse of the Scottish economy, driving prosperity for a third of Scotland's population. 855,500 between 16 and 64 are employed within the city region (Scottish Government, 2017c), and Glasgow City Region's Gross Value Added (the goods and services added to the City Region) totals £40Bn p.a.; a third of Scotland's total. However, our economy is undergoing a transformation. Glasgow City Region is shifting its focus from pure economic growth, instead seeking to build an economy that works for everyone and operates within environmental limits. Effort to develop in a way that is sustainable now and into the future can be seen in the development and implementation of inclusive growth agendas, as well as efforts to address water security, energy and resource efficiency, greening waste management and encouraging the circular economy.

National Priorities

Scotland's Economic Strategy (Scottish Government, 2015b) sets the framework for how the Scottish Government aims to achieve a more productive, cohesive and fairer Scotland. The approach is based on increasing competitiveness and tackling inequality. The Government's approach to delivering sustainable economic growth is characterised by four key objectives to create:

- An economy where growth is underpinned by long-term sustainable investment in people, infrastructure and assets;

- An economy where growth is based on innovation, change and openness to new ways of doing things;

- A society that promotes inclusive growth and creates opportunity through a fair and inclusive jobs market and regional cohesion to provide economic opportunities across all of Scotland; and

- A country with an international outlook and focus, open to trade, migration and new ideas.

The economic strategy also identifies Food & Drink (including agriculture & fisheries), Creative Industries (including digital), Sustainable Tourism, Energy (including renewables), Financial & Business Services, and life sciences as growth sectors where Scotland has a comparative advantage.

Table 25. National Performance Framework Outcomes and Sustainable Development Goals relevant to economy, business and Industry

National Performance Framework outcomes	Sustainable Development Goals
We have a globally competitive, entrepreneurial, inclusive and sustainable economy	2 ZERO HUNGER; 4 QUALITY EDUCATION
We have thriving and innovative businesses, with quality jobs and fair work for everyone	6 CLEAN WATER AND SANITATION; 8 DECENT WORK AND ECONOMIC GROWTH
We are well educated, skilled and able to contribute to society	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE; 12 RESPONSIBLE CONSUMPTION AND PRODUCTION

These objectives contribute to a range of National Performance Framework outcomes and Sustainable Development Goals (see Table 26).

The Scottish Climate Change Adaptation Programme (SCCAP) (Scottish Government, 2014c) does not have a theme dedicated to business or industry, but it does emphasise that the private sector has a role to play in adaptation. Businesses of all sizes can engage their workforce and influence customers, and can also be affected by supply chain risks and infrastructure disruption. The SCCAP also recognises that a changing climate may bring new opportunities for businesses in the form of new markets, strengthened supplier relations through building resilience, and increased brand loyalty as customers place value action on climate change related issues.

Glasgow City Region priorities

The Glasgow City Region's priorities for business and industry are set out in the Glasgow City Region Economic Strategy and Action Plan (Glasgow City Region, 2017). This sets out the city region's vision to 2035, to create a strong, inclusive, competitive and outward-looking economy that sustains growth and prosperity, allowing every person and business reaching their full potential.

The strategy contains a wide range of actions and targets, but the key ones include:

- Increasing the working population by over 50,000 by 2035;
- Increasing the number of jobs in our city region by over 100,000;
- Attracting an additional 1 million tourists annually to the city region by 2023; and
- Creating 6,500 new businesses in the city region through to 2035.

The economic strategy highlights that Glasgow City Region has comparative strength in financial services; business administration; creative industries; distribution; transport; and manufacturing and production.

Over 50% of the city region's Gross Value Added comes from Manufacturing & Production; Distribution; transport; accommodation and food; public administration; education; health. This has remained fairly consistent since 2009. The city region has a lower than average proportion of employment in Scotland's six key growth sectors, though they still make a strong contribution to overall employment numbers.

Whilst there is an emerging common approach to economic development across the city region, there are also eight local economic development strategies in place that provide locally focussed, tailored activities. While each strategy is tailored to their local authority area, all share a common focus on:

- Creating more and better jobs;
- Strengthening and growing the business base in absolute terms, by the size of business and improving the productivity of existing businesses;
- Building the skills base and improving employability;
- Infrastructure to support economic growth;
- Growing the working age population;
- Targeting key sectors of strength and opportunity;
- Economic diversity; and
- A focus on innovation; sustained growth and prosperity for all.

The Regional Economic Strategy is supported by the Strategic Development Plan (SDP) which provides a spatial framework for the development of the city region's economy. The plan is designed to tackle economic, social and environmental challenges that are shared across the city region. It identifies geographic areas for development including Strategic Economic Investment Locations, Strategic Freight Transport Hubs, and the network of Strategic Centres to support the city region's economy. Finally, tourism is playing an increasing role in the region's economy. The recently launched Glasgow City Region Tourism Strategy (2018a) and Action Plan (2018b) set out ambitions to increase the number of tourists a year by one million by 2023.

