Annex 7: Completed workbook trial for New Anglia

Local Economic Development and the Environment (LEDE) project researcher workbook

April 2013

Organizational details

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Contents

1. One page initial summary

1.1. The geographical area of the LEP

The New Anglia Local Enterprise Partnership (LEP) covers the Local Authority areas of Norfolk and Suffolk. It includes the districts of Norwich, South Norfolk, Great Yarmouth, Broadland, North Norfolk, King's Lynn and West Norfolk, Breckland, Ipswich, Suffolk Coastal, Waveney, Mid Suffolk, Babergh, St Edmundsbury, and Forest Heath. New Anglia has borders with Lincolnshire and Cambridgshire to the West and Essex to the South (see Figure 1.1.a).

Figure 1.1.a: Map showing the geographical boundaries of the New Anglia Local Enterprise Partnership. Source: Office for National Statistics

1.2. Description of the economy of the area

- How successful is the economy of the area compared to English average?
- What are the most important sectors of the economy?
- Are there any significant geographical inequalities in economic success?

New Anglia's economic indicators suggest that the region falls behind that of the regional and national economy. In the period 1998 to 2008, average annual economic growth in the region was around 4.8% compared to 5.4% in England. GVA per capita relative to all LEPs did not change significantly and the region's productivity levels continued to decline against UK indicators.

The region's low-value oriented economic structure plays a significant role in determining this comparatively low economic performance. To some extent, geographical inequalities and poor connectivity also influence inward investment in key sectors such as manufacturing and distribution for example.

1.3. Challenges faced by the economy

- What are the major challenges faced by the economy?
- How is the economy being affected by the current economic downturn?

In order to achieve growth in the long term, promoting the expansion of high-value sectors has been identified as the main challenge ahead. In the short-run, the region is focusing on moving on from the recent economic downturn. It is estimated that between 2008 and 2010 more than 8,000 jobs were lost as well as around 1,500 businesses across the region and across all sectors[1].

1.4. The plausible future development pathway

In order to achieve growth in the long term, promoting the expansion of high-value sectors has been identified as the main challenge ahead. In the short-run, the region is focusing on moving on from the recent economic downturn.

The Sector Growth Strategy for the LEP (2013) identifies nine key growth sectors. These are:

- Advanced Manufacturing;
- Energy;
- ICT;
- Ports and Logistics;
- Life Science and Biotechnology;
- Digital and Cultural Creative Industries;
- Food Drink and Agriculture;
- Financial Services;
- Tourism.

1 New Anglia (2013), Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf.

Forecasts suggest GVA growth rates of between 2% to 3% year on year until 2030[2]. This will result in cumulative growth rates of between 40%-60% in the next 20 years.

Economic development however, is also determined by the capacity of the environment to cope with increasing pressures on already strained resources and the capacity of such growth to minimize its environmental footprint or in some cases, contribute towards enhancing the environment. This report is concerned with the opportunities and threats arising in New Anglia as the region undertakes its planned economic development. The top 10 opportunities and threats are summarised in the following table.

Opportunities		**Threats**	
Code/Name	Description	Code/Name	Description
FR1, FR7, GCCM2 Enabling investment in renewable energy and new technologies	Identifying and promoting the benefits of the area (financial and planning incentives assisted by award of Enterprise Zones, activities that are taking place, technologies being developed, infrastructure in place and planned, how the area is investing in itself to improve attractiveness to incentives)	**FCoa2** Flood defence funding in coastal areas	Changes in availability of funding for flood defences for coastal areas could increase the severity of the impacts of flooding as well as decrease inwards investment in high risk areas
GCCM6 Improving and developing existing Green Infrastructure	Supporting and spearheading the importance of high quality Green Infrastructure for improving quality of life and the environment. Ensuring its inclusion in development planning, with the region acting as a leader with above average uptake and quality	**LCR1, Hea3** Population growth negatively affecting green infrastructure	Increases in the population along with economic growth could negatively affect green infrastructure, e.g. the need for rapid development may mean that insufficient time is given to consideration of green infrastructure when assessing planning applications
LSQ3, ER2, FCr9 Promote agri-environment schemes and broader scale sustainable farm management	Promotion of sustainable farm management which may include diversification into other practices such as farm tourism and other environmentally friendly practices. Promotion of uptake of agri-environment schemes	**LSQ1, Pol3** Impacts from intensive farming	Movement towards more intensive high value crops could lead to greater use of chemical fertilisers, herbicides, pesticides and water with knock on impacts for pollinators (through both use of chemicals and growth of different crops)

2 Cambridgeshire County Council (2012): EEFM 2012 baseline forecasts grouped by area, accessed at http://www.cambridgeshire.gov.uk/business/research/economylab/Economic+forecasts.

WS6, WS4, WS12, WP1 Increase water efficiency, recycling, management and awareness	Support the uptake of water saving measures into new developments (including the use of natural systems). Increase the uptake of SUDs and support the development of water efficiency technologies	**WS1, LCR6, WS10, FCR8** Water resources deficits	Increased demand for freshwater resources, which are already stressed, and impacts of climate change potentially leading to a deficit at some times of the year (potential loss of biodiversity if deficit is dealt with purely by building storage reservoirs, since these may be targeted towards least productive areas)
Foo5 Increase food security and reduce reliance on the global food market	Promotion of locally grown produce to increase local food security and reduce reliance on the global market. This will also provide security in terms of global climate change impacts, and lowering food miles, thus reducing emissions	**FNC3** Increased severity of flood events	Climate change, ageing infrastructure and greater pressure from development are likely to increase the severity of flood events
LCR8 Improving broadband speed	Increasing broadband speed has the potential to reduce local carbon emissions by enabling more people to work from home and encouraging new businesses to the area	**MI4** High speed broadband	High speed broadband infrastructure is increasingly becoming a concern for businesses with new technology and communication requirements
WP1 Growing population size and external pressures present the opportunity to improve water quality alongside growth	Improving water quality alongside growth will have knock on benefits for the whole economy and the environment	**WP2** Water quality	Growing population and size could increase demand for resources resulting in declining water quality
DaP4 An LEP wide approach to establishing a biosecurity defence system	An LEP wide approach to establishing a biosecurity defence system. This will ensure that detection and response is quick enough to prevent negative impacts to the economy, especially as there is no current specific body allocated to invasive non-native species in Suffolk as there is for Norfolk	**Foo6, DaP2** Threat of introduced pests and diseases	Climate change in combination with greater capacity at ports in the LEP could increase the risk that pests and diseases are brought into and/or transferred within the LEP

Hea1, Rec11 Increase non-motorised infrastructure and public transport links	Increase connectivity and access by improving non-motorised routes and public transport links. Awareness raising of these services should also be carried out	**FR10, FR3, LU1, FR8** Lack of infrastructure	Failure to meet Government targets for energy supply from renewable sources by 2020. Investors are likely to be deterred by the lack of infrastructure. This includes transport connections (particularly in relation to coastal areas), grid capacity for large scale renewable development and potentially port infrastructure. A linked issue is changes to the feed-in-tariff for renewables which creates uncertainty and could limit investment in infrastructure. The skills deficit also limits new technologies and workforce
GR1 Increase strategic design of biodiversity for new developments and infrastructure	Increase strategic design of biodiversity for new developments and infrastructure. For example, where there are several different developers in one area, plans could be considered in conjunction, which would aid in the preservation and enhancement of ecological networks. New infrastructure such as roads and cycle ways, should incorporate biodiversity, such as the insertion of hedgerows	**Rec1, GR12,Noi1** Tourism and resource use	Growth in tourism could put pressure on already stressed resources (e.g. water) and transport infrastructure

Note: As a refining process was used to establish the top 10 opportunities and threats, some of the top 10 are amalgamations of more than one opportunity or threat. The codes refer to those represented (see accompanying spreadsheet).

2. Economic development indicators and pathway

2.1.Indicators for the whole LEP

2.1.1. Gross Value Added (GVA) data

New Anglia's economic indicators are lower than the national average. Growth rates in the region were around 4.8% compared to 5.4% in England for the period 1998 to 2008. GVA per capita relative to all LEPs did not change significantly in this period and the region is characterized by having below national average productivity levels[3]. This is largely related to the structure of the local economy and the relatively low skill-base of its workforce. Local efforts are attempting to address these issues and therefore the region's economic performance may converge with national levels in the long run.

The most dynamic sectors in the New Anglian economy are those based in tourism, energy and business support. A breakdown of GVA per sector is given in Figure 2.1.1.a. This figure also shows the percentage change in GVA between 1995 and 2008.

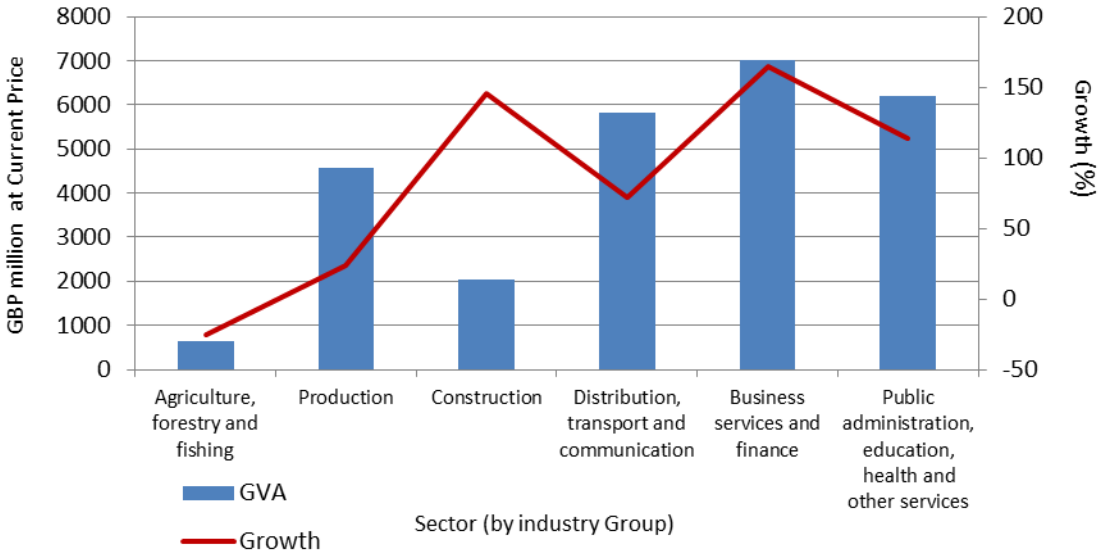

Figure 2.1.1.a: Most active sectors in New Anglia's and growth trends from 1995 to 2008. Source: Office for National Statistics

In this period, business services, insurance and finance, was the most dynamic sector experiencing a 164% growth since 1995. Construction has the second highest GVA growth rate with an increase of 145%. At the other end, the agricultural sector has experienced a declining trend of around 25% while production (manufacturing) has increased by 23%. This suggests an ongoing structural change in the local economy during the period reviewed. It is noted however, that these changes may be a reflection of how industries have changed in terms of their employment structure.

[3] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

Despite these changes, Figure 2.1.1.b illustrates how productivity measured by GVA per capita has been in decline in the region since the mid 1990's in relation to the UK average disaggregated by County. Suffolk has traditionally performed better than Norfolk and amid recent changes, this remains the same. It is important to note that National GVA levels include London; characterised by high productivity levels. All LEP's have suffered under current economic conditions and since 2008 there has also been an overall declining trend in productivity[4].

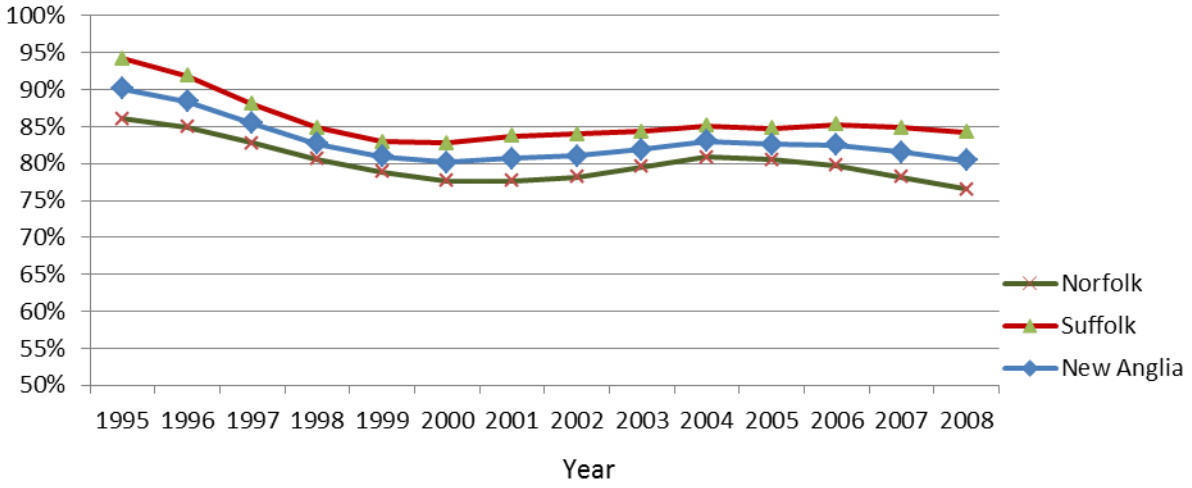

Figure 2.1.1.b: Decline in GVA per Person in New Anglia compared to National Average (National=100%) and disaggregated by county. Source: Office for National Statistics.

Declining economic performance is a general pattern of the national economy in current economic conditions. However, the current economic downturn is affecting key sectors for New Anglia such as the business support sector including finance and insurance as well as manufacturing[5,6]. It is estimated that between 2008 and 2010, more than 8,000 jobs were lost across all growth sectors as well as around 1,500 businesses in New Anglia[5].

The insurance and financial sectors have been at the centre of economic change in New Anglia. These have suffered the highest losses; their output almost halved during this period, and the region's output declined from £15.2 billion to £11.8 billion as consequence[5]. Recovering the economy from current difficult times is at the top of the economic development agenda in New Anglia. Therefore, making local business more competitive is a key priority in the region.

[4] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

[5] New Anglia (2013), Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf.

[6] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

2.1.2. Trend in population for LEP

In the period 1994 to 2010, average population growth in New Anglia was 0.72% per year. This is similar to the regional average and significantly higher than the national average of 0.52%. This difference is narrowing in recent years due to a reverting population trend. A sharp decrease in New Anglia's population growth was experienced since 2009, whilst the opposite occurred at the national level (Fig. 2.1.2.a). Population growth was estimated at half a million people per year in 2009 and 2010 in the U.K.

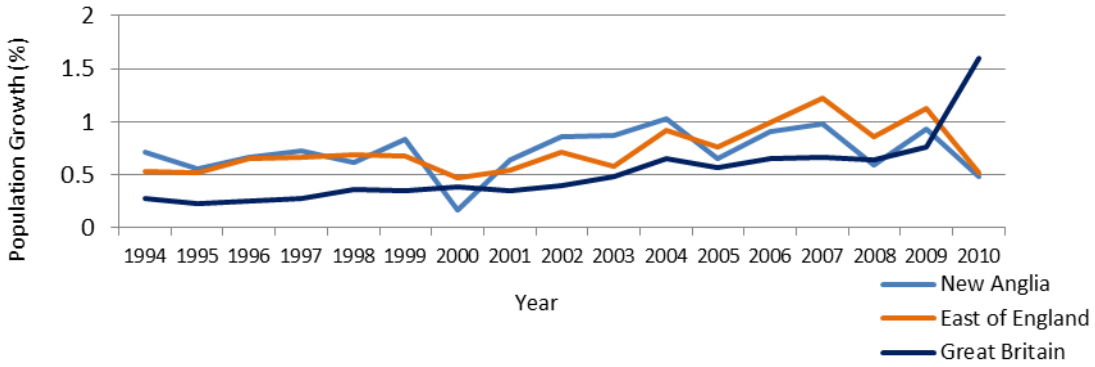

Figure 2.1.2.a: Population Growth, New Anglia compared to East of England and UK average (%). Source: Office for National Statistics.

With births and deaths comparatively equal, net migration is the main driver for demographic change, both in New Anglia and in the U.K[7]. There are however important differences in migratory trends.

While national population growth is mainly driven by net migration in the working age group (16-64), this is mainly produced by people in the 65 and over group in New Anglia. This contributes to an older age profile in New Anglia compared to other LEPs. The percentage of people in the 65 and above group is 20% compared to 19% in the East of England and 16% in the UK. In Suffolk, the high proportion of those aged 65 and over makes the County the eighth oldest of any sub-region in Britain[8]. In Norfolk, over a fifth of the population is 64 and over and 1 in 10 people are 75 and over. Norfolk has a much higher proportion of people aged 55 and over in comparison to national figures whilst the opposite occurs in the younger age groups[7].

An older age profile is also reflected in the percentage of working age people. As Figure 2.1.2.b portrays, New Anglia has 2% less people in this group in comparison to the Eastern Region and the UK as a whole. This is not however a good representation of the main urban areas such as

[7] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

[8] The Local Futures Group, (2006). The State of Suffolk: An Economic, Social and Environmental Audit of Suffolk. Report, October 2006. Accessed at: http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

Ipswich in Suffolk and Norwich in Norfolk, where the percentage of working age population is significantly higher[9,10].

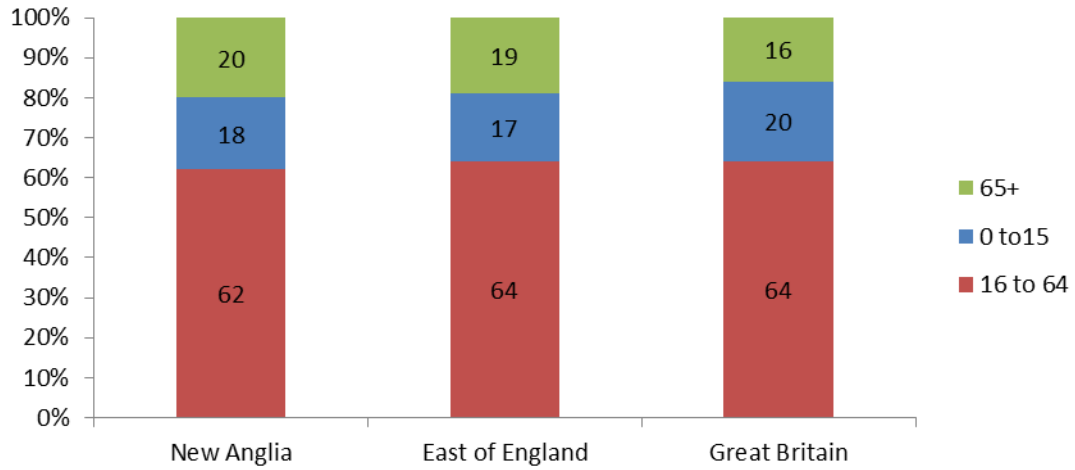

Figure 2.1.2.b: Percentage of people aged 15-64 in New Anglia compared to East of England and UK. Source: Office for National Statistics.

Assuming that these trends will continue in the same direction, it is projected that New Anglia will have a higher population growth than most other regions over the next 20 years with a particular increase in the older age group[11].