Risks to economy, business and industry

BI1: Risk to new and existing business sites from river, surface water and coastal flooding

Current / future level of risk	High
Adaptation shortfall	Significant
Benefits to further action	Yes
Urgency score	More action needed

Risk Description

As climate change increases precipitation across Glasgow City Region, businesses will potentially be at increasing risk of flooding from more frequent extreme weather and storms and the effects of sea level rise. The risk of inundation and flooding can damage stock, assets and premises, disrupt local and international supply chains and influence customer behaviour. Small and Medium Size Enterprises (SMEs) are particularly vulnerable, as they are less able to prepare, respond and recover than larger organisations.

Evidence for Glasgow City Region

There are approximately 52,415 businesses in Glasgow City Region (Scottish Government, 2017d). Small business comprises the majority of these, with 90% (47,370) having under 50 employees. Research by Kingston University (2015) has shown SMEs are particularly vulnerable to the impacts of flooding because they are likely to be underinsured, and they have limited financial reserves to fund recovery. Indirect impacts can be particularly high as their localised sales and supply networks will also likely be impacted by flooding.

One of the key risks to business sites is flooding from surface water, as well as a lower set of risks from coastal and river flooding. There are 9,400 non-domestic premises at risk of flooding in the Clyde and Loch Lomond Local Plan District, and this is projected to rise to 13,800 by the 2080s, though these figures only consider current buildings, and do not account for planned growth.

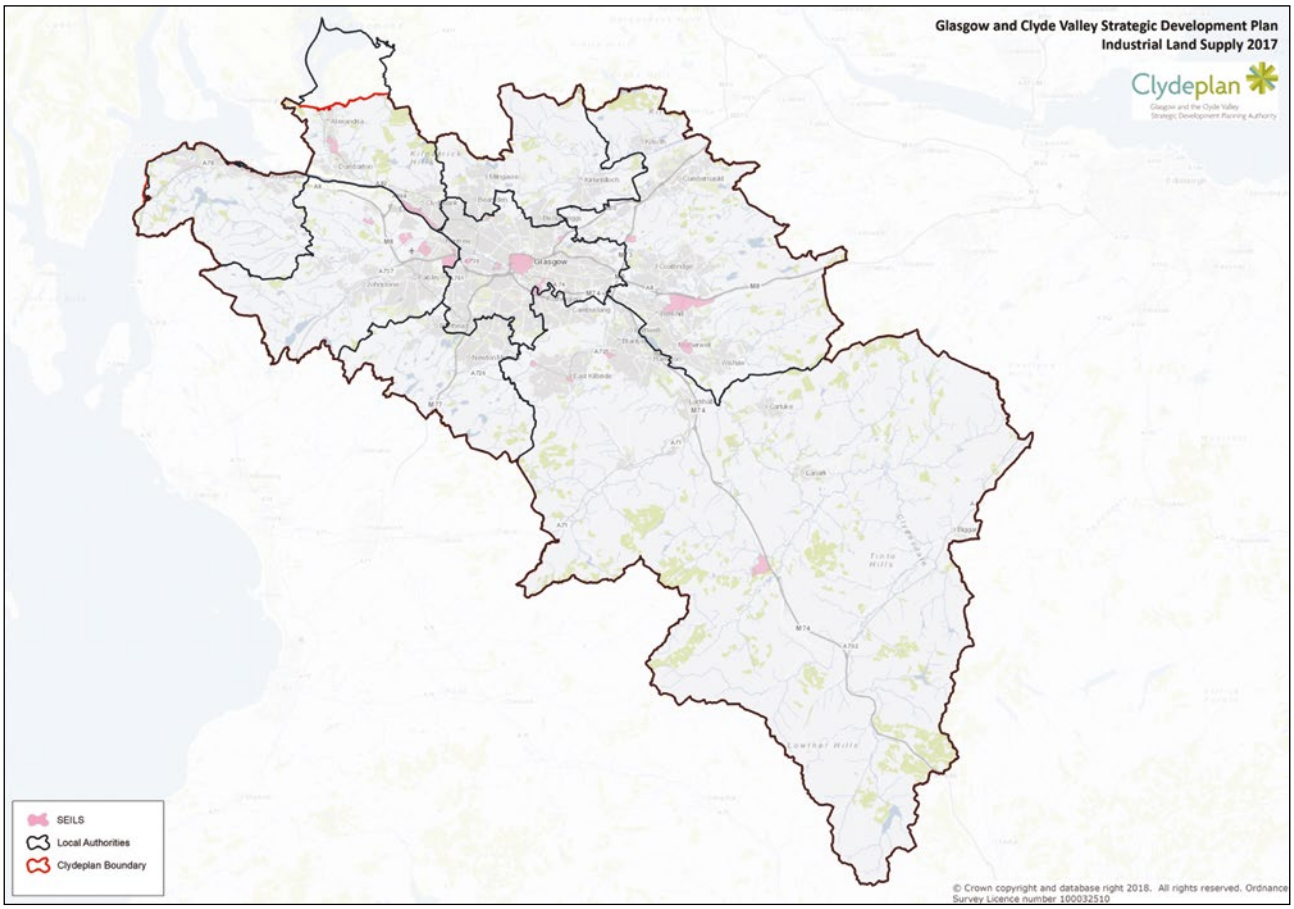
In support of the city region's economy Clydeplan's Strategic Development Plan (2017b) identifies areas where new businesses are likely to invest through the designation of Strategic Economic Investment Locations (SEILs), Strategic Freight Hubs and a Network of Strategic Centres and a broader, more locally focussed industrial land supply for Glasgow City Region. The SEILs have been defined as the priority locations to promote the Scottish Government's key economic sectors, Scottish Enterprise's locational priorities, and as being in a sustainable location. The Spatial Development Strategy identifies 22 Strategic Economic Investment Locations (SEILs) in Glasgow City Region which will support the long-term vision of a rebalanced low carbon economy, boosting competitiveness and tackling inequality.