2.1.3. Commuting patterns

New Anglia is characterized by low productivity with comparative low earnings. Amid some recent changes, people who work in the region earn less than people who live in the region but work outside[10]. Given the geographic location of the area, labour markets are to some degree disconnected and self-reliant (this is perhaps more relevant to Norfolk). Nevertheless, only 37.6% of managerial, professional and technical positions are held by residents. This is below the 43.8% average for England suggesting that high skill workers tend to commute from other regions[12].

[9] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

[10] The Local Futures Group, (2006). The State of Suffolk: An Economic, Social and Environmental Audit of Suffolk. Report, October 2006. Accessed at: http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

[11] Corke S and Wood J (2009): Portrait of East of England, National Trends 41. Office for National Statistics Report, 2009.

[12] New Anglia (2013). Plan For Growth. Outline Approach. PowerPoint presentation, New Anglia 2013.

Job density (number of jobs relative to the resident workforce) is lower in New Anglia compared to UK but similar to East of England's levels at 0.78 jobs per working age resident (see Fig. 2.1.3.a). The region, however, has one of the highest employment rates in the country with 76% of the economically active population employed in 2012 (see Fig. 2.1.4.a in next sub-section).

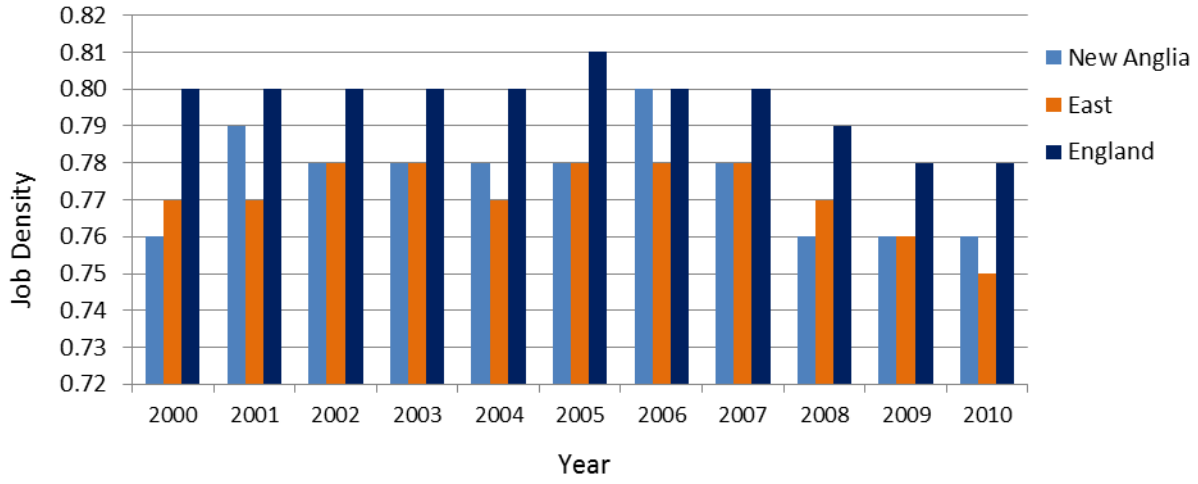

Figure 2.1.3.a: Job Density in New Anglia, East of England and England. Source: Office for National Statistics

Within New Anglia, there are important differences between Suffolk and Norfolk. Job density is increasing in Suffolk while the opposite is taking place in Norfolk (Fig. 2.1.3.b).

Although overall connectivity is low compared to other counties, Suffolk is better connected than Norfolk. Suffolk's commuting levels however are low on average, with 30.8% of jobs in each district taken by non-residents relative to the UK average of around 40%. The proportion of residents who work elsewhere is also low at 32.2% in Suffolk compared to 39% in the UK.

It is important to note that these figures are highly influenced by Ipswich and St. Edmundsbury that are leading the economic change in the county, becoming increasingly important labour importing regions[13].

[13] The Local Futures Group, (2006). The State of Suffolk: An Economic, Social and Environmental Audit of Suffolk. Report, October 2006. Accessed at: http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

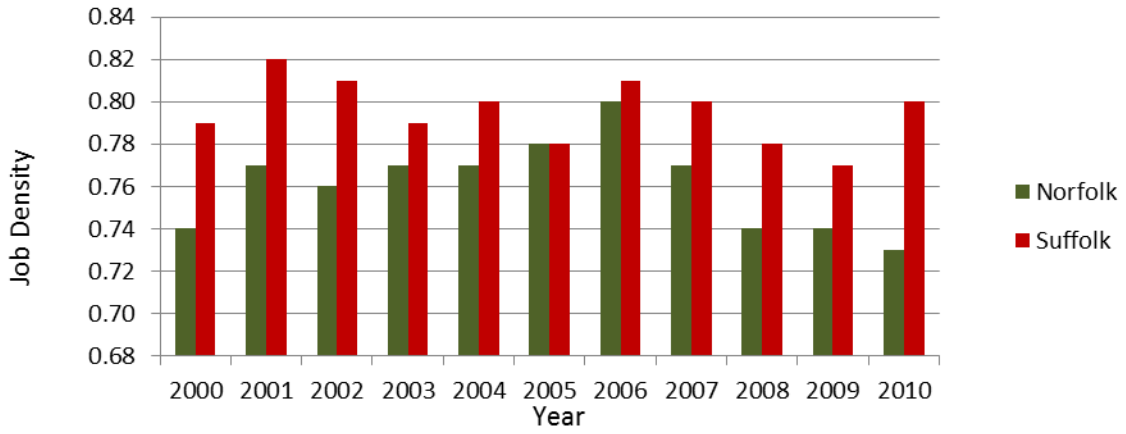

Figure 2.1.3.b: Job Density in Norfolk and Suffolk (number of jobs by working age population). Source: Office for National Statistics.

Despite figures suggesting low levels of inter-regional commuting, a larger proportion of the workforce use their cars to commute to work compared to the East and the UK averages; 66.9% compared to 64.7% and 61.18% respectively.

Public transport use in Suffolk is substantially below averages from the East of England and the UK at 5.82% compared to 10.8% and 14.8%. This is understandable taking into account that most businesses in Suffolk are country-side based and clustered in key urban centres such as Ipswich and St, Edmundbury, suggesting rural-urban commuting patterns[14].

Due to its relative remoteness, Norfolk's commuting patterns are likely to be more intra-regional than inter-regional. Although the information available in this area is limited, method of travel to work data in Norfolk suggest that around 70% of the population use short-distance travel methods, works at home or walk to work. The remaining 28% travel mainly by car or van, and only 0.8% use the train.

Economic change coupled with a shrinking workforce and low qualification levels compared to national levels could indicate that the regions would become a net importer of high-skilled labour.

2.1.4. Employment rate LEP twenty years to present

New Anglia's employment rate is high compared to UK levels. New Anglia accounts for around 76% of the working age population in employment compared to 70.5% nationally. Employment rates have been the same for the last decade, experiencing only a 0.8% increase in the period 2004 to 2012 and are consistently higher than national rates (Fig. 2.1.4.a).

[14] The Local Futures Group, (2006). The State of Suffolk: An Economic, Social and Environmental Audit of Suffolk. Report, October 2006. Accessed at: http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

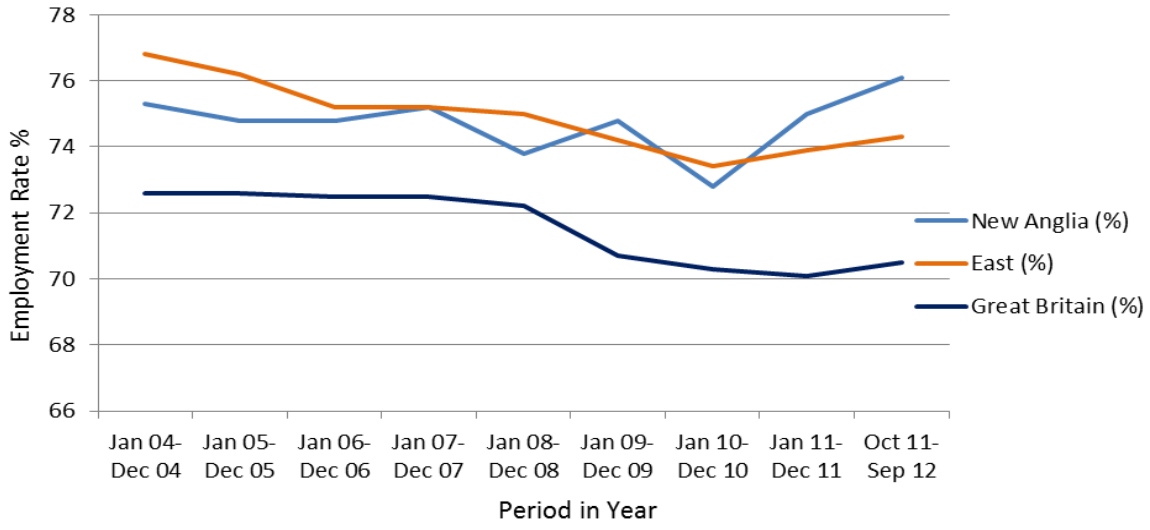

Figure 2.1.4.a: Employment rates in New Anglia, East of England and Great Britain 2004-2012 (%). Source: Office for National Statistics

Within New Anglia, employment rates in Suffolk are higher than in Norfolk. In September 2012, 77.6% of the working age population was employed in Suffolk compared to 75% in Norfolk.

Above average employment rates cannot then explain why the region is falling behind regional and national growth levels. It becomes clear however, that employment in New Anglia is not as productive as the national average since the economy needs more workers to produce less in relative terms.

2.1.5. Productivity

Productivity in New Anglia, measured by GVA per hour worked, is low relative to the UK average. This is normal, taking into account that above average productivity levels in London pushes national figures up.

Nevertheless, New Anglia's, productivity levels have declined slightly compared to the UK as a whole. Norfolk has lower productivity than Suffolk in terms of both GVA per hour worked, and GVA per filled job. Both counties have lower productivity levels compared to the East of England and East Anglia. This is presented in figures 2.1.5.a and 2.1.5.b where local and regional productivity levels are expressed as percentage of national average (UK=100%).

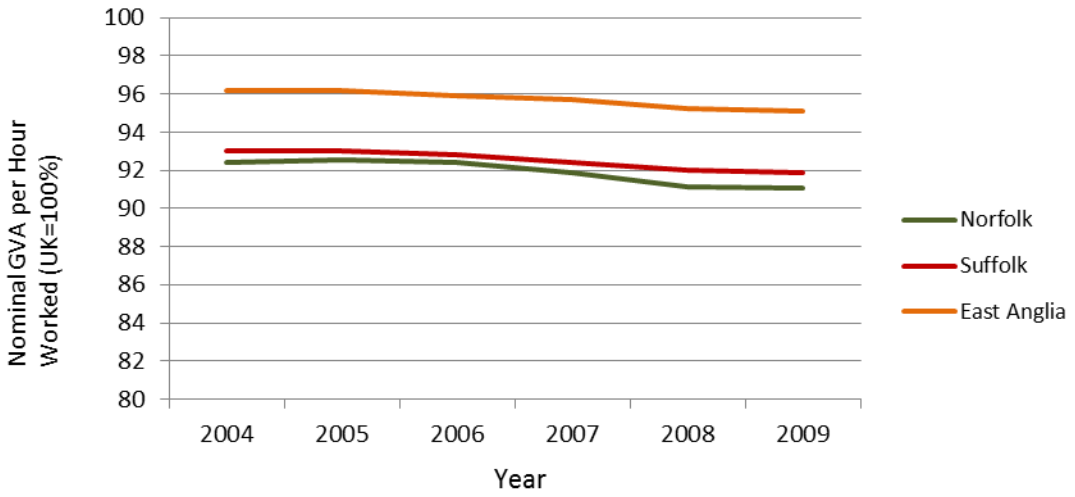

Figure2.1.5.a: Nominal GVA per hour worked, NUTS2 and 3 regions as a percentage of the UK 2004-2009. Source: Office for National Statistics.

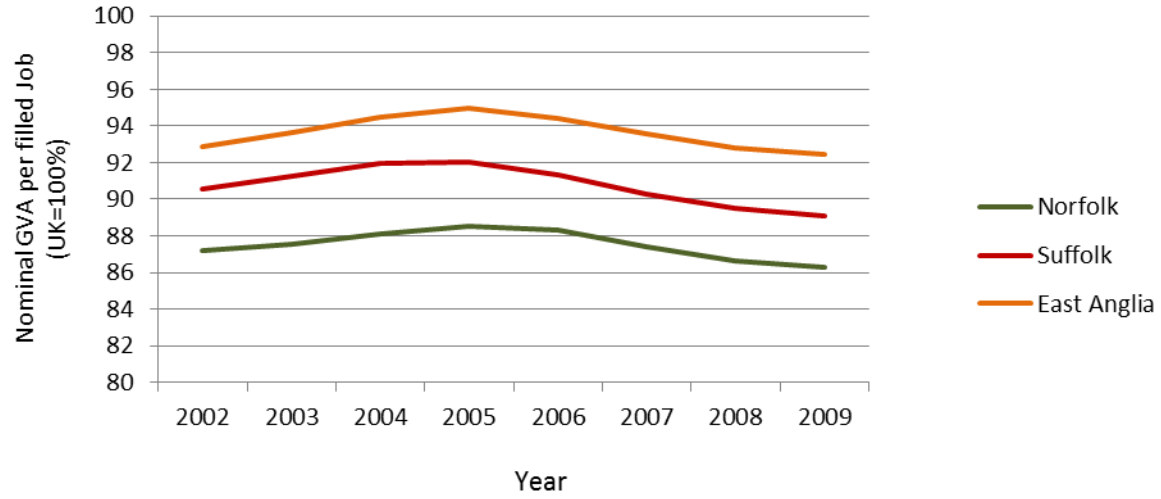

Figure 2.1.5.b: Nominal GVA per filled job, by NUTS 2 and 3 region, as a percentage of the UK 2004-2009. Source: Office for National Statistics.

Low productivity explains relatively low GVA in the LEP despite high employment rates. It also reinforces the view pinpointing New Anglia's low-value oriented economic structure.

As the economy in New Anglia moves towards higher value economic segments, and improvements in the local skill-base take place, it is expected that productivity levels will improve as well as GVA.

Data however, suggest that these changes will not be as profound so as to change the employment structure. Productivity levels are lower when measured by per filled job indicators as it is portrayed in Figure 2.1.5.b. This might be an indication that despite a changing economic structure, employment creation continues to be driven by lower value sectors.

2.1.6. Qualifications level

Qualification levels in New Anglia are generally lower in comparison to the East of England and UK averages. In the period 2004 to 2010, the percentage of population in New Anglia holding level 2 NVQ qualifications was higher in comparison to the UK average; 17% to 15.5% respectively. Nevertheless, UK levels were significantly higher for NVQ 3 and NVQ 4 (Fig. 2.1.6.a).

In the case of NVQ level 4, New Anglia's level was about 5% lower than the UK average at 22.9% compared to 28.3%. These figures suggest that the population of New Anglia spends less time in education than the UK population as a whole.

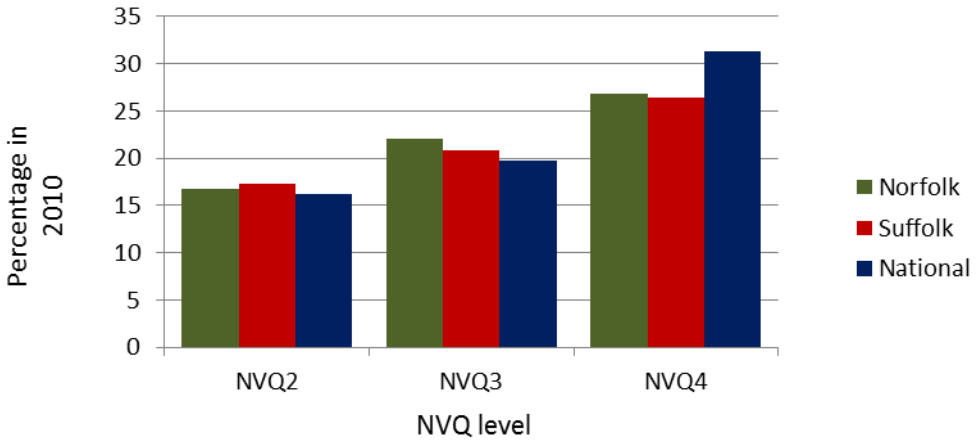

Figure 2.1.6.a: Qualifications levels in LEP compared to national levels by NVQ level (% population). Source: Office for National Statistics.

New Anglia's recent economic development, coupled with local initiatives for improving the qualification-base in the region are driving qualification levels up, slowly converging them with regional and national levels[15].

Data suggest a progressive, even though mixed, improvement in qualification levels over time. Qualification levels in New Anglia seem to be converging with the national average at the lower levels with a widening gap at the higher levels. Data also suggest an important improvement over the last 6 years in NVQ3 rates, coming from 1% below to outperforming the national average by 1.1% in the period 2004 to 2010. However, there is still a significant gap when considering NVQ 4 qualifications that has marginally widened during the same period.

On-the-job training is becoming an alternative for college qualifications. Figure 2.1.6.b shows how from 2005 to 2009 the percentage of people obtaining alternative types of qualifications outperformed the national average before converging in around 2010. These might not be recognized as an official qualification but they contribute to the overall skill base of the region. Apprenticeships and internships are often within key sectors of the economy that have been

[15] New Anglia (2013). Plan For Growth. Outline Approach. PowerPoint presentation, New Anglia 2013.

identified by local authorities as the engine for growth in the region. They are also a product of good coherence and cohesion in joint efforts between local authorities and the private sector[16].

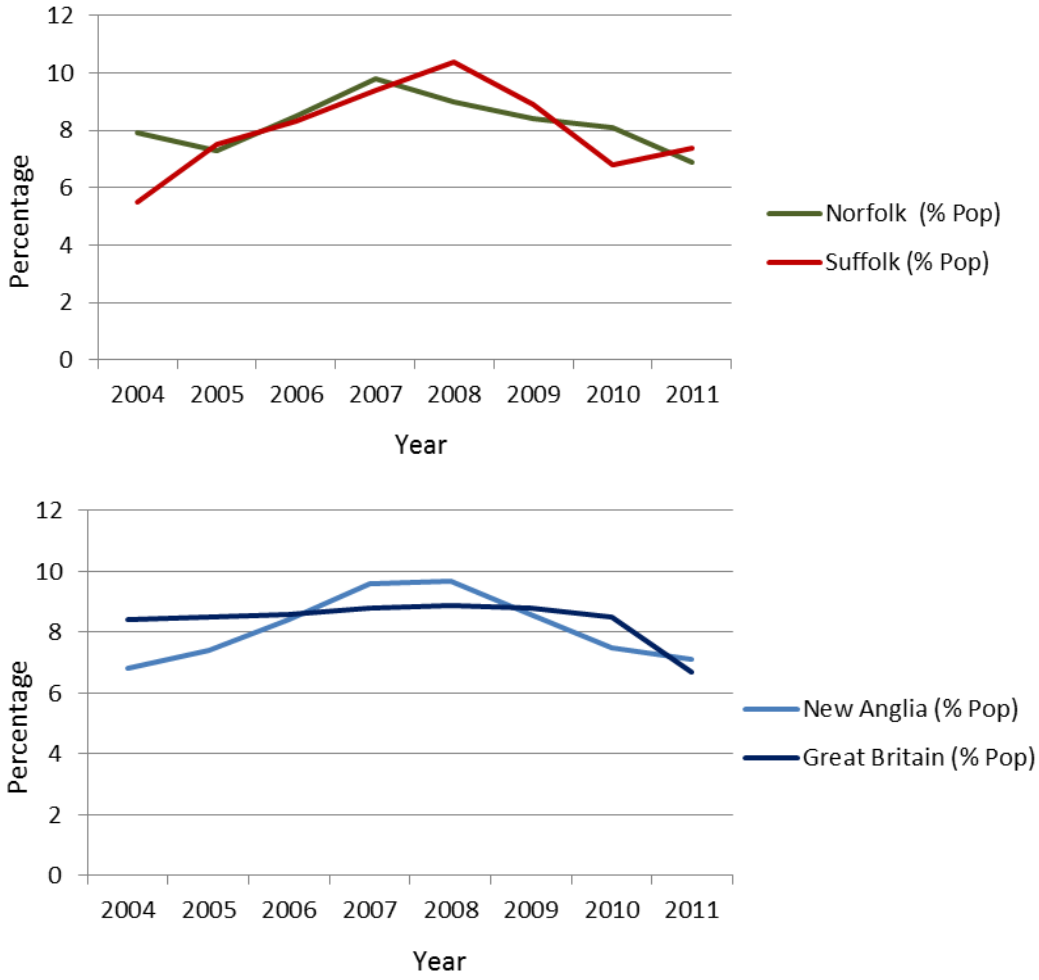

Figure 2.1.6.b: Alternative qualifications in New Anglia compared to national levels (% of working age population). Source: Office for National Statistics.

During the same period, New Anglia experienced a significant decrease in the percentage of the population without any type of qualifications. Data show the percentage of people without qualifications has been reduced from 18.5% in 2005 to 10.3% in 2010. Compared to national figures, New Anglia started this period with 3% more un-qualified people than the national workforce. By the end of 2010 the percentage of the workforce without any type of qualifications was 0.3% smaller in New Anglia than nationally.

It is hoped that this trend will continue in the near future as there are many initiatives, such as the enterprise zone, that are attracting new businesses to the region, and investments to

[16] For more information visit www.thesource.me.uk for Suffolk and www.norfolk.gov.uk/Business/Apprenticeships_Norfolk/index.htmNorfolk for Norfolk.

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activate the economy further have recently been pledged[17,18]. Thus, headline figures might mislead us to think that the region is falling behind national averages in terms of qualifications when in fact this might not be the case.

2.1.7. Indices of Multiple Deprivation (IMD)

New Anglia has a smaller percentage of Lower Level Super Output Areas (LLSOAs) in the most deprived quintile in England than any other region apart from the South East (Fig. 2.1.7.a). This is due to a low percentage of workless households, 13% compared to 16% nationally. Deprived areas are predominantly in Great Yarmouth and North Norfolk where average employment rates since 2004 are well below the regional average of 74.7% at 67% and 72% respectively. Kings Lynn also has an important share of most deprived areas. A key factor behind deprivation in these areas is the high percentage of people living entirely on benefits[19].

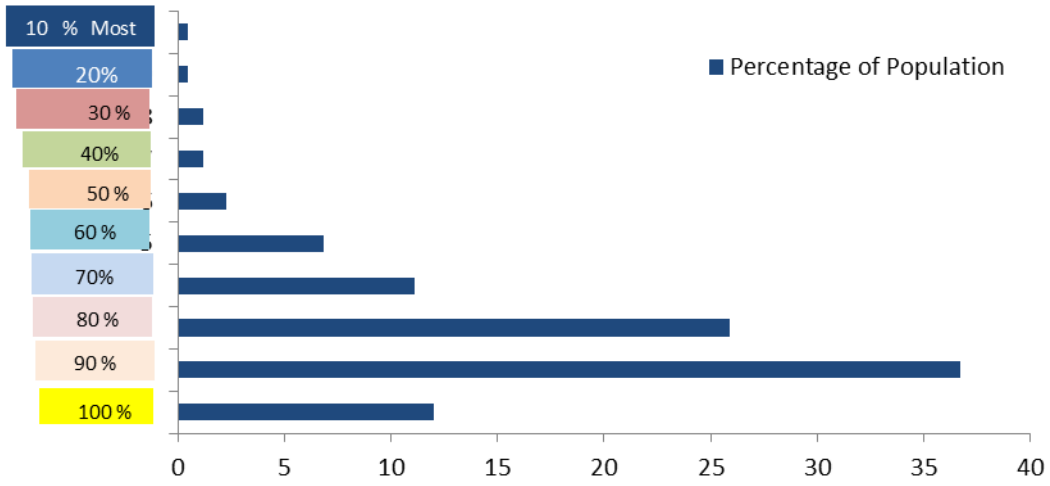

Figure 2.1.7.a: Percentage of Population in each Decile of Index of Multiple Deprivation. Source: Data from Department for Communities and Local Governments, available online at https://www.google.com/fusiontables/DataSource?dsrcid=622724.

Workless-ness might not be entirely related to poor economic performance as one would be inclined to think. Some areas such as great Yarmouth are recently hosting rapidly expanding

[17] New Anglia (2013): Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf.

[18] Finn E (2013): EDP News article, 'Get Set for Investments of'. Insight Energy, Eastern Daily Press 24. Tuesday, March, 2013. Accessed at: http://www.newanglia.co.uk/Assets/Files/Content/EADT%20Insight%20Energy%20P16%205.3.13.pdf

[19] Corke S and Wood J (2009): Portrait of East of England, National Trends 41. Office for National Statistics Report, 2009.

industries and large investment influxes from companies within Enterprise Zones. This is coupled with strong public investment in infrastructure. Despite these developments, the LEP area still ranks amongst the highest Indices of Multiple Deprivation (IMD) levels in the country. Norfolk ranks 90th and 99th of most deprived areas out of 147 authorities, whilst ranking 8th in terms of employment rates[20].

New Anglia's employment rate is above national averages and the regional economy is experiencing a rapid expansion of high GVA sectors, generating further employment. Figure 2.1.7.b gives a snapshot of the key sectors at the forefront of employment creation.

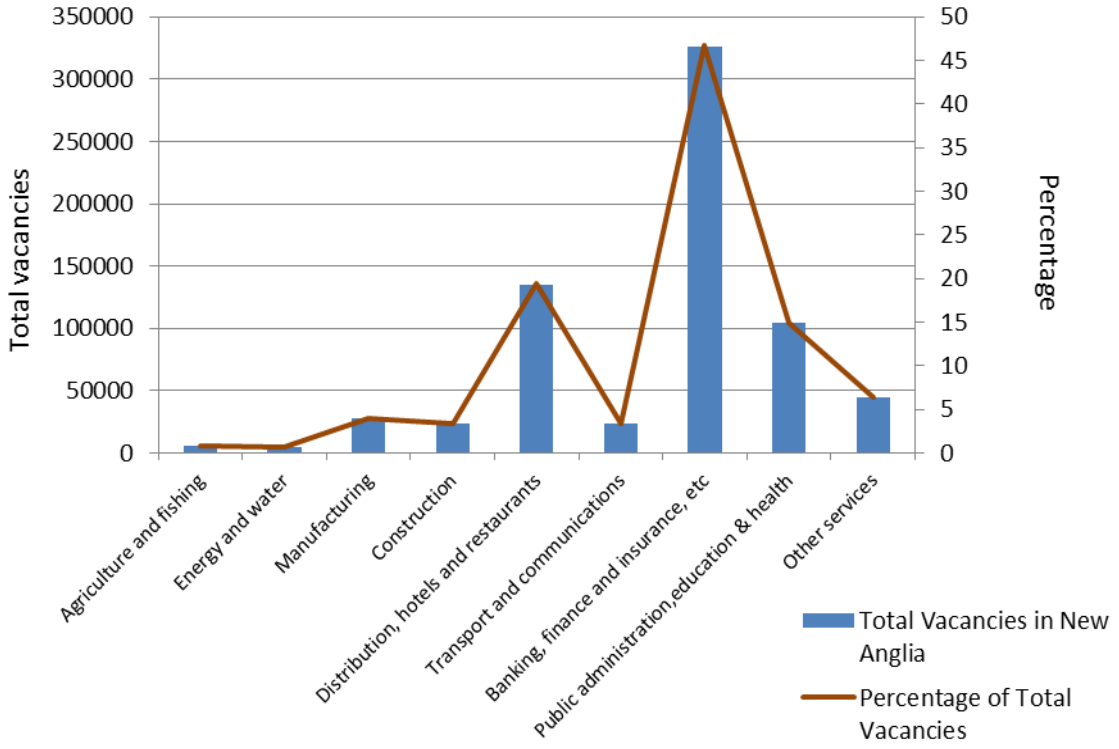

Figure 2.1.7.b: Vacancies per sector and percentage change of Vacancy creation (2005-2012). Source: Office for National Statistics.

Hence, labour demand is increasing. Low qualifications levels however, may be a limitation for the resident population to benefit from these growth areas. Figure 2.1.7.c suggests that the percentage of people in deprived areas in New Anglia holding NVQ3 and NVQ4 qualifications is significantly lower than the regional average. This may be the reason that deprivation is subjected to the competition areas of the LEP being disconnected in Labour Market terms from strong performance rather than caused by poor economic performance.

[20] Norfolk Insight, (2012) Local Economic Assessment for Norfolk. Report. Available online at: http://www.norfolkinsight.org.uk/lea

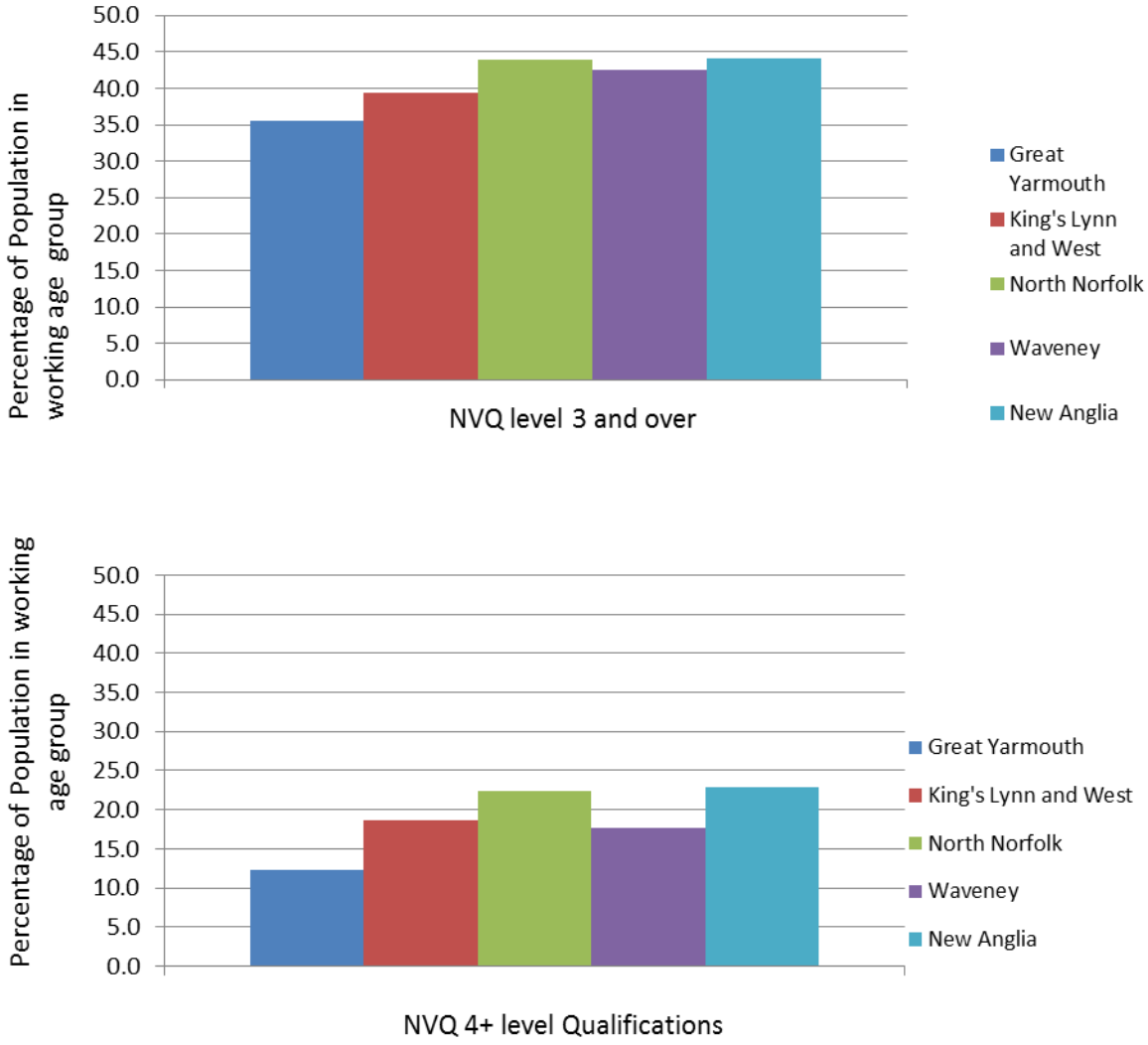

Figure 2.1.7.c: Qualification Levels (%) in Most Deprived Areas. Source: Office for National Statistics.

2.1.8. Section overview

New Anglia's relatively low economic performance is largely due to a less than dynamic business environment in the region. Stable or static entrepreneurship levels are found in New Anglia measured by the low number of new business and business per 1,000 residents, and low enterprise deaths. This is not necessarily negative altogether if the existing business stock remains innovative and competitive. What becomes clear is that the area is relatively dependent on industries and activities with a long local history, rather than new emerging industries[21].

Most growth sectors, however, have suffered during the recent economic downturn. The insurance and financial sectors have been at the centre of economic change in the region

[21] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

suffering the highest losses; their output almost halved during this period. The region's output declined from £15.2 billion to £11.8 billion[22].

Nevertheless, there are several positive aspects that might suggest that the economy is forging a strong growth base. Improvements in the pool of human capital have been made and key growth sectors are often high-value oriented. Recessions and economic crises also bring some advantages to local economies and businesses. New business models and innovation tend to emerge, there is higher interest in entrepreneurship and there is a higher acceptance of change[23].

2.2. Geographical variation within LEP

2.2.1. Central economic results

There are significant similarities in the structures of the two major economies within New Anglia; Norfolk and Suffolk. There are also important differences that are important to future economic planning.

Norfolk's economy is slightly larger than Suffolk's and this difference has widened in recent years. In the period 1995 to 2008, both economies experienced a rapid expansion, growing by more than 80%. On average, the economy in Norfolk has grown 1.7% more in GVA in relation to Suffolk in this period (Fig. 2.2.1.a). Suffolk's productivity levels are on average 5% higher than in Norfolk as data from the same period reveals.

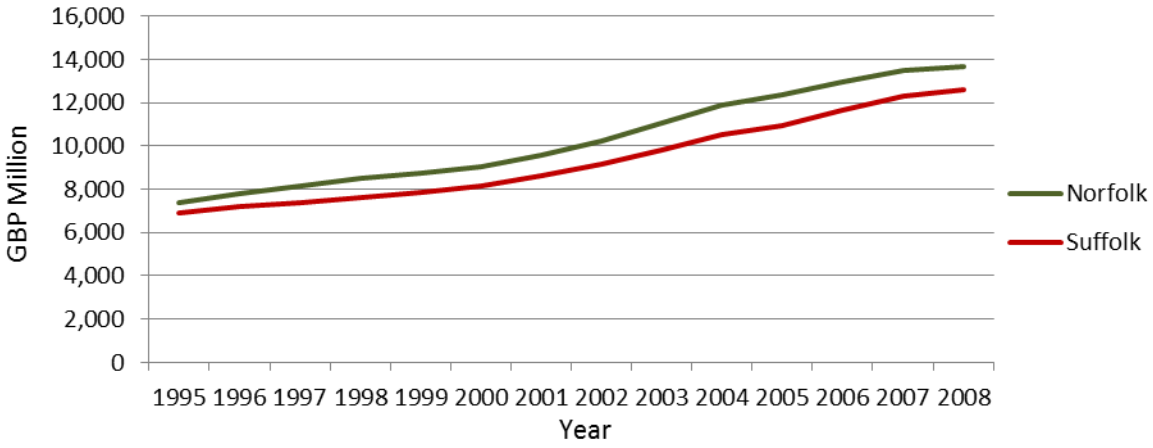

Figure 2.2.1.a: GVA in Norfolk and Suffolk, long-term trend (Workplace based GVA at basic prices, £ million). Source: Office for National Statistics.

Economic growth in both counties is driven by growth in high value sectors. In Norfolk however, employment patterns reveal that the economy is largely oriented to relative low and

[22] New Anglia (2013), Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, February 2013.

[23] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

medium value sectors. Thus, suggesting that the structural changes in the economy are not as profound as indicated by GVA per sector figures in section 2.1.

Business support services, including insurance and finance are the main sectors behind increasing GVA levels. They are attributed around 25% of Norfolk's GVA and employ just 17.9% of the workforce altogether. The tourism industry is estimated to employ over 14% of the workforce both directly and indirectly. This is just 3.9% less than the business support, finance and insurance sectors combined, even though it contributes substantially less to the local economy's GVA at £2,582 million against £4,000 million[24].

New Anglia is listed as having an industrial specialism in 'food products' based on employee share in 2010[25]. In addition, current data suggest that the manufacturing sector in Norfolk contributes about £2,100 million to the local economy, representing 16% of total GVA and employing 10.8% of the workforce compared to a national average of 8.8%.

Figure 2.2.1.b compares Norfolk's workforce occupation structure by skill-level, compared to England and the East of England. Norfolk's professional, scientific and technical employments, those considered high-skill and high-value, account for about 10% less in Norfolk in relation to regional and UK levels. At the other end, lower skill employments take up the majority of the working age population in Norfolk. This is consistent with low-productivity per worked hour and per filled job data discussed in the previous section. It is important to note that low skill sectors are more likely to rely on part-time or seasonal work than the high skill sector[26]. This in turn deteriorates productivity even further (i.e. less training).

[24] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

[25] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

[26] Jones E and Dukes D (2013): Planning Analyst, Norfolk County Council and Economic Development Manager, Norfolk County Council; Personal consultation, 14th February 2013.