An initial assessment by Climate Ready Clyde has identified that 12 of the SEILs (in Glasgow, Inverclyde, Renfrewshire, South Lanarkshire and West Dunbartonshire) are at a moderate risk of flooding, with 10-50% of the site at risk of flooding from a 1 in 200-year return period (including climate change uplifts for surface water) (Clydeplan, 2017a). The majority of these are in Glasgow and Renfrewshire, with a mix of surface water, coastal and river flooding.

Table 26. Non-domestic premises at risk of flooding (Source: SEPA, 2015)

Source	Current numbers	Annual Average Damages (Current)	Future numbers (UKCP09, 2080s High Emission)
River Flooding (Clyde)	1,800	£6.4 million	2,900
Coastal	1,300	£11 million	2,400
Surface Water	6,300	£8.8 million	8,500
Total	**9,400**	**£26.2 million**	13,800

Figure 27. Glasgow City Region Strategic Economic Investment Locations. (Source: Clydeplan, 2017a)



Alongside the SEILs, Glasgow City Region's broader supply of land for business is identified in the Industrial Land Supply. 71 of the 535 sites in the Industrial Land Supply have been identified as having 50-100% of their area at risk of river, coastal or surface water flooding (Clydeplan, 2017a), for a 1 in 200-year return period event (including climate change for surface water). The majority of these sites are in West Dunbartonshire from a combination of river, coastal and surface water flooding, with a smaller number in Renfrewshire (with the same mix of flooding sources) and South Lanarkshire (driven by surface water and river flooding). This uncertainty around the extent and severity of flooding risk indicates the strong need to ensure that effective management and adaptation processes are in place to protect the city region's businesses now and into the future.

Clydeplan's SDP also identifies a network of strategic centres, a high proportion of which have parts of their centre which are subject to flood risk.

Sea Level Rise has the potential to increase risk of flooding in some areas. There are identified risks in the 2080s to the harbour in Inverkip, industrial estates, development opportunities and infrastructure in Greenock, an industrial estate in Gourock, the former Exxon site in West Dunbartonshire, and a golf course in Renfrewshire (Hansom et al., 2017). This is likely an underestimate in terms of impact due to the report not covering the entire stretch of the Clyde as far as Glasgow.

BI2: Risks to business operations from water scarcity

Current / future level of risk	Medium
Adaptation shortfall	Less significant
Benefits to further action	N/A
Urgency score	Sustain current action

Risk Description

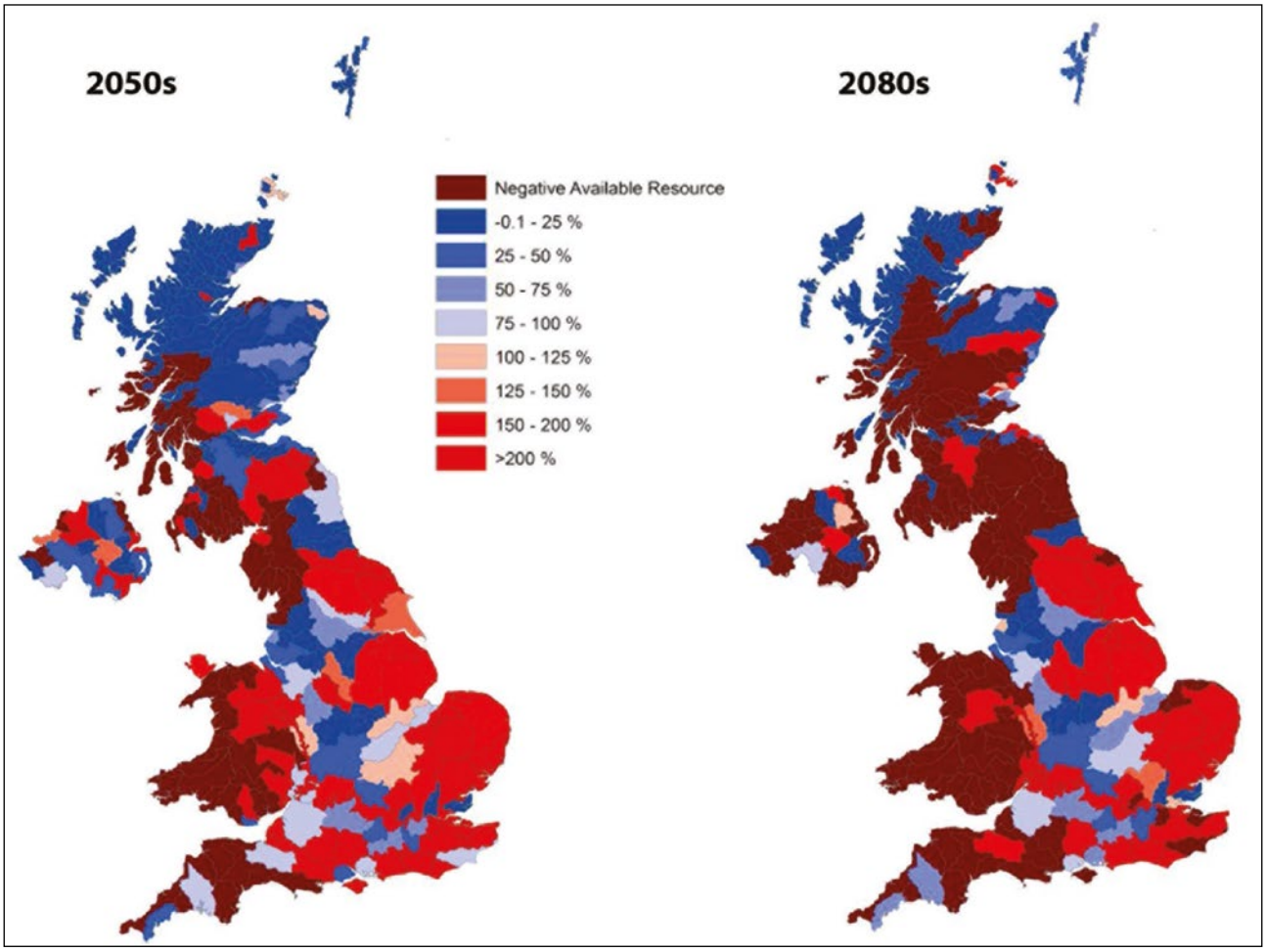
Water-intense manufacturing sub-sectors such as chemicals and chemical products, basic metals, paper and paper products, beverages and food products are at higher risk of water scarcity as climate change alters levels of precipitation in the West Scotland, particularly in projected hotter and drier summer months. In addition, because water is a public good, this risk is also linked to the use of water and policies in agriculture as set out in the Natural Environment theme.