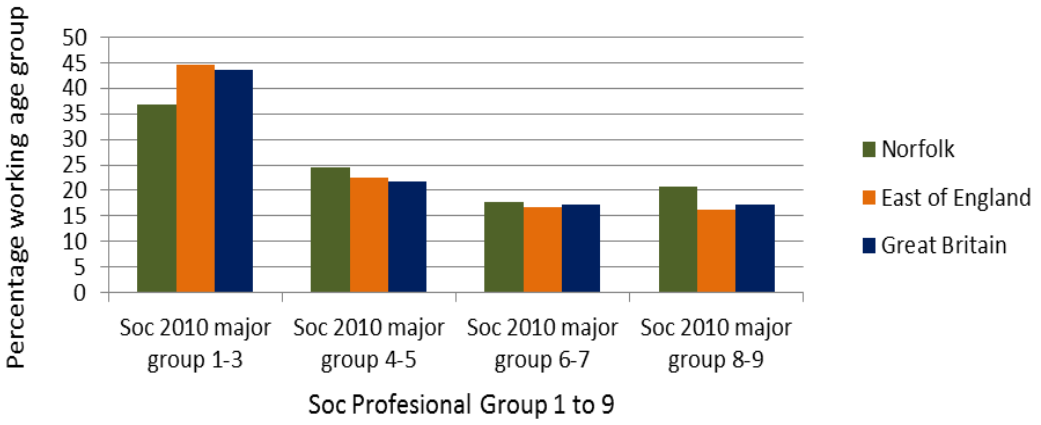

Figure 2.2.1.b: Norfolk's Standard Occupational Groups 1 to 9 by skill level in Comparison to Regional and National figures. Source: Office for National Statistics. Group 1-3 = Senior Managers, Senior Officials and High-Technical Jobs. Group 4-5 = administrative, secretarial and skilled trades occupations. Groups 6-7 = Customer Service, sales, care and leisure occupations. Groups 8-9 = manufacturing and elementary occupations.

Several factors of Norfolk's economy also suggest a less than dynamic business environment. Business start-ups in Norfolk are well below national and regional averages with 2,330 new businesses in 2010; a 7.8% increase from the previous year. This is relatively low against 9.7% in the East of England and 10.4% in the UK as a whole[27].

In 2010, 3,220 business closures were registered, a 10.7% increase compared to previous years. This is also low compared to a 12% rate in the East of England region and over 13% nationally. Business survival after 5 years is better in Norfolk than regional and national averages. Forty eight per cent of businesses were still active after 5 years since they started, compared to 46.1% regionally and 44.1% nationally[27]. Business closure figures portray the general understanding that the region has responded better to turbulent economic environments than the rest of the country. This is reinforced by survival of enterprises figures.

Nevertheless, a low number of start-ups and high business survival rates could also suggest a lack of economic dynamism. This is whereby existing enterprises do not find competition in the market, enabling a relatively easy market share capture while erecting barriers to entry for newcomers.

Hence, a relatively low value oriented economic structure intertwined with low productivity and a lack of economic dynamism might explain Norfolk's low economic performance compared to regional and national levels.

Suffolk's economy follows similar patterns to Norfolk's in terms of structure. Higher productivity in relation to Norfolk, however, may have arisen due to local efforts to move from relying primarily on low to medium skilled sectors towards a high skill, advanced

[27] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

manufacturing sector[28]. Occupation patterns suggest that the percentage of people working in the high skill segment in Suffolk is higher than Norfolk. Suffolk has however, an above average workforce employed in the second and third tier of the skilled employment ladder (Fig. 2.2.1.c).

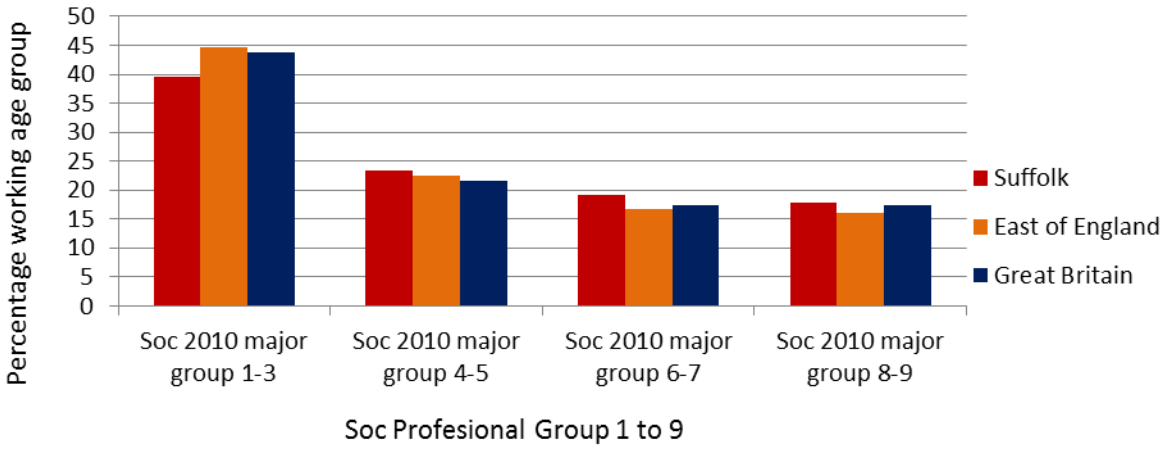

Figure 2.2.1.c: Suffolk's Standard Occupational Groups 1 to 9 by skill level in Comparison to Regional and National figures. Source: Office for National Statistics. Group 1-3= Senior Managers, Senior Officials and High-Technical Jobs. Group 4-5 = administrative, secretarial and skilled trades occupations Groups 6-7= Customer Service, sales, care and leisure occupations. Groups 9-9=manufacturing and elementary occupations.

This is consistent with structural changes experienced in Suffolk's economy. Suffolk's increasing business sectors such as finance, insurance and business support have grown around 20% more than in Norfolk (Fig. 2.2.1.d). In addition, a shift towards 'knowledge-based manufacturing' is increasingly gaining momentum as the region hosts high skill manufacturing companies whist several strategies for improving the business environment and the workforce's capabilities were put in place[28].

[28] The Local Futures Group, (2006). The State of Suffolk: An Economic, Social and Environmental Audit of Suffolk. Report, October 2006. Accessed at: http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

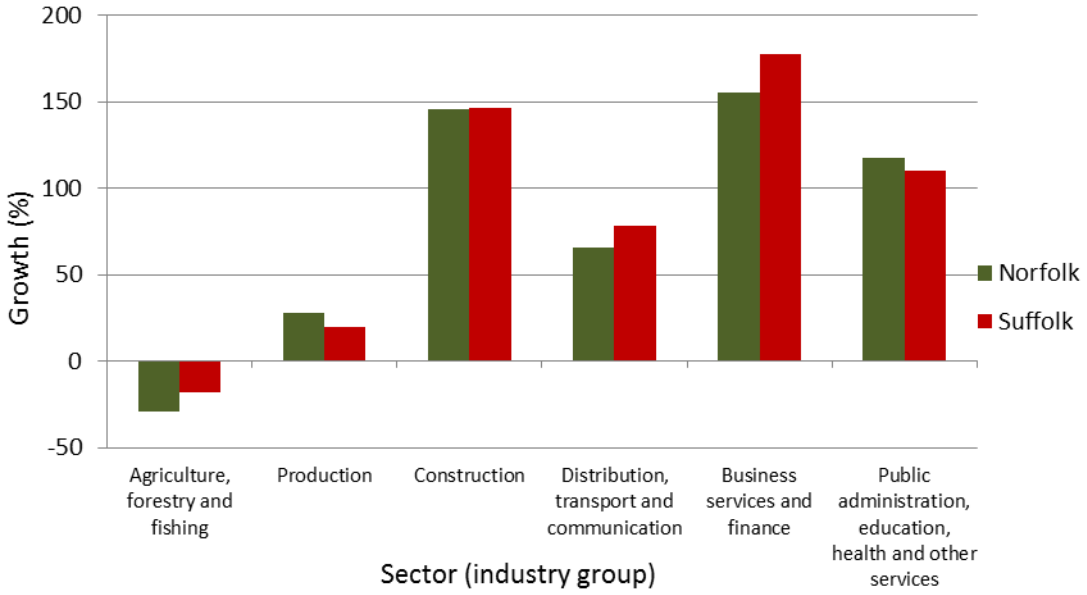

Figure 2.2.1.d: Comparison of Norfolk and Suffolk's fastest growing sectors (% growth between 1995-2008).
Source: Office for National Statistics.

Suffolk's proximity to London and the rest of the East of England in relation to Norfolk might also affect economic performance in the form of commuting patterns. In this case, it is important to point out that commuting patterns are similar between these two regions and significantly below regional and national levels. On average, there is no difference between inward and outward commuting patterns. There are important limitations for making a detailed assessment in this respect due to lack of data and the fact that commuting patterns do not reveal skills, occupation and other trends. Thus, we are inclined to attribute these differences to real economic differences rather than commuting patterns.

2.2.2. Employment results for LEP twenty years to present

Within New Anglia, employment rates in Suffolk are higher than in Norfolk. In September 2012, 77.6% of the working age population was employed in Suffolk compared to 75% in Norwich.

The period 2008 to 2011 represents a sharp decline and steady recovery in employment rates in both counties due to the economic downturn. This is presented in Figure 2.2.2.a. Employment rates in both counties did not recover until September 2012.

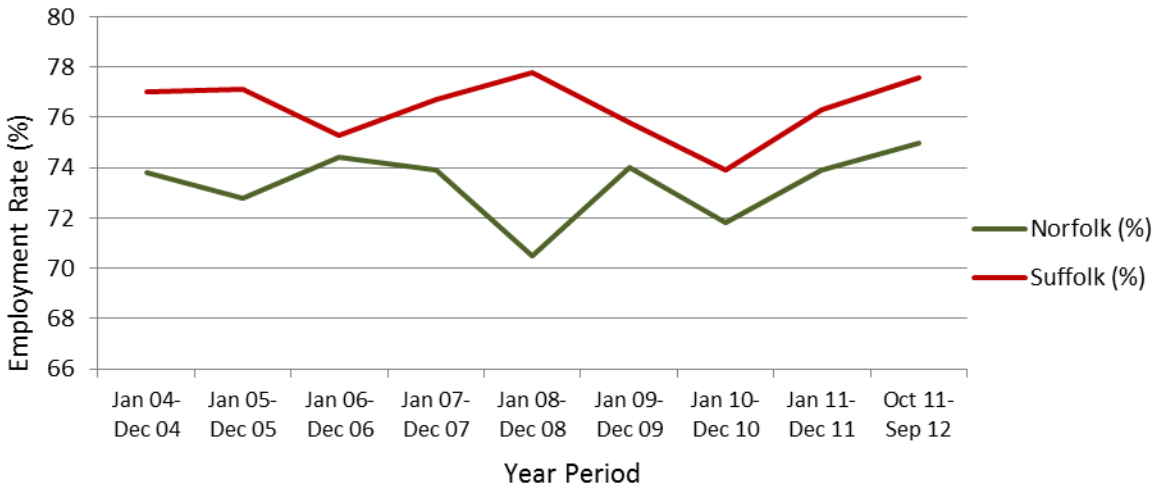

Figure 2.2.2.a: Time Series employment rates between Suffolk and Norfolk. Source: Office for National Statistics

As discussed in the previous section, Suffolk's professional groups account for larger proportions of the workforce relative to Norfolk however, Norfolk's economy is larger than in Suffolk. In addition, although official figures for the two regions suggest stable levels of part-time employment at around 35%, it is thought that the region has experienced a sharp increase in this type of employment to the detriment of full-time employment as a result of the recession[29].

In summary, employment data does not explain differences in economic performance between Norfolk and Suffolk. However, they might support the view that the structure of the local economy plays an important part in determining these differences. With similar employment rates but different labour market structures, it become clear that productivity is a key underlying driver behind economic differences between Suffolk and Norfolk.

2.2.3. Productivity results for LEP twenty years to present

Norfolk and Suffolk's productivity levels have slightly declined compared to national levels in the period 2004 to 2009. In 2009, Norfolk had lower productivity levels than Suffolk in terms of both GVA per hour worked and GVA per filled job. Both counties however, had lower productivity levels in the same year compared to the East of England and with East Anglia. This is presented in Figures 2.2.3.a and 2.2.3.b.

[29] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

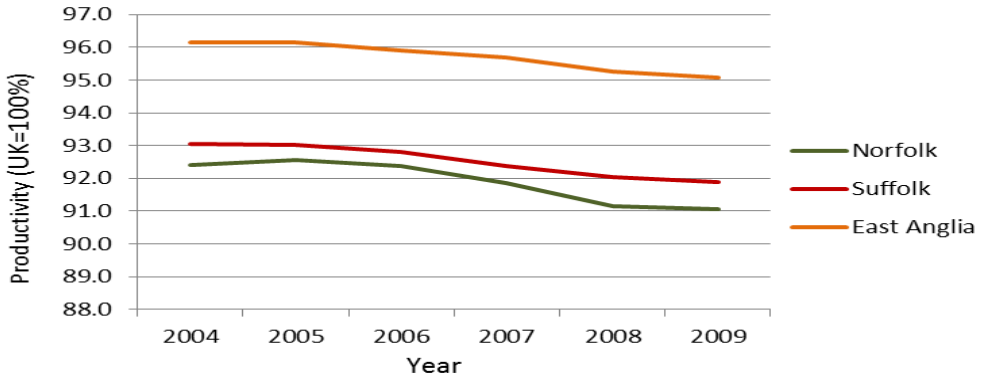

Figure 2.2.3.a: Nominal GVA per hour worked, NUTS2 and 3 regions as a percentage of the UK 2004-2009. Source: Office for National Statistics.

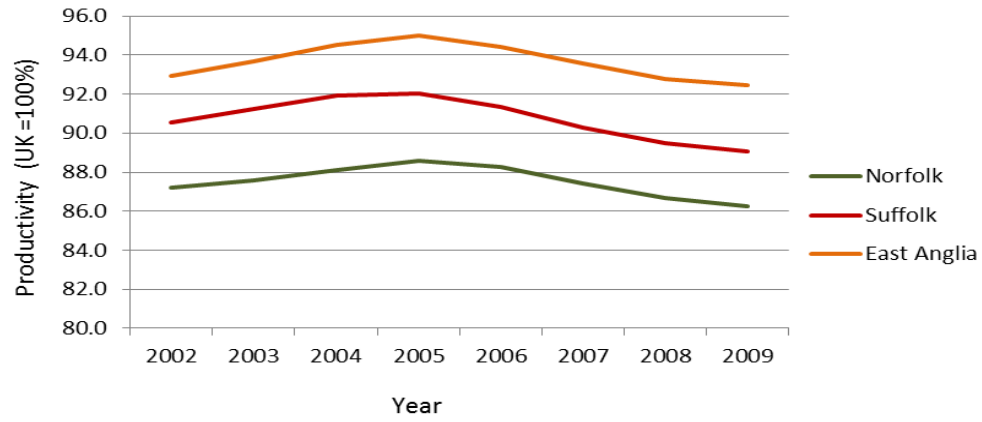

Figure 2.2.3.b: Nominal GVA per filled job, by NUTS 2 and 3 regions, as a percentage of the UK 2004-2009. Source: Office for National Statistics.

As the economies move towards higher-value economic segments, it is expected that productivity levels will improve. There are some concerns however, that these changes will not be as profound so as to change the employment structure. Productivity levels are lower when measured by per filled job indicators (Fig. 2.2.3.b). This might be an indication that despite a changing economic structure, employment creation continues to be driven by low-value sectors.

In the period 2005 to 2012, the number of vacancies per sector in Norfolk and Suffolk suggests that banking, finance and insurance was the most active sector. Figure 2.2.3.c gives a brief summary of the total vacancies generated across different sectors in this period. Distribution, hotels and restaurants was the second highest sector in employment creation, resulting in the generation of approximately 18% and 20% more vacancies in 2012 compared to 2005 in Norfolk and Suffolk respectively. The agriculture and fishing and energy and water sectors had the lowest increase in total vacancies generated between 2005 and 2012.

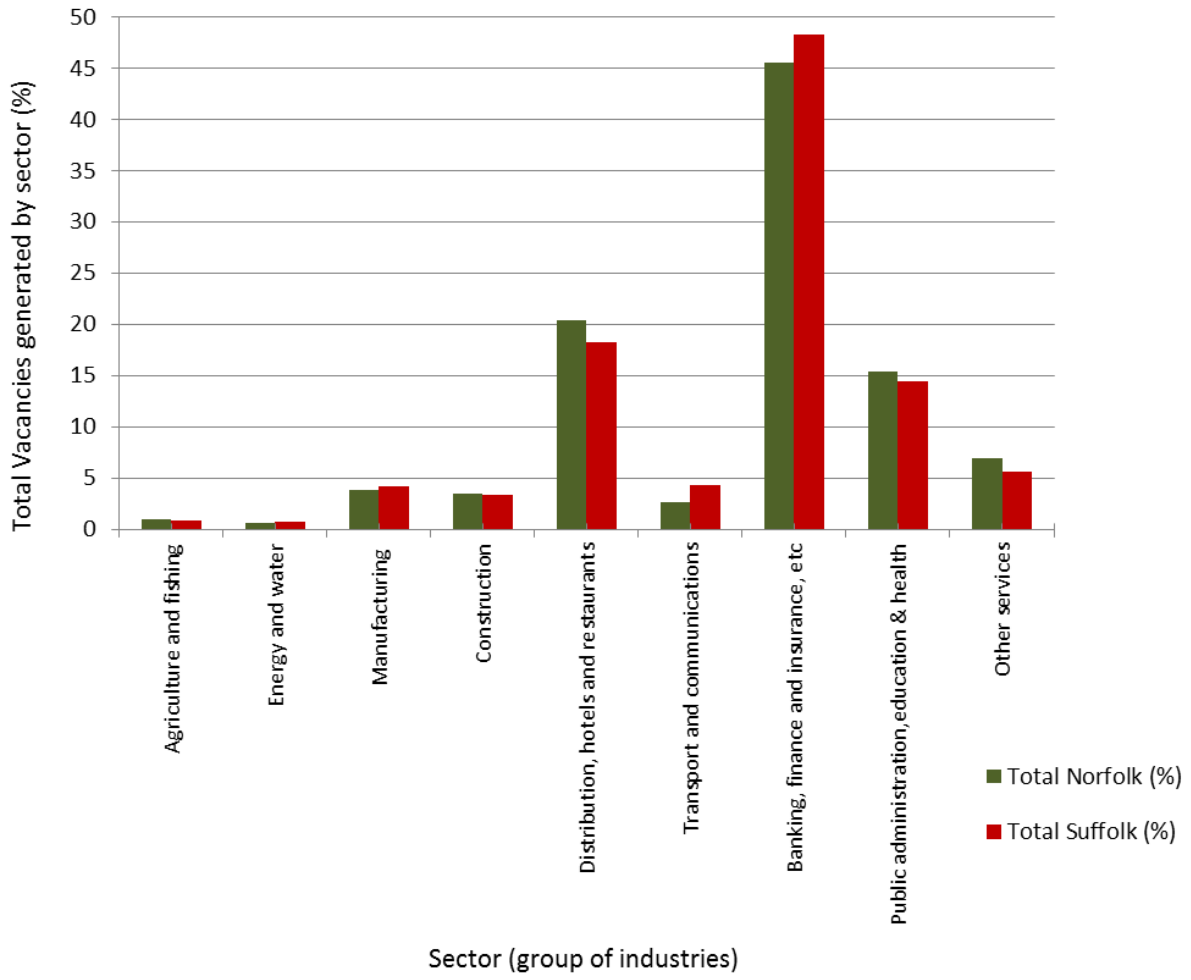

Figure 2.2.3.c: Change in vacancies creation by sector from 2005 to 2012 (%). Source: Office for National Statistics.