Evidence for Glasgow City Region

The water supply zones to Glasgow City Region currently have a good level of service (either less than a 1 in 100 chance or 1 in 40 chance of water restrictions in any given year) (Scottish Water, 2015). However, when accounting for climate change scenarios analysis finds that at a national level, there is the risk of less water available and therefore a lower level of service for the majority of customers which could result in more frequent waters shortage for some customers. There are a wide range of possible different outcomes from little impact to up to 45% of customers being affected to different degrees. The report highlights more work needed to understand this, and any potential adaptation measures required.

A separate assessment of water availability was undertaken for the second UK Climate Change Risk Assessment (HR Wallingford, 2015). The assessment examined the supply/demand balance for Water Resource Zones in the 2050s and 2080s for 'all sectors' (i.e. public water supplies plus agriculture, energy generation, industry and commerce and the natural environment). Whilst in lower population growth and climate scenarios the risks of water shortages were relatively small, when considering

Figure 28. Abstraction demand in (a) 2050s and (b) 2080s as a percentage of the available resource under high climate and high population growth scenarios, assuming no additional action adaptation and fixed minimum environmental flow requirements. (Source: HR Wallingford, 2015)



both high scenarios of climate change and population growth, there is a general pattern of a lack of available resource across central Scotland by the 2050s and 2080s.

In particular, the results show that in 2050s and 2080s, unrestricted demands in catchments across Central Scotland (including Glasgow City Region) at low flows is projected to be in excess of total available resource. This was using the higher population scenarios, assuming no change in absolute flow rate compared to the baseline and without adaptation.

HR Wallingford also highlight that population and adaptation decisions (including decisions on environmental flow calculations) frequently have a greater influence than climate on the water balance of an area, meaning that adaptation can help manage the risk and many businesses are also pursuing water efficiency measures as a result of sustainability strategies. This means that managing the development of the city region more broadly is a key factor in ensuring future resilience.

The work also found that adaptation has the potential to substantially (but not completely) alleviate supply demand deficits, based on a high level of adaptation, including a significant reduction in leakage and household consumption. However, this assumes all supply and demand reduction measures outlined as preferred and feasible by Scottish Water are successfully implemented and generate savings estimated, as well as implementing significant leakage and water efficiency household measures.

BI3: Risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments

Current / future level of risk	Unknown
Adaptation shortfall	Significant
Benefits to further action	Yes
Urgency score	Build capacity and understanding

Risk Description

Business productivity may be significantly affected during extreme weather that disrupts infrastructure, as well as higher temperatures in working environments. Infrastructure disruption may limit the ability of employees to access sites, prevent them working remotely if digital infrastructure and network access is reduced, or require employees to take unplanned leave. Exposure to high temperatures can reduce productivity or even stop work completely, and impact the safety, health and wellbeing of employees.

Evidence for Glasgow City Region

Extreme Weather
There is limited information on the wider potential impact of this disruption both at the UK scale, and for Glasgow City Region. However, it is widely acknowledged that Scotland already has a productivity issue (David Hume Institute, 2018), unrelated to climate disruption. Scotland had the lowest proportion of homeworkers in the UK (ONS, 2014), at 10.7%, though the Confederation of British Industry have highlighted that teleworking is an increasing trend (CBI, 2011). It not clear whether a higher or lower proportion of homeworkers increases or decreases vulnerability to climate-related reductions in productivity. Homeworking may reduce the risk transport-related disruption, but work at home could be more vulnerable to disruptions to the supply of electricity and digital services.