Lower productivity levels than national figures however do not necessarily mean that the region is falling behind the rest of the country. National figures are often highly affected by high productivity levels in London. As a general trend, productivity levels have fallen outside London due to the current economic climate[30].

2.2.4. Qualifications levels

There is not a significant difference in the qualification levels between Norfolk and Suffolk. Suffolk has a higher percentage of the workforce holding NVQ 4 qualifications in comparison to Norfolk by a mere 0.4% (23.3% and 22.9% respectively). Norfolk accounts for larger percentages of people holding NVQ 3 and over qualifications by only 0.3%. This suggests that the qualifications levels of both regions are almost the same. Changes in productivity levels

[30] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

within New Anglia, therefore, might not be explained by the stock of human capital in each local economy.

In addition, commuting patterns are similar in both regions and relatively low compared to regional and national averages. Suffolk's commuting levels however are low on average, with 30.8% of jobs in each district taken by non-residents relative to a national average of around 40%. Also, the proportion of residents who work elsewhere is low at 32.2% compared to 39% nationally. These figures are also highly influenced by Ipswich and St. Edmundsbury that are leading the economic change in the county and therefore are increasingly becoming important labour importing regions[31].

In Norfolk, 70% of the population use short-distance travel methods, works at home or walk to work. The remaining 28 % mainly travel by car or van, and only 0.8% of people use the train. Thus, there is not significant evidence suggesting that commuting patterns are a factor influencing productivity differences in the region either.

2.2.5. Indices for Multiple Deprivation (IMD)

Multiple Deprivation Indices reveal low levels of deprivation in the New Anglian LEP. Only 2.5% of Lower Level Super Output Areas (LLSOAs) fall within the 30% most deprived areas group. If we group them up to the fifth decile, the percentage of LLSOAs in the most deprived quintile increases to only around 8%.

Most deprived areas are located in coastal regions and in inner city-deprivation pockets. Suffolk has very low levels of deprivation, ranking 36th out of 47 sub-regions in England. Pockets of deprivation appear in Ipswich and Waveney and have similar characteristics; they both suffer particularly from education and employment deprivation while barriers to housing services are low. Deprivation in these areas is highly linked to inequality as they coexist with areas ranking high in prosperity indices[31].

In Norfolk, deprivation patterns follow similar trends to those in Suffolk. Most deprived areas are often coastal such as Great Yarmouth and North Norfolk with small inner city deprivation pockets in Norwich and King's Lynn. Deprivation in these areas share similar characteristics to those in Suffolk as well[32].

Deprivation in New Anglia follows a similar pattern to the rest of England in that it is largely urban. According to the ranking of most deprived areas in New Anglia, the rural share of deprivation is very low. In England, IMD indices identify only 50 of the 3,248 most-deprived

[31] The Local Futures Group, (2006). The State of Suffolk: An Economic, Social and Environmental Audit of Suffolk. Report, October 2006. Accessed at: http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

[32] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

10% areas as being rural and 143 of the 6,496 in the most deprived 20%. This means that only 2.2% of the 20% most-deprived areas are rural[33].

However, rural areas are substantially more deprived based on the location of deprived people. Figures suggest that 17% of households living on less than 60% of the median income across England live in rural areas. Income deprivation in rural Norfolk accounts for 42.7% of total deprivation levels across the county. In rural Norfolk, around 41.7% of the working age population received some DWP benefit and 53% of unskilled adults lived in rural areas in 2010**Error! Bookmark not defined.**[33]. In Suffolk, rural deprivation is lower with 29.4% of total DWP benefit claimants and 39% of total adult unskilled population living in rural areas[33].

This suggests that efforts for targeting deprivation focused in the most deprived areas are likely to miss the large majority of deprived people if their location is not taken into account.

2.2.6. Section overview

There are significant similarities between the economies of Suffolk and Norfolk. They have similar skills, they share similar productivity levels and the economic change taking place in both economies is affecting similar sectors. To some extent, this reduces the complexity of designing growth strategies for the LEP as a whole.

Access, availability of qualified staff, quality of telecommunications, transport links and value for money office space are the top five aspects influencing business locations decisions[34]. In this context, New Anglia is making important efforts to provide this type of business environment to reactivate the economy.

As this section reveals, Norfolk and Suffolk show growth and productivity levels below national and regional averages. This trend, however, is slowly changing and the region's key indicators might start converging with national averages in the short to medium term.

Building on the region's expertise and developing new capabilities in higher value sectors could see the region move away from the static and slow economic snapshot that the analysis carried out in this section portrays. As section 2.2 outlines, there have been important changes in the region in terms of the sectorial structure of the economy, revealing what kind of sectors might be more likely to lead economic change in the region.

[33] Oxford Consultants for Social Inclusion (2010): "The Rural Share of Deprivation in Norfolk", accessed at : http://www.norfolkrcc.org.uk/wiki/index.php/Rural_Deprivation_2010

[34] LEP Network, (2012). Creating Successful Local Economies. Review of LEPs in 2012.

2.3. Sectoral variation within LEP

The economy in New Anglia underwent significant changes in the last seventeen years. GVA has increased by around 83% in the period 1995 to 2008, with an average growth of 6.4% per year[35].

The sectorial make-up in 1995 was characterized by four different sectors with similar contribution to GVA. Manufacturing was the largest sector, contributing 22.8% of total GVA, followed by distribution, transport and communications, business insurance and finance, and the public sector, encompassing areas such as public administration, education, health and other services. These sectors contributed to around 20% of total GVA each. The agricultural sector was comparable to the construction sector at 6% (see Fig.2.3.a).

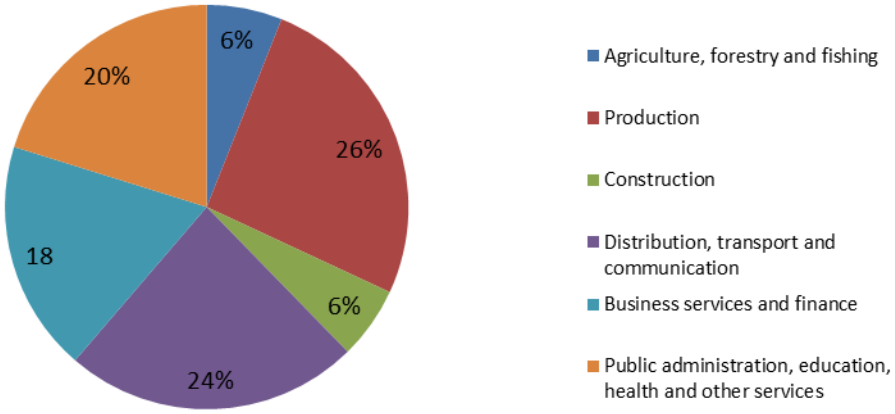

Figure 2.3.a: Sectorial make-up of New Anglia economy in 1995 by industry GVA (%) at current basic prices. Source: Office for National Statistics. Percentages worked out using work-based GVA 2,3 by industry group at current price.

The sectorial make-up today in the region follows a similar structure to the national economy. That is a 'service-based' economic structure. The sector with the highest GVA is business services, insurance and finance. This sector experienced a 164% growth since 1995. Construction is the second fastest growing sector with a 145% increase in the same period. At the other end, the agricultural sector has experienced a declining trend of around 25%, while manufacturing or production has increased only by 23%. It would be important to note that agriculture's contribution to GVA is somehow underestimated due to significant structural changes taking place in the industry[36]. This suggests an important structural change from

[35] Calculated using work-based figures by industry at current prices data from the National Office for Statistics.

[36] The number of workers has halved in Agriculture, but farm productivity has increased. People work as contractors, travelling around different farms. This means that they might be counted in other categories (e.g. business services) rather than under agriculture. So the figures for agriculture may be artificially low. In addition, such contractors may work in Norfolk but not actually be registered there (Jones E and Dukes D

product-based towards service-based in more lucrative economic sectors, similar to the structure of the national economy.

It is difficult to identify what has driven New Anglia's economy in such a direction without looking at the longer term trends for the national and global economy. The move towards a service economy at the detriment of manufacturing is a key feature of most industrialized economies in the west. The consolidation of the service sector as most active was pronounced during the recovery of the economic downturn at the end of the 1980's. Since 1992, the rate of output growth in the service sector was almost double than in the manufacturing one in the U.K. The narrative of the 'two speed' economy differentiating the slow manufacturing sector and the buoyant service sector was used to describe these dynamics[37].

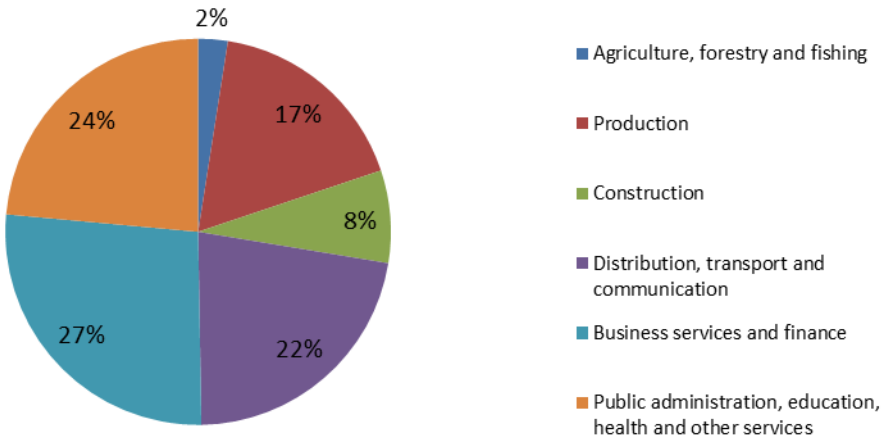

Figure 2.3.b: Sectorial make-up of New Anglian economy in 2008 by industry GVA (%) at current basic prices. Source: Office for National Statistics. Percentages worked out using work-based GVA 2,3 by industry group at current price.

There is also a renewed emphasis on advanced manufacturing and there are strong links between several important sectors in the region such as the energy and water sector with local manufacturing companies that can boost the sector in the short-term[38].

Possible limitations that might hold back the expansion of high value sectors have been discussed throughout this section and can be summarised as a less than dynamic business environment and the low skill set of the workforce. Moving further towards high-skill sectors would require new skills that might not be readily available. This trend is changing and the topic is at the forefront of the regional agenda.

(2013): Planning Analyst, Norfolk County Council and Economic Development Manager, Norfolk County Council; Personal consultation. 14th February 2013)

[37] De Anne J and Butler J (1997): Inflation and Growth in a Service Economy, Bank of England. Accessed at: http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/service.pdf

[38] New Anglia (2013), Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, February 2013.

2.4.Positive plausible future development pathway – (*plan/vision)*

2.4.1. GVA results for the next twenty years

Historic data for the region reveal average GVA growth rates of 2.2% per year in the period 1991 to 2010. In response to current economic hardship, the government has emphasised the importance for local authorities encouraging private sector growth by providing a local business environment that supports expansion and investments[39].

New Anglia's Enterprise Partnership (2013)[39] is confident that the region is ideally suited to leading the UK's transition to a green economy across three focus areas: low carbon, natural capital and social capital. The New Anglia Business Plan has identified the following nine growth sectors:

- Advanced Manufacturing
- Digital & Cultural Creative Industries
- Energy
- Food, Drink & Agriculture
- ICT
- Financial Services
- Ports & Logistics
- Tourism
- Life Sciences & Biotechnology

The East of England Forecasting Model (EEFM) provides a forecasting service to local authorities. It was developed by Oxford Economics to project economic, demographic and housing trends in a consistent fashion. It covers a wide range of variables, and is designed to be flexible so that alternative scenarios can be run[40]. The Model captures the interdependence of the economy, population and housing at the local level, as well as reflecting the impact of broader economic trends at a regional level[41]. Using historic data and taking account for the current economic environment, a prediction of the economy of New Anglia can be estimated.

[39] NewAnglia (2013): New Anglia local enterprise partnership for Norfolk and Suffolk: sector growth strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[40] Cambridgeshire County Council (2012): EEFM 2012 baseline forecasts grouped by area, accessed at http://www.cambridgeshire.gov.uk/business/research/economylab/Economic+forecasts.

[41] Norfolk County Council (2012): Norfolk's Story, Norfolk County Council, June 2012, Version 3.0, Planning Performance and Partnerships Service. Accessed at: http://www.norfolkinsight.org.uk/Custom/Resources/NorfolkStory.pdf

In this way, it is predicted that the economy in New Anglia will increase by around 29.7% by 2020 and 61.4% by 2030 that is an average GVA growth of 3.07 % per year. Figure 2.4.a illustrates GVA growth forecast in percentage per year and in absolute terms using 2008 GBP (thousand).

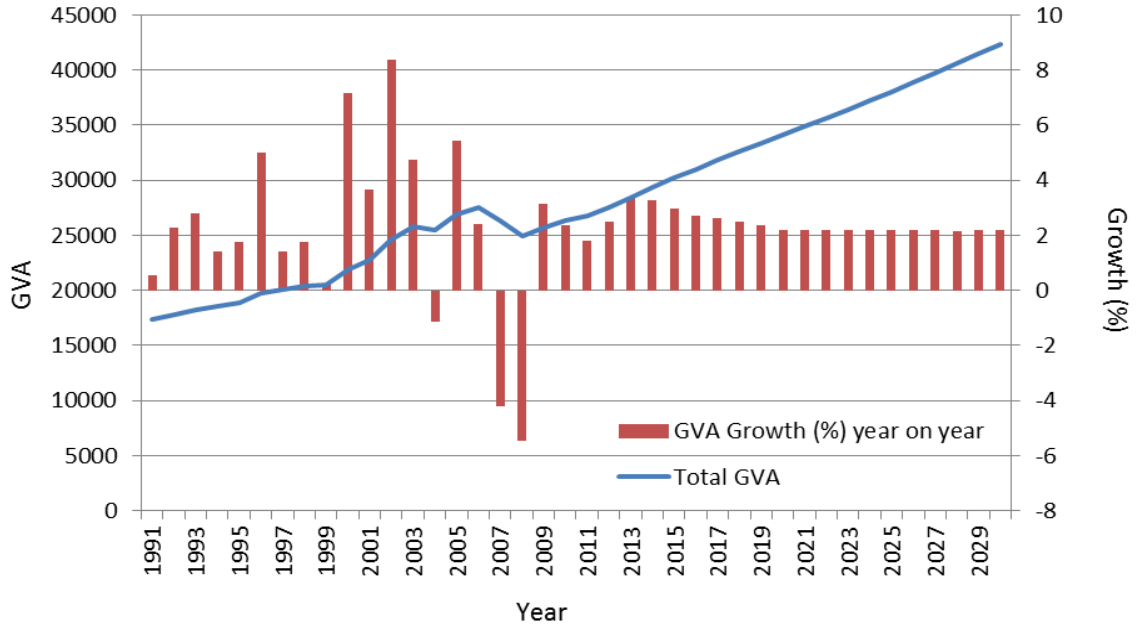

Figure 2.4.a: GVA growth forecast in percentage change per year and in absolute terms using 2008 GBP (thousands of millions).

2.4.2. Sectoral make-up

The economy is expected to grow by 61% between 2010 and 2030 with a population growth of about 17%. This is equivalent to an average growth of 3.07% per year. Some sectors will perform better relative to others, giving shape to a more productive economic structure.

Sectors such as agriculture, food manufacturing and general manufacturing are likely to decline relative to other sectors. The agri-food sector currently contributes over £2 billion to local GVA, equivalent to 9.7%. Agriculture on its own currently creates around 20,000 jobs but it is estimated that this figure will decrease to about 13,000 by 2030. That is a 36% decline in the sector's employment. Food manufacturing has traditionally been the region's specialisation, and it is expected to follow similar trends, with an approximately 21% decline in jobs in the sector.

Advanced manufacturing has a turnover of £4.7 billion and showed an increase in employment of 4.2% between 2008 and 2010 when many other sectors declined. By definition, advanced manufacturing describes companies using high levels of design or scientific skills to produce innovative product and processes that are high value and technologically complex[42]. Hence, the

[42] NewAnglia (2013): New Anglia local enterprise partnership for Norfolk and Suffolk: sector growth strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

sector is a cornerstone of the region's development pathway towards a greener and more productive economy because of its cross-cutting industry linkages. It is estimated that the advanced manufacturing sector will grow above the forecasted average growth in the next 20 years.

Highly linked to the advanced manufacturing sector are the health and life science as well as the Research and Design sector that have an encouraging profile for growth. It is estimated that these sectors will experience growth of between 30-40% between 2010 and 2030 in Norfolk, home to a cluster of internationally renowned research organisations, employing 2,700 scientists, the largest cluster of health, food, plant and bio-scientists in Europe.

The professional business sector, including insurance and finance is likely to be the largest sector of the economy by 2030. Estimations based on employment creation suggest that employment in the sector will increase by 45%. In Norfolk, the sector's GVA is expected to grow by 73% from £2.4 billion in 2009 to £4.1 billion in 2020; corresponding to an average growth of 6.6% per year[43]. Expectations are higher in Suffolk given the stronger performance shown in recent years.

Strong growth is also expected from the energy sector. This sector is still relatively small in the New Anglian economy but possesses an encouraging prospect for growth. Its linkages with the engineering, construction and maintenance sectors suggest that growth in the energy sector could have a knock-on effect on these as well. The increasing growth of its business base by 1.8% between 2008 and 2010 suggests that the industry has been able to withstand the economic downturn. Significant investment in the sector may push it forwards and it is expected to experience above average growth.

To some extent, growth in these sectors is related to growth in the logistics, transport and ports sectors. Forecast models using EEFM do not suggest that the sector would experience growth. Nevertheless, this model does not take into account that the sector will be affected by key developments in the next few years. The Port of Felixstowe is the largest container port in the country. Around 15,000 people derive their livelihoods from Suffolk's ports (Felixstowe, Ipswich and Lowestoft) and related industries. Felixstowe will be used as a catalyst for growth across the Suffolk economy. The Port is undergoing a major expansion, which will grow its processing capacity from around 3.5 million TEUs (twenty-foot equivalent units) to 6 million TEUs by 2020, and create at least 600 direct and 800 indirect jobs[42]. The global economic recovery and increasing volumes of trade with emerging economies are likely to drive continued growth in port traffic. Recent losses in the sector's business base due to the economic downturn decreased the amount of companies in the sector by almost 2%. Nevertheless, employment rates in the sector increased by 4% in the same period[44].

[43] Norfolk County Council (2012): Norfolk's Story, Norfolk County Council, June 2012, Version 3.0, Planning Performance and Partnerships Service. Accessed at: http://www.norfolkinsight.org.uk/Custom/Resources/NorfolkStory.pdf

[44] NewAnglia (2013): New Anglia local enterprise partnership for Norfolk and Suffolk: sector growth strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

Communications and Information technology (ICTs) play an important role in the New Anglian economy, especially in Suffolk. As an enabler for growth in other sectors, the ICT sector has strong linkages with the creative and digital industries, financial, energy and health and life science sectors within New Anglia[44]. It is expected that the sector will experience significant growth enhanced by important developments in Suffolk and Norwich to host ICT companies. The sector is to be one of the fastest growing sectors in the U.K and it is anticipated that there will be 163,000 more jobs in the sector by 2016.

The tourism industry has always been an important economic sector in the region. It accounts for around 10.5% of total employment in the region and this percentage is much higher if indirect employment is accounted for. Tourism poses strong linkages with other industries because it is believed to have the ability to respond rapidly to market stimulation while contributing to enhance the region's profile as a good place to live, work, invest and play[44]. It is estimated that the tourism industry will experience a 38% growth between 2010 and 2020[45].

These growth sectors account for 37% of total employment in Norfolk and Suffolk combined and 36% of the area's business base. This equates to over 236,916 jobs and 19,988 businesses in growth sectors[44]. In addition to contributing to employment creation, growth in these sectors could be a real boost for the region's economy.

2.4.3. Employment rate

Employment in the LEP was relatively high compared to regional and national levels at around 76% for most of the last decade although the economic downturn has had a negative impact in employment rates, and in the quality of employment. It is expected that employment rates will not reach pre-recessionary rates until 2015.

In the next 20 years, the working age population is expected to increase by 17% which is an average of 0.7% per year. In terms of achieving growth targets, employment rates will need to increase by 12% in the same period or 0.6% per year.

A well-defined growth strategy in key sectors will continue to shift employment demand. It is possible that labour markets will adjust to such demand in terms of skills and geography. As the next subsection will discuss, a move towards higher value economic sectors implies demand for higher skills in these sectors. It will also shape the geographic pattern of the labour market as sectorial growth strategies often cluster industries in regions with competitive advantages so they are able to become hubs for innovation and knowledge sharing. In this way, commercial urban centres might become a hub for industries such as finance, insurance and business sector while the coastal region is most likely to play a key role in developing the Energy, off-shore and renewable energy industries for example.

[45] Norfolk County Council (2012): Norfolk's Story, Norfolk County Council, June 2012, Version 3.0, Planning Performance and Partnerships Service. Accessed at: http://www.norfolkinsight.org.uk/Custom/Resources/NorfolkStory.pdf

2.4.4. GVA Productivity

There is a general understanding that in terms of meeting growth targets there is an urgent need to improve productivity levels in the region. In this context, New Anglia has 234,000 jobs in growth sectors. This is equivalent to 36.4% of total employment. The fact that low productivity is related to a weak economic structure in the LEP suggests that a changing structure will bring changes in productivity levels accordingly.

Moving towards higher value sectors contributes to better productivity in several ways. The most obvious one is that high skill sectors are often associated with higher earnings; the financial sector in New Anglia has a GVA per head of £148,000 per head compared to the LEP annual average of £16,600. High skill positions also encourage employers to hire their staff on a full time basis compared to low skilled jobs that are largely skewed towards part-time staff. It is estimated that around 35% of total workforce works part-time in low skilled, low earning employment while local evidence suggest that this figure has severely increased during the economic downturn[46]. EEFM estimations suggest that productivity would increase by 37.5% between 2010 and 2030; this is an average productivity increase of around 1.9% per year.

2.4.5. Qualifications

Analysis of employment patterns carried out by the UK Commission for Employment and Skills in England concluded that in the period from 2001 to 2009, the fastest moving sectors in employment creation typically require a minimum of NVQ 4 level qualification while the fastest declining occupations were those requiring NVQ 2 and lower qualifications[47].

Meeting economic targets will demand shifting the labour market in New Anglia towards a more high skill end, and this will demand a higher skill-base. In this regard, the LEP has achieved impressive results in narrowing the qualifications gap with regional and national levels increasing by 20% in the degree-level group.

2.4.6. Overview

Section 2 discussed encouraging economic development forecasts for New Anglia in the next 20 years. A new Sector Growth Strategy aimed at promoting high value jobs and high-value industries identified as growth sectors will be the main delivery tool used at the LEP level.

[46] Norfolk Insight, (2012) Local Economic Assessment for Norfolk 2012 Update. Norfolk County Council, accessed at: http://www.norfolk.gov.uk/view/NCC106434

[47] UK Commission for Employment and Skills (2010): National Strategic Skills, Audit for England. Report (2010) Jobs: Today and Tomorrow' Volume 1, p.4

3. Inputs and outputs to the economy

3.1. Land use

3.1.1. Current land use pattern within LEP coverage

The landscape in New Anglia is predominantly rural with greenland representing around 90% of total land area and less than 5% is classed as urban (see Fig. 3.1.a). In the most urbanized centres such as Ipswich and Norwich green space represents 34.2% and 36.1% of total area respectively and more than 80% in other urban centres such as Great Yarmouth and Waveney (80.5% and 88.4% respectively)[48].

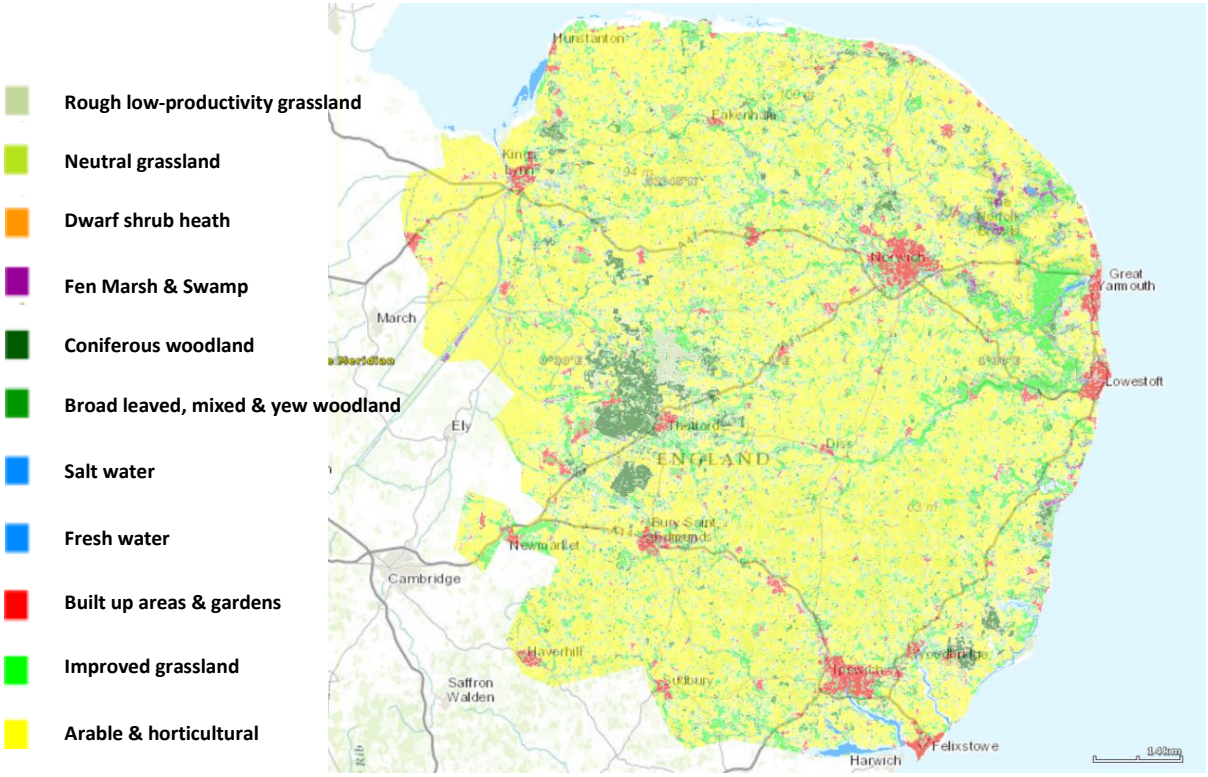

Figure 3.1.a Land Use Pattern in the New Anglia LEP. Source: Natural England (2007): Natural England Land cover Map 2007, clipped to Norfolk and Suffolk. Data received from Natural England.

Greenspace in the region is dominated by agricultural land use, making up 71% of land use in the Broads for example. Urban spaces are predominantly domestic buildings with 3.8% of total land area including domestic buildings and gardens. Table 3.1.1.a provides a summary of land use, broken down into broad categories using data from the Land Use statistics.

[48] Neighbourhood statistics (2005): Land Use Statistics, Generalised Land Use Database.

Table 3.1.1.a: Land use statistics for Norfolk and Suffolk (2005)						
Land use	**Norfolk**		**Suffolk**		**New Anglia**	
	Area (ha)	**%**	**Area (ha)**	**%**	**Area (ha)**	**%**
Domestic buildings	3,487	0.6%	2,625	0.7%	6,112	0.7%
Non-domestic buildings	2,001	0.4%	1,795	0.5%	3,796	0.4%
Path	197	0.0%	203	0.1%	401	0.0%
Domestic gardens	15,200	2.8%	13,446	3.5%	28,646	3.1%
Total urban	**20,885**	**3.8%**	**18,069**	**4.7%**	**38,955**	**4.2%**
Road	7,140	1.3%	5,274	1.4%	12,414	1.3%
Rail	248	0.0%	231	0.1%	478	0.1%
Greenspace	**495,309**	**90.0%**	**348,268**	**90.4%**	**843,577**	**90.2%**
Water	22,066	4.0%	8,583	2.2%	30,649	3.3%
Other land uses	4,916	0.9%	4,717	1.2%	9,633	1.0%
Unclassified	2	0.0%	0	0.0%	3	0.0%
Source: Neighbourhood statistics (2005): Land Use Statistics, Generalised Land Use Database						

Land use in the countryside has traditionally been determined by prices for key agricultural commodities, government policies related to the agricultural sector and farm profitability[49]. Issues such as environmental degradation and Climate Change adaptation are increasingly determining land use patterns today. There has been a wide expansion of Environmental Stewardships Schemes covering almost 60% of Norfolk's land area and 53.7% in Suffolk (90% of land under entry level schemes)[50].

The tourism industry also revolves around the natural environment. Many seaside resorts experienced a boom following connection to the railway in the past. Tourism has remained strong in other regions as well, such as the broads and other protected areas such as the Brecks[51]. Generally, sustainable land management allows new ventures for tourism because it enhances the quality of the natural environment. Attracting tourists to the area is largely associated with land use change and management.

Energy generation, including oil and gas, renewables and nuclear is also an important sector of the economy and it is largely linked to the environment. This sector however, is mainly clustered around the coast with little land requirement elsewhere, although biomass and onshore wind farms have the potential to contribute to land use change. The agricultural sector

[49] Angus, A. et, al. (2009). "Agriculture and Land use: Demand for and Supply of agricultural commodities, characteristics of the farming and food industries for land use in the U.K". Land Use Policy , Vol.26-PP. 230-242.

[50] Environment Agency, (2011). "The state of our environment: Agriculture and land management". Report. accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Agriculture_and_Land_Management.pdf

[51] Visit Norfolk: Tourism in Norfolk Strategy 2009-2012, accessed at http://mediafiles.thedms.co.uk/Publication/ee-nor/cms/pdf/TIN%20Strategy.pdf

however is likely to play a key role in determining possible expansions of this sector because of land competition[52].

3.1.2. Changes to land use based on plan/vision/tailored baseline

New Anglia's sectorial strategy is desirable on the grounds that New Anglia is ideally suited to lead the UK's transition to a green economy across three focus areas: low carbon, natural capital and social capital[53]. However, it is likely to trigger demand for infrastructure, housing and recreational spaces. Sustainability concerns arise due to the area already suffering from strained resources and infrastructure such as water and housing[54].

In addition, the strategy may suffer from land use issues as well[55]. Norfolk and Suffolk are isolated counties with relatively poor transport connectivity, inhibiting inward investment amongst some sectors such as manufacturing and distribution. Increasing the competitiveness of the region is likely to involve increasing transport networks and overall connectivity. In addition, promotion of sector focused Technology Parks and enterprise hubs offering a range of tailored enterprise and business improvement measures relies on having adequate land availability which is a challenge in some locations, requiring close collaboration with local authorities[55].

3.2. Land management

3.2.1. Rural land management

The rural landscape is dominated by agriculture in the New Anglia Region. Arable and horticultural land takes up more than 60% of a total area of almost 1 million hectares (around 600,000 hectares). Grasslands, including improved and rough-low productivity, make up another 20%. Thus, agriculture uses more than 80% of total land within the LEP. Table 3.2.1.a provides a summary of land composition per habitat in the region.

[52] BBC News (2005): Sugar beet threat to biofuel unit, accessed at http://news.bbc.co.uk/1/hi/england/4551718.stm

[53] New Anglia LEP (2012): Green Economy Pathfinder Manifesto, available at: http://www.newanglia.co.uk/Assets/Files/Content/2012-06-01%20Final%20New_Anglia_Manifesto_2.pdf

[54] See for example: Environment Agency (2009) Water for life and livelihoods: river basin planning: summary of significant water management issues: Anglian river basin district, accessed at http://www.environment-agency.gov.uk/static/documents/Research/anglianswmidoc_1953860.pdf

[55] New Anglia (2013), Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, February 2013. Accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

Table 3.2.1.a: Constitution of the landscape in the New Anglia region by habitat area and as a percentage of total area (2007)		
Habitat type	**Area (ha)**	**% Total Area**
Acid grassland	47	0.005%
Arable and horticulture	**602,425**	**62%**
Broad leaved, mixed and yew woodland	**59,459**	**6.1%**
Built up areas and gardens	**46,697**	**4.8%**
Calcareous grassland	17	0.002%
Coniferous woodland	**25,880**	**2.7%**
Dwarf shrub heath	1,521	0.2%
Fen marsh and swamp	3,034	0.3%
Freshwater	5,135	0.5%
Improved grassland	**164,822**	**17%**
Inland rock	470	0.05%
Littoral rock	4	0.0004%
Littoral sediment	13,960	1.4%
Neutral grassland	7,729	0.8%
Rough low-productivity grassland	**28,327**	**2.9%**
Salt water	8,195	0.8%
Supra-littoral rock	14	0.001%
Supra-littoral sediment	2,218	0.2%
Total	969,955	100%
Source: Natural England (2007): Natural England Land cover Map 2007, clipped to Norfolk and Suffolk. Data received from Natural England.		

Table 3.2.1.b presents a summary of agricultural land use by sector in the years 2007 and 2010 and compares it with regional and national land use patterns. The table shows that cereals and root crops were the preferred option for New Anglian farmers in 2010, occupying around 50% of total farmed area following an upward land use trend since 2007. Cropping patterns in New Anglia are similar to those in England and in the East as a whole, however, fruit and vegetable production declined in New Anglia while the opposite was taking place in Eastern England during this period. The overall trend of the livestock industry in 2010 was negative when compared with livestock numbers (heads) in 2007. However, numbers of poultry experienced an increase of 4% in the period 2007-2010.

Table 3.2.1.b: Summary of agricultural land use by sector in 2007 and 2010 compared with regional and national land use patterns

Land use	New Anglia			Eastern England			England		
	2007	2010	% Change	% Change	% in New Anglia 2007	% in New Anglia 2010	% Change	% in New Anglia 2007	% in New Anglia 2010
Total farmed area (ha)	716,336	689,798	-4	-3	50	50	-4	8	8
Cereals (ha)	289,996	300,104	+3	+4	47	47	+4	12	12
Arable crops (excluding cereals) (ha)	159,099	172,700	+9	+10	50	50	+9	14	14
Fruit and vegetables (ha)	21,750	19,613	-10	+1	64	57	-2	16	15
Grassland (ha)	121,945	122,273	0	-3	52	53	-4	3	3
Number of cattle	134,555	127,985	-5	-5	61	61	-1	2	2
Number of sheep	194,596	166,325	-15	-13	55	54	-8	1	1
Number of pigs	938,497	932,555	-1	-3	88	90	-9	24	26
Number of poultry	21,778,745	22,689,486	+4	-1	76	80	-3	17	18

Sources: Defra agricultural statistics by Local Authority; http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-landuselivestock-june-results-localauthority2010-120608.xls
Notes: Eastern England covers Peterborough, Cambridgeshire, Norfolk, Suffolk, Bedfordshire, Hertfordshire, Essex.
Figures show the percentage of each crop/livestock that is found within New Anglia as a percentage total of Eastern England and England.

The region's agriculture is important to the national economy. In 2007, farmland in the East of England contributed around £1.85 billion to the local economy from food, non-food and agricultural produce. A further £110 million came from sports such as shooting. Income per ha is estimated at £900 to £1,000 for highly productive farms, while shooting is estimated to generate £1,750 in expenditure per person (2010 prices)[56]. The agri-food sector is the largest employment sector in the region; it supports around 81,000 jobs not including high skilled technicians and consultants[57].

Several factors have contributed to current rural land use patterns. The second half of the 20th century was a period of aggressive agricultural expansion up until the 1990s. This was promoted by national policies aimed at using the agricultural sector to aid economic revival in the port-war period. This period was characterised by new highs in output per hectare as a consequence of further implementation of new intensive technologies[58].

Since the mid-1990s, national average farm yields have not kept pace with increases in yields seen in best practice trials for cereals[59] and a general decrease of agricultural land began to take place. Environmental concerns were translated into policies and land was no longer seen as a mere input for food production but a provider of a wide range of environmental goods and services as well[60].

Table 3.2.1.c gives a detailed overview of the different environmental management schemes operating in the region using recent data from Natural England. Around 75% of all agricultural land in East Anglia was under some form of agri-environmental scheme in 2012. In Norfolk, Land Management Schemes covered around 79.6% of total area and 67.3% in Suffolk.

[56] URSUS Consulting Ltd (2011): Valuing ecosystem services in the East of England, Phase 2: Practical applications of the approach, Arable Agriculture Local Pilot.

[57] New Anglia (2013). Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, February 2013. Accessed at http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[58] Angus, A. et, al. (2009). "Agriculture and Land use: Demand for and Supply of agricultural commodities, characteristics of the farming and food industries for land use in the U.K". Land Use Policy , Vol.26-PP. 230-242.

[59] Defra, (2012). Green Food Project Wheat Sub-group Report: Themes, Tensions and Recommendations. Report. July 2012. Accessed at: http://www.defra.gov.uk/publications/2012/07/10/pb13794-green-food-project/

[60] Renting, H. et al (2009). Exploring Multifunctional Agrriculture: A Review of Conceptual approaches and prospects for an integrative transitional framework. Journal Environmental Management, 90. Pp 112-123.