The Chartered Management Institute et al. (2013) highlights that staff being unable to come into the office either due to travel disruption (63% of respondents) or school closures/child care costs (46%) were the most common impacts of extreme weather on surveyed organisations. They also show that the most common measures taken by surveyed organisations in response to extreme weather were to allow staff to work remotely (53%), to prioritise resources on key projects (34%) and to postpone work until the weather improved (29%).

Many homeworkers depend on ICT infrastructure to allow them to work remotely, and whilst this is an effective adaptation option for managing disruption, it highlights the importance of resilient digital infrastructure and services. Baglee et al. (2012) assessed that major ICT disruption due to climate change is considered to be relatively low for large businesses.

Business continuity plans and management (BCM plans) are an increasingly common way for businesses to help manage this risk, alongside implementing remote working solutions, and the proportion of private sector organisations saying they have a business continuity plan in place increased from 42% to 58% between 2008 and 2013 (Surminski et al. 2016). Extreme weather was the most commonly cited reason for activating a BCM plan, cited by 69% of managers surveyed with BCM plans in their organisation. However, many businesses do not develop business continuity plans until affected by an extreme weather event, and SMEs are both less likely to have a plan in place, and more vulnerable to the financial costs of stopping business. Risks for SMEs could be greater, particularly in relatively remote areas where they may be dependent on single electricity and telecommunications connections.

High temperatures
The impacts of high temperatures in Glasgow City Region are likely to be moderate in the medium term. The UK CCRA Summary for Scotland found no evidence relating to heat impacts on productivity for Scotland. In Glasgow people currently experience thermal comfort between 9°C and 18°C (Oertel et al., 2015). By the 2080's, average summer temperatures are expected to be significantly higher, creating a potential risk to health of employees and productivity. Compounding the risk of overheating, there are identified areas in the city region which display characteristics of an urban heat island (RAMSES, 2017).

There is uncertainty around the amount of productivity loss and the annual average impact across the UK, but modelling in the first UK CCRA (HR Wallingford, 2012) suggested that future impacts could be large. Upper bound results suggested that the cost of loss in productivity due to building temperature could increase from a baseline of £770 million in 2010 to

- between £850 million and £1.6 billion in the 2020s;
- between £1.1 billion and £5.3 billion in the 2050s; and
- between £1.2 billion and £15.2 billion in the 2080s.

BI4: Risks to business from disruption to supply chains and distribution networks

Current / future level of risk	High
Adaptation shortfall	Significant
Benefits to further action	Yes
Urgency score	More action needed

Risk Description

Large amounts of freight are transported around the UK every day, and businesses rely on resilient transport infrastructure and ports. Adverse weather is already one of the reasons most commonly cited by business for interruptions of supply chains (ASC, 2016). Increases in extreme weather events could see such disruptions become more frequent without further adaptation. Exports from UK businesses are already impacted, and expected to be more at risk as they may take place in countries deemed highly vulnerable to climate change and less able to adapt. This risk is also linked to those set out in the international chapter, as there is the potential for weather related shocks to disrupt international trade.

Evidence for Glasgow City Region

Data is not collected on the size of imports and exports for Glasgow City Region, but the UKCCRA Summary for Scotland (ASC, 2016) highlights that the value of Scotland's exports increased from £12.6 billion in 2005 to £17.5 billion by 2015. Over the same period, the value of Scotland's imports increased from £9.8 billion to £13 billion. These estimates are lower than those produced by Scottish Government, which value total exports from Scotland at £75.6bn (Scottish Government, 2018c). There are no statistics on the total value of imports to Scotland on a comparable basis, but imports make up an important part of the economy and allow consumers to access a wide range of goods.

Glasgow City Region acts as a gateway to move freight across Scotland and the wider U.K. Clydeport have ports at Glasgow and Greenock, along with sites at Ardrossan and Hunterston store. Between them, these facilities process 5.4 million tonnes of cargo each year, delivering goods as diverse as containers, dry and liquid bulks, energy and forest products, metals, and project and bulk cargoes. Clydeplan's Strategic Flood Risk Assessment identified that a small proportion (0-10%) of Clydeport's King George V dock in Glasgow is at risk coastal flooding[1], however, no public information is available on climate change risks to Clydeport operations or freight hubs.

At this stage, the port authorities do not consider climate risk to be substantial in the short or medium term (HR Wallingford, 2012). However, as sea level rise becomes more severe over next several decades, quays with fixed elevation will be at greater risk of flooding. Similarly, other waterside equipment, particular lifting equipment, may need to be modified to cope with flooding and inundation (Marine Climate Change Impacts Partnership 2013).

Glasgow Airport also processes a more limited amount of cargo. A small amount of cargo also passes through Glasgow Airport. In 2010, this figure was 2,700 tonnes (Glasgow Airport, 2011). Most freight arriving through Glasgow Airport connects to different modes of transport, including road, rail, sea and air travel. If one mode of transport is disrupted by climate related extreme weather or challenging conditions, then knock on effects will be felt throughout the transport chain.

The interconnectivity of transport services is compounded by risks to sorting and storage facilities. Clydeplan's SFRA identified that the Gartsherrie freight hub has a small proportion (0-10%) of the site at risk of surface water flooding. Extreme weather and any kind of flooding at any point in the transport chain can cause major disrupting to the entire network, and result in loss of opportunity and reputation for businesses that rely on the transport of goods.