Table 3.2.1.c: Area of land under different Land Management Schemes in Norfolk and Suffolk (2012)			
County	**Land use**	**Area (ha)**	**% of county**
Norfolk	Total area/Total area under LMS (%)	537,521	79.60
	Agriculture: Entry Level Stewardship (ELS)	187,004	34.8
	Agriculture: Combined ELS and Higher Level Stewardship (HLS)	111,228	20.7
	Agriculture: HLS	4,593	0.
	Agriculture: Environmentally Sensitive Areas (ESA)	7,701	1.4
	Agriculture: Countryside Stewardship Scheme (CSS)	3,721	0.7
	Agriculture: total in agri-environment schemes	314,247	58.5
	Designated sites: Sites of Special Scientific Interest (SSSI)	36,940	6.9
	Designated sites: Special Areas of Conservation (SACs)	23,155	4.3
	Designated sites: Special Protection Areas (SPAs)	27,839	5.2
	Designated sites: Ramsar sites (wetlands of international importance)	25,354	4.7
Suffolk	Total area/Total area under LMS (%)	381,242	67.30
	Agriculture: Entry Level Stewardship (ELS)	126,565	33.2
	Agriculture: Combined ELS and Higher Level Stewardship (HLS)	66,796	17.5
	Agriculture: HLS	1,560	0.4
	Agriculture: Environmentally Sensitive Areas (ESA)	8,333	2.2
	Agriculture: Countryside Stewardship Scheme (CSS)	1,290	0.3
	Agriculture: total in agri-environment schemes	204,545	53.7
	Designated sites: Sites of Special Scientific Interest (SSSI)	23,162	6.1
	Designated sites: Special Areas of Conservation (SACs)	6,114	1.6
	Designated sites: Special Protection Areas (SPAs)	14,089	3.7
	Designated sites: Ramsar sites (wetlands of international importance)	8,377	2.2
Sources: Natural England (2012): Norfolk, Agri-Environment Schemes: Key Information, scheme uptake and expenditure data, November 2012, accessed at http://www.naturalengland.gov.uk/ourwork/farming/celebration.aspx#stats Natural England (2012): Suffolk, Agri-Environment Schemes: Key Information, scheme uptake and expenditure data, November 2012, accessed at http://www.naturalengland.gov.uk/ourwork/farming/celebration.aspx#stats			

Managing ecosystem services has become an important topic to the extent that green infrastructure is being purposely built in the region. An example is the restoration of fens in the Little Ouse headwaters (Norfolk/Suffolk border) and the Broads[61]. The Little Ouse Headwaters project covers an area of 60 ha and is aimed at addressing the drying out of the fen that resulted in the removal of the SSSI designation in 1983. The Broads project was also focused on fens, this time reconnecting wetland ecosystems to recreate corridors for aquatic wildlife. The aim of

[61] Natural England (2012): Valuing Ecosystem Services: Case studies from lowland England; McInnes RJ (2007): Integrating ecosystem services within a 50-year vision for wetlands, Wetland Vision technical document, November 2007; Luisetti T (2008): An Ecosystem Services approach for the Broads, Appendix 6, report prepared for the Broads Authority (Lake Restoration Strategy).

this project is to enhance the resilience of these habitats to climate change, social and economic pressures[62].

Current trends suggest that the region is moving towards an increasing reliance on Green Infrastructure and ecosystem services for coping and adapting to development pressures and the changing environment. Since land use is largely determined by agriculture, the extent to which Green Infrastructure will be effectively implemented might be determined by Common Agricultural Practice (CAP) and government policies making a commitment to Rural Development Programmes, as well as creating markets for agricultural commodities and the development of effective tools for valuing ecosystem services.

3.2.2. Urban land management

The main urban areas in the Anglian region are Norwich, Peterborough, Ipswich, Chelmsford, Cambridge, Northampton and Lincoln. Almost six million people live in the region and it has one of the fastest growing populations in the United Kingdom[63].

Around 54% of the population of Suffolk lives in urban areas (areas with a population of 10,000 or more). The major urban area in Suffolk is in the south east of the county consisting of Ipswich and associated towns. The other major urban areas are Lowestoft, Bury St Edmunds, Newmarket and Haverhill[64].

Norfolk's land area is around 95% rural, including smaller towns and their fringes, villages and hamlets. This area includes a little over half its population. So, while most of Norfolk can be considered rural, almost half its residents live in an environment that can be classed as urban[65].

Natural England's Accessible Natural Greenspace Standard analyses the quality and quantity of natural green spaces within and nearby urban centres. It is an instrument to provide evidence for green space planners and managers to look at improving these spaces. The parameters used to measure whether specific locations have a deficit or a surplus of green infrastructure is calculated as the percentage of households that have access to:

[62] Natural England (2012): Valuing Ecosystem Services: Case studies from lowland England, Annex 2: Reconnecting the Broads and fens: Norfolk, 15 August 2012.

[63] Environment Agency website (2012): Anglian Region, available at: http://www.environment-agency.gov.uk/aboutus/organisation/77998.aspx

[64] Suffolk Biodiversity Partnership (2000): Urban Habitats, accessed at: http://www.suffolkbiodiversity.org/content/suffolkbiodiversity.org/PDFs/action-plans/urbanHabitats.pdf

[65] Norfolk County Council, (2012). Norfolk-Place and People, An evidence base to support the County Council Plan. Report. accessed at: http://www.norfolk.gov.uk/view/ncc090847

- At least 2 hectares in size, no more than 300 metres (5 minutes walk) from home;
- At least one accessible 20 hectare site with two kilometres of home;
- One accessible 100 hectare site within five kilometres of home;
- One accessible 500 hectare site within ten kilometres of home; and
- Plus a minimum of one hectare of statutory Local Nature Reserves per thousand population.

Table 3.2.2.a gives a snapshot of the amount green spaces as a percentage of total land per Local Authority compared to other regions in the East of England. Data suggest that natural green space as a percentage of the total area is 4.3% in Suffolk and 4.8% in Norfolk[66]. This is lower than the rest of the East of England. The total number of households in urban and rural areas with nearby natural green spaces at any level in Norfolk and Suffolk are around 50% lower than places such as Essex and Hertfordshire. The percentage of households without access to nearby green spaces is several times higher in Norfolk and Suffolk in comparison to these locations as well.

Table 3.2.2.a: Accessible Natural Greenspace (ANG) in urban areas (2010)

Local Authority	County areas (ha)	Area of ANG (ha)	Accessible Natural Greenspace area as % of County area	Households (%) with access to all levels of Natural Greenspace	Households (%) with no access to any levels of Natural Greenspace
Norwich	549,612	26,184	4.8	3.2	29.7
Suffolk	385,371	16,731	4.3	3.4	32.9
Essex	367,502	16,712	5	7	14
Herts	164,306	8,264	5.0	6.7	6.4

Data Compiled from Natural England (2010): Analysis of Accessible Natural Greenspace reports. Accessed at: http://www.naturalengland.org.uk/regions/east_of_england/ourwork/gi/accessiblenaturalgreenspacestandardangst.aspx

Even though the region's access to Natural Greenspaces is lower than neighbouring regions, urban centres in New Anglia offer a balance between buildings and green spaces and domestic gardens. The density of domestic garden per domestic building, suggests that Norfolk has an overall ratio of 4.4 ha of garden per ha of buildings while Suffolk has a ratio of 5.1 (Table 3.2.2.b). The two largest urban centres, Ipswich and Norwich have the lowest domestic garden per domestic building density. Other urban centres with low densities of domestic gardens are Forest Heath and Great Yarmouth.

[66] The Landscape Partnership -Natural England (2010): Analysis of Accessible Natural Greenspace Provision for Norfolk report. Accessed at: http://www.naturalengland.org.uk/regions/east_of_england/ourwork/gi/accessiblenaturalgreenspacestandardangst.aspx

Table 3.2.2.b: Area of domestic garden per ha of domestic buildings (2011)			
Norfolk		**Suffolk**	
District Council	**Ratio of garden (ha) per ha of building**	**District Council**	**Ratio of garden (ha) per ha of building**
Breckland	4.4	Babergh	5.9
Broadland	4.5	Forest Heath	3.6
Great Yarmouth	3.2	Ipswich	3.6
King's Lynn and West Norfolk	4.4	Mid-Suffolk	7.0
North Norfolk	4.6	St Edmundsbury	4.8
Norwich	3.0	Suffolk Coastal	5.8
South Norfolk	5.3	Waveney	4.2
Total Norfolk	**4.4**	**Total Suffolk**	**5.1**
Source: Based on Neighbourhood statistics (Land Use Statistics, Generalised Land Use Database). The figures show area of gardens (ha) for every 1ha of domestic buildings			

Direct threats to green infrastructure are factors such as economic and population growth that increase demand for new developments and infrastructure. The percentage of new developments taking place on previously developed land has been on average around 10% lower in New Anglia in comparison to England and the East in the last 15 years (although figures have somewhat converged with the East since 2007). Table 3.2.2.c provides a review of new dwellings on previously developed land from 1995 to 2010. The table suggests that since 2007, around 35% of new developments have been established on previously undeveloped land or green space in New Anglia.

Table 3.2.2.c: Land use change statistics 1995 to 2010				
Local Authority	**Proportion of new dwellings on previously-developed land (%)**			
	1995-1998	**1999-2002**	**2003-2006**	**2007-2010**
Norfolk	**34**	**39**	**54**	**67**
Breckland	22	33	43	85
Broadland	28	29	50	57
Great Yarmouth	54	42	43	66
King's Lynn and West Norfolk	22	33	59	60
North Norfolk	31	51	74	72
Norwich	49	63	69	94
South Norfolk	34	25	40	32
Suffolk	**54**	**54**	**55**	**62**
Babergh	45	58	67	47
Forest Heath	52	50	59	35
Ipswich	81	84	78	86
Mid-Suffolk	55	61	42	56
St Edmundsbury	56	60	55	89
Suffolk Coastal	57	43	40	55
Waveney	33	20	44	64
New Anglia	**44**	**47**	**55**	**64**
East of England	**54**	**58**	**64**	**67**
England	**54**	**60**	**72**	**76**
Source: Department for Communities and Local Government (2011): Land Use Change Statistics, accessed at https://www.gov.uk/government/organisations/department-for-communities-and-local-government/series/land-use-change-statistics#statistical-data-sets Note: data for East of England and England are averages over the four year periods				

It is expected that new development will be accompanied by adequate Green Infrastructure levels to cater for the increasing population. Good planning is thought to be the answer amongst planners and Council officials to cope with future developments[67]. There is a general understanding that Green Infrastructure is necessary; most developers include some forms of Green infrastructure such as Sustainable Drainage Systems in their projects. However, a holistic way of integrating Green Infrastructure has not yet been fully developed[68]. One of the key functions that natural green spaces and Green Infrastructure are expected to fulfill is managing flood risk. Around 20% of the Anglian Region is classed as flood zones, with most of this area lying below sea level[69]. This includes 30% of the most productive agricultural land, around 400,000 properties (125,000 residential and 257,000 non-residential) or 11% of total properties in the area and 18,000 other assets such as electricity transmission assets and water infrastructure in the Anglian region. This is a key issue that will need to be addressed in terms of sustaining current and future growth.

3.3. Material input overview

Table 3.3.a summarises consumption and generation patterns in Gigawatt hours (GWh) in the LEP and County level. In 2009, total energy demand (measured by sales of energy units) was 21,283 GWh per year while total energy generation including renewables and non-renewable sources surpassed 37,000 GWh per year (where 1 GWh or Gigawatt hour is equivalent to one million units of electricity).

Table 3.3.a: Energy consumption (measured by sales of energy) and generation in New Anglia in GWh by source (2009)

Authority	Total Energy Consumption GWh (Gas Generated)	Total Energy Consumption GWh (Electricity)	Total Consumption GWh (Energy)
New Anglia	13,431	7,852	21,283
Suffolk	5,835	3,648	9,483
Norfolk	7,596	4,204	11,800

Non-Renewable Generation (GWh per year) in New Anglia and LAs by source				
Authority	**Natural Gas**	**Nuclear Power**	**Coal**	**Total Capacity**
New Anglia	3,710	5,020	0	36,896
Suffolk	254	5,020	0	22,288
Norfolk	3,457	0	0	14,608

Renewable Generation (GWh) in New Anglia and LAs by source				
Authority	**Dedicated Biomass**	**Landfill Gas**	**Onshore Wind**	**Total Capacity**
New Anglia	457	113	300	870

[67] Dr. White, D (2013): Coordinator of Green Infrastructure. Norfolk County Council. Personal Communication.

[68] Bishop, H. (2013): Wild Anglia Local Nature Partnership Coordinator. Personal Communication.

[69] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at: http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

Suffolk	162	56.5	74	293
Norfolk	294	56.5	226	577

Notes: Energy Consumption as GWh measured by sales in GWh. Gas Conversions in original dataset. Data on Non-renewable sources converted into GWh from MV.
Sources: **Consumption data** from Department of Energy and Climate Change, (2013). Sub-national energy consumption statistics. Statistical data set, January 2013. Accessed at https://www.gov.uk/government/statistical-data-sets/sub-national-energy-consumption-statistics.
Generation Capacity Data from NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, Report. February 2012. Accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

Suffolk's total electrical energy consumption was 3,648 GWh and 5,835 GWh of energy from gas in 2009. Norfolk consumed 4,204 GWh of electrical energy in 2009, and 7,596 GWh from gas in the same year. Domestic and commercial (including industrial) consumption of gas is similar when compared at the LEP level. In 2009, domestic total consumption (measured in GWh sales) was 6,618 compared to 6,813 attributed to the commercial sector. At the County level, Suffolk's domestic consumption is larger than its commercial counterpart while the opposite takes place in Norfolk[70].

Electricity consumption has slightly declined in the period 2005 to 2011 in both counties. Total consumption, including domestic and commercial fell from 4,443 GWh in 2005 to 4,204 GWh in 2011 in Norfolk and from 4,025 GWh to 3,446 GWh in Suffolk in the same period[70]. This might be due to increasing efficiency as the trend is negative and consistent with previous years. A small dip in 2008 can be interpreted as a consequence of the economic downturn as it is consistent with reducing CO_2 emissions due to declining energy demand as reported by the European Environment Agency (2011)[71].

Total renewable energy generation capacity (onshore) in Norfolk and Suffolk is 206 MW, generating 870 GWh per year (577 GWh per year in Norfolk and 293 GWh per year in Suffolk). This can be mainly attributed to dedicated biomass (457 Gwh per year) and onshore wind (300 Gwh per year), with a further 113 Gwh per year from landfill gas and 4 GWh per year from photovoltaic. Offshore renewable energy generation off the Norfolk and Suffolk coast has a total capacity of 817 MW, representing 54% of UK capacity, generating about 3,456 GWh per year[72].

New Anglia has an energy generation capacity of non-renewable energy of 2,066 MW constituted by 818 MW in Norfolk and 1,248 MW in Suffolk. All 818 MW in Norfolk is from

[70] Department of Energy and Climate Change, (2013). Sub-national energy consumption statistics. Statistical data set, January 2013.

[71] European Environment Agency, (2011). Why did greenhouse gas emissions fall in the EU in 2009? Analysis in Brief, December 2011.

[72] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, 4 February 2012, accessed at: http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

natural gas, while all 1,248 MW in Suffolk is from nuclear power[73]. This is equivalent to 36,895 GWh per year.

Lack of data for the LEP makes it difficult to assess any input/output relationship between oil demand and production. Nevertheless, UK's oil demand has been following a declining trend since the 1990's; demand for oil was around 91 million tonnes of oil equivalent (MTOE) in 1998 dropping to 77 million MTOE in 2012. Oil production and demand figures from the Department of Energy and Climate Change suggest that the UK was self-sufficient up until the end of the 1990's. However, in 2012, the UK had an oil import dependency of around 36%. It is forecast that by 2030, this dependency may increase up to 67%[74]. These figures and the fact that New Anglia is not a major oil producing region suggests that the region is a net oil importer.

Water is a key input for any economy. Water is particularly important for the economy in New Anglia because of the limited resources available in comparison to other regional economies in the UK. Despite being one of the driest regions in England, daily domestic water consumption averaged 153 litres per person across the East of England in 2008-09; slightly above the national average of 150 litres per person[75].

Table 3.3.b provides a brief description of water abstraction by purpose in the Anglian region for the period 2000 to 2010. The table shows increasing overall abstraction levels during this period. This includes water used for electricity generation that it is generally returned to water bodies as part of the process. Excluding figures for the electricity sector, water abstraction figures show an actual decrease in the water abstracted by around 300 million litres per day.

Public water supply is the main water user in the Anglian Region. In the period 2000 to 2010, public water supply has not changed significantly. Other industries referred to in Table 3.3.b include the commercial and light industry sector (non-agricultural) which has shown the largest reduction of water demand by around 200 million litres per day. It is likely that this is related to decreasing overall industrial activity due to the economic downturn.

Water management is imperative in the region due to emerging sustainability concerns. Managing water resources requires an array of stakeholders to work together. Catchment Abstraction Management Strategies (CAMS) are processes that aim to balance the anthropogenic and environmental water requirements both in the present and in the future in order to comply with the Water Framework Directive (2000/60/EC). These have been set up under the supervision of the Environment Agency. CAMS consider how much freshwater resource is reliably available, how much water the environment needs and the amount of water

[73] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, 4 February 2012, accessed at: http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[74] Department of Energy and Climate Change, (2013). Oil and Gas Demand/Productions Projections. Summary Brief, February 2013. Accessed at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/136390/production_projections.pdf

[75] Essex & Suffolk Water (2010): Final water resources management plan 2010-2035, January 2010.

already licensed for abstraction. This aids in the identification of where water is potentially available for abstraction whilst avoiding damage to existing resources[76].

The New Anglia region is aiming to become a green economy. This is an economy in which economic growth is combined with continued reductions of greenhouse gas emissions and other environmental impacts are reduced. Thus, emphasis on effective demand management and efficiency measures to increase efficiency when using natural resources such as energy and water is at the core of the LEP's development strategies. For example, The Green Economy Pathfinder Manifesto (2013) recognizes that the inputs of materials to production processes should be optimised and the level of waste to landfill should decrease, or be eliminated completely. It is expected that the area will continue to make efficiency gains to cope with expected population and economic growth.

[76] Environment Agency (2008). Water resources in England and Wales - current state and future pressures. Report, December 2008. Accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho1208bpas-e-e.pdf

Table 3.3.b: Estimated abstractions from surface and groundwater by purpose for the Anglian Region (Ml/day)										
Year	**Public water supply**	**Spray irrigation**	**Agriculture (excl. spray irrigation)**	**Electricity supply industry**	**Other industry**	**Fish farming, cress growing, amenity ponds**	**Private water supply**	**Other**	**Total**	**Total (adjusted)**
2000	2,075	187	27	2,063	496	158	4	1	5,011	2,948
2001	1,674	137	15	2,667	698	174	3	0	5,369	2,702
2002	2,171	115	15	5,243	637	168	3	0	8,353	3,110
2003	2,153	159	16	4,396	1,040	70	4	1	7,838	3,442
2004	2,153	126	14	4,875	1,027	69	5	2	8,270	3,395
2005	2,120	119	8	4,949	984	71	4	1	8,256	3307
2006	2,166	153	7	4,339	984	59	5	2	7,715	3,376
2007	2,011	91	7	4,535	1,005	67	5	1	7722	3,187
2008	2,032	97	4	4,651	261	56	5	1	7,108	2,457
2009	2,007	153	7	3,434	255	41	5	2	5,905	2,471
2010	2,063	175	6	4,471	286	90	4	2	7,098	2,627
Source: Environment Agency (2012): Water abstraction estimates dataset, accessed at https://www.gov.uk/government/statistical-data-sets/env15-water-abstraction-tables										

3.4. Waste treatment

The amount of municipal waste produced in Norfolk and Suffolk, including general household waste, waste from 'bring banks' and litter from street sweepings, has been declining since 2005. This is after a period of increasing waste volumes from 1998 to 2005[77].