Whilst there is some understanding of the relative size of trade and cargo through Glasgow City Region, there is no information on the resilience of the supply chains to climate hazards, or the extent to which actions are in place to aid adaptation.

1 'Flood risk' uses the same definition in other areas of the Clydeplan SFRA (1 in 200 for coastal and river flooding, and 1 in 200year plus climate change for surface water)

Opportunities for economy, business and industry

BI5: Opportunities for products and services to support adaptation to climate change

Current / future level of risk	High
Adaptation shortfall	Significant
Benefits to further action	Yes
Urgency score	More action needed

Opportunity description

Adapting to climate change will require the use of goods and services to support all sectors of the economy, as well as the development of new and more effective products. This presents both domestic and international opportunities for businesses across a range of sectors in the city region.

Evidence for Glasgow City Region

To measure the sector and the scale of the opportunity K-Matrix developed a 'horizontal' sector known as 'Adaptation and Resilience to Climate Change' (A&RCC). This is a subsector of their 'adaptation and resilience' (A&R) classification, which broadly represents the market for economic, social and environmental development within the city region.

Glasgow City Region makes up about 25% of Scotland's sectors both in terms of A&R and A&RCC (k-Matrix, 2018), with data for 2016/17 showing total sales for A&RCC in Scotland were £604m in 2016/17, with Glasgow City Region contributing £146m. This is proportionally lower than Glasgow City Region's overall contribution to Scottish GVA (currently around 33%), suggesting the sector is underperforming, but this is closing marginally, with sector growth rates 0.3% higher per annum than Scotland overall.

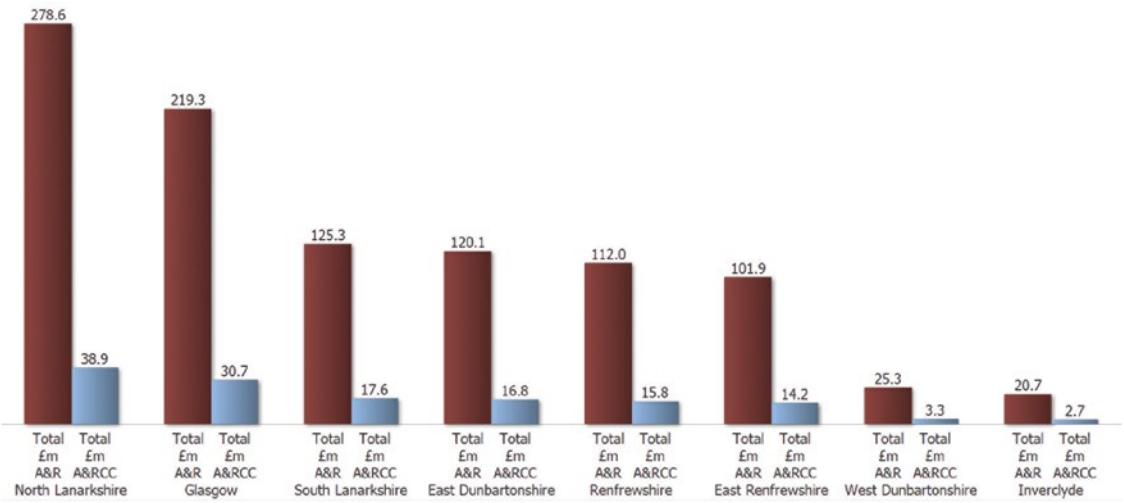
Within this, the largest Local Authorities for both markets are North Lanarkshire and Glasgow, which combined, account for 50% of both markets.

Estimates suggest that the city region is home to around 78 companies, employing roughly 8,390 people, with the largest number of companies and employees in North Lanarkshire and Glasgow.

The largest numbers of sales by volume for Glasgow City Region's A&RCC sector relate to five key sub-sectors: Built Environment (£32.9m), Water (£26.9m), Transport (£19.4m), Professional Services (£18m) and Energy (£14.7m).

The A&R sector in Glasgow City Region is expected to grow significantly, reaching 18.9% by 2020/2021. This is underpinned with the growth of the available market to £98m, and to new products to £46m for 2020/21. The projected growth in A&R is in line with the broader trend for Scotland, though growth rates for the city region are projected to be slightly higher than the country overall.

Figure 29. 2016/2017 A&R and A&RCC sales for Glasgow City Region by Local Authority. (Source: K-Matrix, 2018)



Exports present an opportunity for the city region's economy, with available exports across the key sub-sectors amounting to over £150m a year. Whilst this is small in comparison to Scotland's total exports, (£75.6Bn in 2016) it remains a positive opportunity for development.

Removing barriers to entering the market is a key activity o encourage development of the adaptation economy. Some sub-sectors, such as Agriculture & Forestry, Health Care, Waste and Built Environment have relatively even spread of barriers to market entry, others such as Health, Transport, Disaster Preparedness and Natural Environment have higher barriers to entry in some areas than others. The financial barriers to market for smaller companies in the city region is relatively high when compared to their larger competitors. Market awareness is limited amongst smaller companies and this may be a contributor to the apparently high financial barriers, with limited sector spend on research and development within the city region of between 2.4% and 2.7%.

Glasgow City Region has strong foundations to secure economic benefits from supporting places to adapt to climate change, and is already delivering products and services in this space. However, tailored economic development policy will be needed if the city region is to realise the full potential of the economic opportunity afforded by a changing climate (kMatrix, 2018).

Figure 30. Glasgow City Region 2016/17 A&R and A&RCC subsector sales by volume. (Source: kMatrix, 2018)

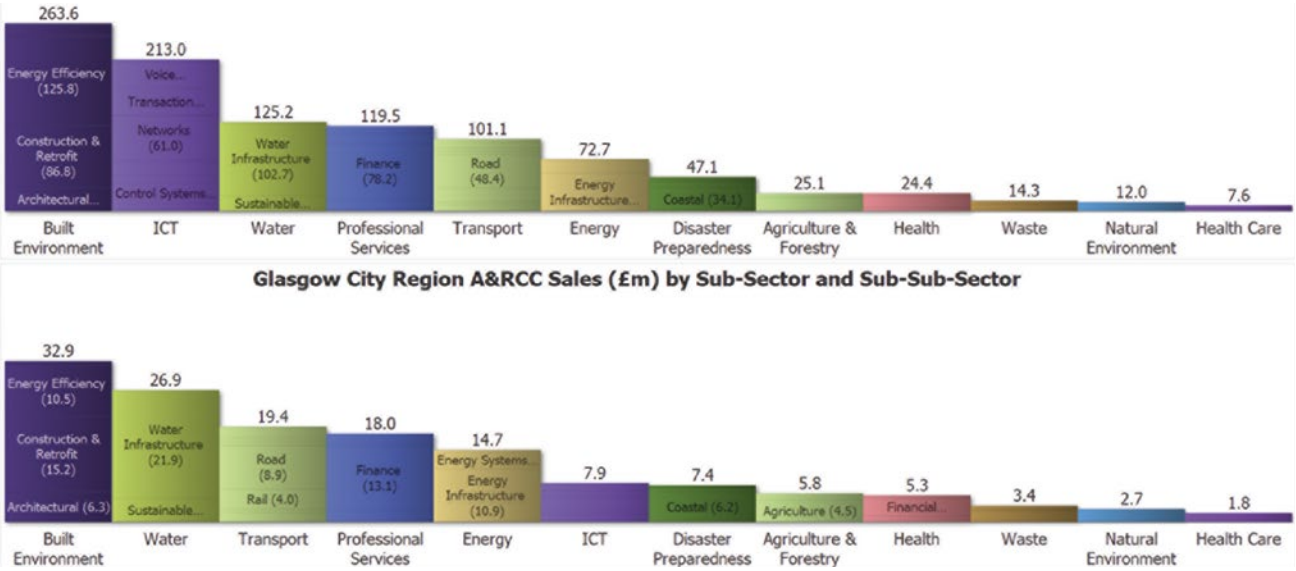
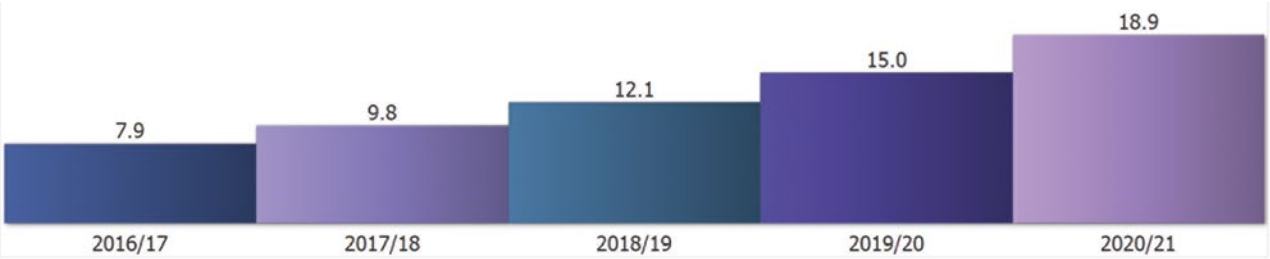


Figure 31. Growth forecasts for A&R to 2021 for Glasgow City Region. (Source: kMatrix, 2018)



BI6: Increased tourism revenue from rising temperatures

Current / future level of risk	High
Adaptation shortfall	Less significant
Benefits to further action	Not Scored
Urgency score	Sustain current action

Opportunity description

Climate change could enhance a range of tourism-related opportunities for Glasgow City Region, due to warmer temperatures and an increase in the number of good weather days for tourism. Forestry and woodlands could benefit significantly as activities available for tourists such as walking and cycling become more appealing as the climate warms.

Evidence for Glasgow City Region

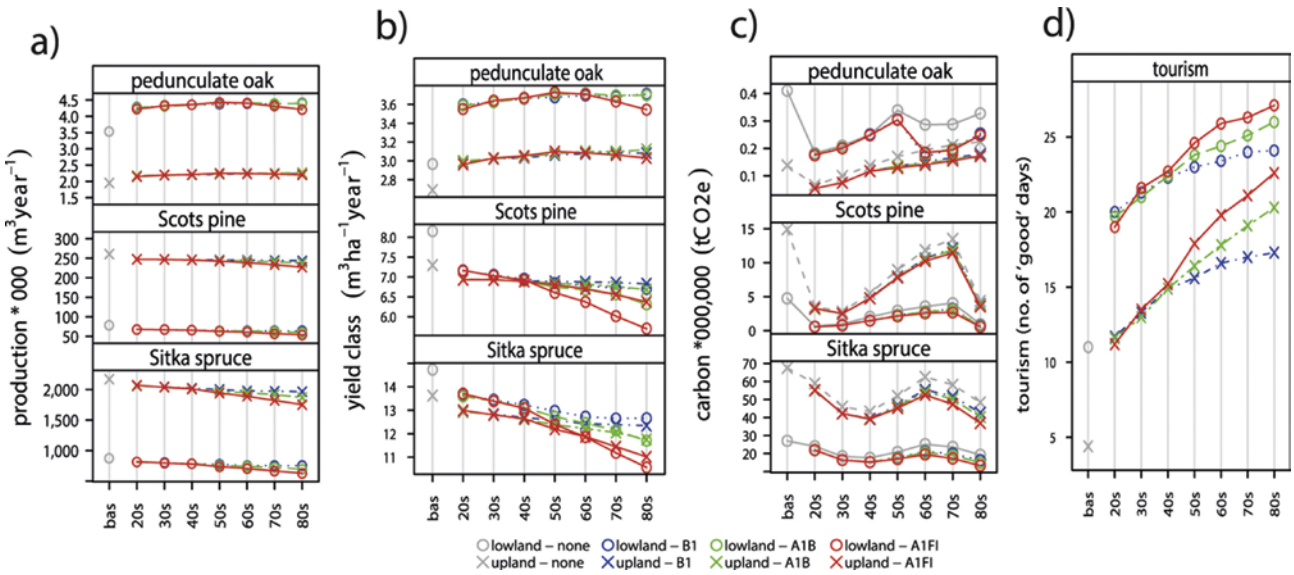
Over 59,000 people work in the tourism sector in Glasgow City Region (Scottish Government, 2017e), with 51% employed in Glasgow and 13% in South Lanarkshire. In 2015, it contributed £881m in GVA, 23% of Scotland's total for the sector.

Table 27. Sustainable Tourism by Local Authority Area for 2015 (Source: Scottish Government, 2017e)

Local Authority	Employees (Thousands)	GVA at basic prices (£m)
East Dunbartonshire	2,000	£31.2
East Renfrewshire	1,600	£22.8
Glasgow City	30,400	£426.2
Inverclyde	2,000	£28.0
North Lanarkshire	6,300	£121.7
Renfrewshire	5,600	£97.9
South Lanarkshire	8,100	£107.0
West Dunbartonshire	3,000	£45.9
Glasgow City Region	59,000	£880.7

In Glasgow, there were 2.2m staying visits in 2011, with a further 21m day visits (Scottish Cities Alliance, 2014). At 78%, most of these visits were from Great Britain. Tourist visits to Glasgow do not have a high degree of seasonal variation so assuming a direct link between a longer summer season and increased tourism expenditure is somewhat speculative (Scottish Cities Alliance, 2014).

Figure 32. Estimated (a) potential forest production; (b) potential weighted mean stand yield class; (c) potential sequestered carbon; and (d) tourism potential for the number of 'good days' (tourism climatic index>60), due to drought and climate change impacts for the B1, A1B, and A1FI emissions scenarios where 'none' represents no climate change; and for the baseline (1961–1990) and seven time periods (2020s until 2080s). (Source: Petr et al., 2015)



There is significant potential for woodland to support tourism and recreation. Forests and woodlands already provide recreation opportunities ranging from the network of mountain biking routes in the Carron Valley to rich woodlands around the New Lanark World Heritage Site and the Falls of Clyde National Nature Reserve, the Kilpatrick Hills and the Clyde Muirshiel Regional Park.

Woodlands also contribute to the character of many longer distance trails, including the West Highland Way, Clyde Walkway and Kelvin Walkway as well as creating the setting for attractions such as the Frontiers of the Roman Empire (Antonine Wall) World Heritage Site, the Burrell Collection and Kelvingrove Art Gallery.

Glasgow City Region contains 56,850 Ha of woodland, including 35,000Ha of productive forest, predominantly containing Sitka Spruce and other introduced species. Under a high emissions scenario, the number of 'good' tourism days in summer (June, July and August) in the lowlands for this type of forest is expected to rise from 11 per year between 1961 and 1990, to over 25 in the 2080s. (Petr et. al., 2015). This suggests that climate change could increase the economic benefits from tourism in forestry.

Glasgow City Region also acts as a major gateway to the West Coast of Scotland, and associated wider tourism. Glasgow Airport's climate adaptation reporting power report (Glasgow Airport, 2011) acknowledges that changes to destination choice due to negative climate change impacts overseas could increase the flow of incoming tourists to the UK.

Whilst there is significant uncertainty around future numbers of tourists, ensuring the city region is positioned to maximise this opportunity in future years will require addressing a range of risks to infrastructure which supports the tourism industry. These are set out in more detail in the infrastructure chapter, but include the rail line to Oban, the A83 at Rest and Be Thankful, the Erskine Bridge and M8, and Glasgow Airport.