Table 3.4.a gives an overview of waste amounts across Norfolk and Suffolk in the last 7 years. It suggests that decreasing waste is largely due to decreasing household waste (6.3% decrease of household waste in Norfolk and 8.5% in Suffolk in the period 2005 to 2012). Data show a significant increase in non-household waste in Suffolk from 3,673 tonnes in 2005/5 to 14,249 tonnes in 2011/12, equivalent to an increase of around 387%. Data for Norfolk suggests that non-household waste followed a similar negative trend to that observed for household waste (Table 3.4.a).

Table 3.4.a: Waste management in Norfolk and Suffolk in tonnes by type of waste

	County	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Total Municipal Waste (tonnes)	Norfolk	415,938	417,514	409,965	401,546	403,634	395,105	389,350
	Suffolk	391,082	432,910	408,254	395,259	386,708	387,601	373,098
% change	Norfolk	-	0	-2	-2	1	-2	-1
	Suffolk	-	11	-6	-3	-2	0	-4
Total Household waste (tonnes)	Norfolk	410,287	401,196	395,687	386,403	379,799	381,215	375,685
	Suffolk	370,350	385,242	367,639	356,800	348,232	352,968	338,892
% change	Norfolk	-	-2	-1	-2	-2	0	-1
	Suffolk	-	4	-5	-3	-2	1	-4
Non-household Waste (tonnes)	Norfolk	5,651	413	2,326	2,747	3,738	3,824	4,583
	Suffolk	3,673	5,966	5,608	7,247	11,688	13,017	14,249
% change	Norfolk	-	-93	463	18	36	2	20
	Suffolk	-	62	-6	29	61	11	9

Source: Defra Local Authority Collected and Household Waste Statistics (2005/2006 to 2011/2012): http://www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/

Local waste management plans such as Joint Municipal Waste Management Strategies and the current Waste and Mineral Development Frameworks have played an important role in moving from landfill dependence to more sustainable waste techniques such as minimization, recycling and composting. Table 3.4.b provides data on the percentage of total recycled household waste in the last 7 years. The table also presents the best and worst performers in a recycling ranking covering 397 authorities in England.

[77] Suffolk Waste Partnership, (2003). Joint Municipal Waste Management Strategy for Suffolk 2003–2020. Accessed at: www.greensuffolk.org/assets/.../JMWMS2003+Addendum2008.pdf

Table 3.4.b: Percentage of household waste sent for recycling (%) and rank of authorities								
	Authority	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**
Household Waste (%)	Norfolk	33.8	38.5	40.4	43.1	43.5	45.0	45.3
	Suffolk	34.6	42.9	43.0	48.5	44.8	53.8	57.0
Rank (out of 397 local authorities in England)	Norfolk	68	73	95	101	107	114	130
	Highest ranking authority (rank)	Broadland (24)	Broadland (21)	Broadland (30)	Broadland (34)	Broadland (58)	Broadland (57)	Broadland (83)
	Lowest ranking authority (rank)	Norwich (353)	Norwich (377)	Norwich (360)	Great Yarmouth (316)	Great Yarmouth (331)	Great Yarmouth (336)	Great Yarmouth (332)
	Suffolk	21	37	44	41	30	29	39
	Highest ranking authority (rank)	St Edmunds-bury (3)	St Edmunds-bury (8)	Waveney (11)	Waveney (8)	Waveney (16)	Suffolk Coastal (9)	Suffolk Coastal (22)
	Lowest ranking authority (rank)	Mid-Suffolk (152)	Mid-Suffolk (125)	Mid-Suffolk (134)	Babergh (154)	Mid-Suffolk (160)	Ipswich (156)	Mid-Suffolk (184)
Source: Defra Local Authority Collected and Household Waste Statistics (2005/2006 to 2011/2012): http://www.defra.gov.uk/statistics/environment/waste/wrfg23-wrmsannual/ Ranking is indicative as it includes the District and Borough Council figures that make up the County figures (due to presentation of the data, which also means that a total for England cannot be obtained by summing data to avoid double counting)								

In Suffolk, waste recycling is in line with their initiative to become one of the greener counties in the UK. The percentage of total household waste sent for recycling has continuously increased since 2005, meeting Defra's updated recycling targets for 2015 well before the deadline[78]. Figures for Norfolk are also encouraging; however, the upward trend has slowed in more recent years.

Suffolk has a widespread network of waste management facilities. These include:

- 7 non-hazardous landfills;
- 11 inert only landfills;
- 8 incinerators;
- 7 composting plants;
- 18 household waste recycling centres;
- 2 materials recycling facilities;
- 26 waste transfer facilities;
- 20 aggregates recycling facilities;

[78] House of Commons (2010). Report on Environment, Food and Rural Affairs Committee on the Waste Strategy for England 2007. Report of session 2009–10. Volume 1. Accessed at: http://www.publications.parliament.uk/pa/cm200910/cmselect/cmenvfru/230/230i.pdf

- 24 metal and end of life vehicles facilities; and
- 25 main waste water treatment works.

There are no hazardous landfill sites in Suffolk. Hazardous waste is taken to sites outside of the County for treatment or disposal even though the volume of hazardous waste generated in Suffolk is low[79]. Radioactive waste from Sizewell is either dealt with on-site (in purpose built incinerators) or transported to the specialist facility near Drigg in Cumbria[79].

Key waste management facilities in Norfolk include[80]:

- 1 Material Recovery Facility (MRF) at Costessey;
- 20 Recycling Centres;
- 6 composting facilities;
- 10 waste transfer station in 3 strategic locations;
- 3 landfill sites; and
- Within other.

Similarly to Suffolk, there are no sites able to deal with hazardous waste. Thus, this type of waste is often exported outside of the region[80]. Examples of hazardous waste exported outside Norfolk include:

- Asbestos being transported to King's Cliffe landfill site in Northamptonshire (near Peterborough) for disposal;
- Clinical waste being transferred to Ipswich Hospital in Suffolk for incineration; and
- Waste batteries (collected at Household Waste Recycling Centres) being sent to the H. J. Enthoven plant near Matlock in Derbyshire for recycling.

Waste management forecasts for Suffolk estimate 548,000 tonnes per year by 2020/21 taking into account current declining trends and the expected level of population growth and approximately 1.54 million tonnes of commercial and industrial waste[81]. In addition, the county would have to deal with an estimated 94,000 tonnes of imported waste, most likely from London[82]. In Norfolk, municipal waste is foreseen to be over 505,000 tonnes with more than

[79] Suffolk County Council (2011): Waste Core Strategy including Development Management Policies, Minerals & Waste Development Framework, March 2011.

[80] Norfolk Waste Partnership, (2006). Joint Municipal Waste Management Strategy for Norfolk. Appendices, March 2006. Accessed at: http://www.norfolk.gov.uk/view/NCC049080

[81] Suffolk County Council (2011): Waste Core Strategy including Development Management Policies, Minerals & Waste Development Framework, March 2011.

[82] Government Office of the East of England, (2008). East of England Plan: The Revision to the Regional Spatial Strategy for the East of England. Appendix C. May 2008. Accessed at: http://web.dacorum.gov.uk/docs/default-source/planning-development/east-of-england-plan-may-2008.pdf?Status=Master&sfvrsn=0

1.18 million tonnes of industrial waste. Norfolk is also expected to manage up to 190,000 tonnes of imported waste per year by 2021[83].

Coping with future waste volumes will be achieved by adapting and expanding current facilities as well as setting up new facilities in places where minimal environmental impact can be achieved[84]. The overarching strategy will be developed upon promoting understanding of the waste hierarchy; the different stages of how people can contribute to generating lower waste levels and how waste will be managed in the future.

3.5. Material output overview

Key outputs from the New Anglia economy are derived primarily from the energy sector. Norfolk and Suffolk are adjacent to large gas hydrocarbon fields on the Southern North Sea (SNS), which are estimated to provide 30% of the future gas reserves in the UK[85]. The area currently supplies around half of the UK's domestic gas requirements, with proven and potential reserves of gas estimated at 174 billion m^3 in 2012. There are a further 66 billion m^3 in possible reserves and 56 billion m^3 in potential additional reserves[86].

The Bacton Gas Terminal located off the coast of north Norfolk is the source of 30% of the country's gas[87]. The terminal is one of the largest in the UK and extracts gas from the SNS fields and Shearwater-Elgin Area Line (SEAL) pipeline. Gas is then distributed to UK customers via the national grid terminal[88]. Table 3.5.a provides data on total gas production and percentage change year on year from the main operators in the area, showing that output is decreasing across the board. New gas developments are likely to take place as energy companies

[83] Government Office of The East of England, (2008). East of England Plan: The Revision to the Regional Spatial Strategy for the East of England. Appendix C, May 2008. Accessed at: http://web.dacorum.gov.uk/docs/default-source/planning-development/east-of-england-plan-may-2008.pdf?Status=Master&sfvrsn=0

[84] Suffolk County Council (2011): Waste Core Strategy including Development Management Policies, Minerals & Waste Development Framework, March 2011

[85] East of England Energy Group website: Southern North Sea remains a treasure trove for East of England, accessed at: http://www.eeegr.com/news/southern-north-sea-remains-a-treasure-trove-for-east-of-england-2439.html

[86] DECC: Pie Charts Showing Potential for UK Reserves Growth, Department of Energy & Climate Change, accessed at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/16093/6310-pie-charts-pot-res-grow-2012.pdf

[87] EDP 24 the business website: The future of Norfolk and Suffolk's energy contribution to be scrutinised, accessed at: http://www.edp24.co.uk/business/the_future_of_norfolk_and_suffolk_s_energy_contribution_to_be_scrutinised_1_1964117

[88] Interconnector website: IBT Terminal, accessed at; http://www.interconnector.com/PhysicalOps/Bacton.html

announced funding of over £3 billion to 10 approved gas drilling projects in the SNS over the next 5 years[89].

Table 3.5.a: Gross gas production by operator 1999 to 2011 at Bacton Gas Terminal						
Year	Million m³ produced			Year-on-year change (%)		
	Bacton Perenco	Bacton ENI Hewett	Bacton Shell	Bacton Perenco	Bacton ENI Hewett	Bacton Shell
2011	2,221	509	4,937	+11	-46	±0
2010	2,003	946	4,920	-1	-38	-5
2009	2,032	1,516	5,165	-14	-5	-9
2008	2,375	1,597	5,706	+1	-38	+31
2007	2,342	2,595	4,347	-3	-11	-30
2006	2,423	2,901	6,174	-5	-1	-25
2005	2,553	2,916	8,230	-23	+37	±0
2004	3,336	2,136	8,193	-14	-27	+3
2003	3,873	2,937	7,932	-14	-25	+6
2002	4,493	3,914	7,466	-13	-24	-30
2001	5,179	5,140	10,660	-12	-23	+11
2000	5,885	6,655	9,638	+8	-7	+21
1999	5,431	7,157	7,966	-	-	-
Source: DECC (2012): Gas production (DUKES F.2), Department of Energy & Climate Change, accessed at https://www.gov.uk/government/publications/natural-gas-chapter-4-digest-of-united-kingdom-energy-statistics-dukes						

The region is also an important nuclear and other low carbon energy producer. Sizewell B produces 36,895 GWh of nuclear energy per year[90] and proposed new reactors at Sizewell C, which forms part of the Government's new civil nuclear build programme, is expected to supply 6% of the nation's electricity. This is enough power for around 5 million homes[91].

Aside from the energy sector, New Anglia has a range of mineral resources. The main minerals extracted within the LEP are sand and gravel. The majority of output is traded within the East of England and in London. The region also imports sand and gravel from other regions[92].

Mineral aggregates from recycled materials are also an important output for the region. In Suffolk, recycled aggregate sales increased from 213,800 tonnes in 1998 to 554,700 tonnes in 2002, before stabilising at around 480,000 tonnes in 2003. An estimated 500,000 tonnes were

[89] Lowestoft The Journal 24 website: Gas drilling upsurge for southern North Sea, accessed at: http://www.lowestoftjournal.co.uk/news/gas_drilling_upsurge_for_southern_north_sea_1_1954358

[90] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, 4 February 2012, accessed at: http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[91] New Anglia, (2013). Local Partnership for Norfolk and Suffolk. Sector Growth Strategy, February 2013. Accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[92] Suffolk County Council (2012): Suffolk Local Aggregates Assessment, accessed at: http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Suffolk%20Local%20Aggregates%20Assessment%20Final%20Draft%20v%2017-12-12.pdf

sold in 2006/2007[93]. It is not expected that sales of recycled aggregate will increase significantly as industry predicts that this could only contribute to a maximum of 30% of total aggregate demand[94].

The region's natural endowments and the expertise in the low carbon and renewable energy sectors will enable the region to benefit from the transition towards a green economy in the UK. The New Anglia LEP included the energy sector in its strategic growth strategy and this will further enhance the development potential of the areas[95].

[93] Suffolk County Council (2009): Waste Core Strategy Submission Final Sustainability Appraisal Report, December 2009. Data excludes Forest Heath.

[94] Suffolk County Council (2012): Suffolk Local Aggregates Assessment, Final Draft, December 2012.

[95] New Anglia, (2013). Local Enterprise Partnership for Norfolk and Suffolk. Sector Growth Strategy, February 2013. Accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

4. Provisioning services

4.1.Fuel

4.1.1. Oil and Gas

In 2009 Suffolk consumed 5,835 GWh of energy from gas and 3,648 GWh of electrical energy. Norfolk consumed 7,596 GWh of gas in 2009, and 4,121 GWh of electricity in the same year. Overall Norfolk consumes more energy from gas and electricity than Suffolk does. The total energy demand in Suffolk, including transport, was estimated at 16,647 GWh for 2008 with domestic use (5,671 GWh) slightly greater than that of either the transport (5,541 GWh) or industrial and commercial (5,396 GWh) sectors[96]. Tables 4.1.1.a and 4.1.1.b show the sales of gas and electricity in Norfolk and Suffolk.

Table 4.1.1.a: Gas sales (2009) by type of consumer (GWh)

	Suffolk	Norfolk	New Anglia	East of England	Great Britain
Domestic consumers	3,158	3,460	6,618	30,756	347,410
Commercial and industrial consumers	2,678	4,135	6,813	16,965	191,648
All consumers	5,835	7,596	13,431	47,720	539,058

Source: DECC (2009) Sub-national energy consumption statistics 2009, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/statistical-data-sets/sub-national-energy-consumption-statistics

Table 4.1.1.b: Electricity sales by type of consumer between 2005 and 2011 for Norfolk and Suffolk (GWh)

Year	Domestic consumers	Commercial and industrial consumers	All consumers
Norfolk			
2005	1,944	2,499	4,443
2006	1,920	2,449	4,369
2007	1,913	2,394	4,308
2008	1,809	2,293	4,103
2009	1,786	2,335	4,121
2010	1,814	2,573	4,387
2011	1,784	2,420	4,204
Suffolk			
2005	1,619	2,406	4,025

[96] Suffolk County Council (2012): Suffolk Flood Risk Management Strategy: Sustainability Appraisal Scoping Report, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Emergency%20and%20Safety/Civil%20Emergencies/SFRMS%20Scoping%20Report%20-%20May%202012.pdf

Table 4.1.1.b: Electricity sales by type of consumer between 2005 and 2011 for Norfolk and Suffolk (GWh)

Year	Domestic consumers	Commercial and industrial consumers	All consumers
2006	1,594	2,362	3,955
2007	1,592	2,213	3,805
2008	1,500	2,200	3,701
2009	1,487	2,161	3,648
2010	1,507	2,087	3,593
2011	1,474	1,972	3,446

Source: DECC (2013): Regional and local authority electricity consumption statistics: 2005 to 2011, accessed at https://www.gov.uk/government/statistical-data-sets/regional-and-local-authority-electricity-consumption-statistics-2005-to-2011

Within the UK Norfolk and Suffolk are at the heart of the energy sector, with around £30.8 billion of a £271 billion planned investment in new energy projects expected within this region by 2020[97].

The government is keen to maximise recovery of the UK's oil and gas supplies as it is predicted they will provide up to 70% of energy requirements into the 2040's[98]. (see Section 3.5 for a detailed overview of gas production in Norfolk and Suffolk).

Department of Energy and Climate Change (DECC) projections for gas production suggest a slight decrease from 2011 levels before production begins to plateau from 2012 to 2017, with total reserves estimated at 493 billion m^3 (central estimate) to 706 billion m^3 (maximum estimate)[99].

The North Sea is classified as a mature oil and gas region which has passed peak production, however as technology has improved, it has become possible to extract more from reservoirs. There are a number of factors which enable and influence this extended viability[100]:

[97] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[98] Oil & Gas UK (2013): Activity Summary 201, accessed at http://www.oilandgasuk.co.uk/cmsfiles/modules/publications/pdfs/EC037.pdf

[99] DECC (2012): UKCS Oil and Gas Production Projections, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/136390/production_projections.pdf

[100] EADT 24: Does North Sea oil and gas have a future?, accessed at http://www.eadt.co.uk/home/does_north_sea_oil_and_gas_have_a_future_1_1468627

- Sustained high oil and gas prices;
- Emergence of companies that specialise in the operation of mature fields and field life extension;
- Marginal field development;
- Technological advancements in drilling and production methodologies;
- Supportive government and stable fiscal environment; and
- A sustainable supply of qualified and competent resources.

Despite these advancements oil and gas reserves are finite and will continue to diminish, therefore the sector does need to evolve. The Norfolk and Suffolk Energy Alliance (NSEA) predicts a capital spend of £7 billion on upstream oil and gas to 2020 for the UK as a whole, but does not anticipate that this expenditure will take place in Norfolk or Suffolk. The East of England is ideally situated to move into the Carbon Capture and Storage (CCS) sector given its proximity to the depleted gas fields of the SNS[101]. Most of the existing and in some cases redundant, on and offshore infrastructure can be easily modified for CCS. There are extensive reserves of coal in the SNS, which have the potential to provide energy security in the future long after gas and oil have been exhausted; a site in Norfolk has already been earmarked for further investigation. It is not possible to extract these reserves using conventional methods so gasification is used, which involves the partial in-situ combustion of a coal seam to produce a gas for use as an energy source[102]. Again the existing infrastructure can be easily modified to deal with the production and transportation of the resultant gas mixture. The region also has a wealth of skills and technical expertise which will be invaluable for both these pioneering ventures.

The oil and gas sector is a major employer and provides a significant number of job opportunities within Norfolk and Suffolk[103]. Any decline in the sector will therefore have a detrimental impact on the local area, particularly Great Yarmouth and Lowestoft.

The UK climate act (2008) commits the UK to an 80% reduction in CO_2 emissions by 2050 and significant progress has been made. Renewable energy might have an important role in contributing to this target. Suffolk is estimated to have 452% of its projected 2020 heat and electricity demands available in natural energy from renewable sources (mainly wind). The actual uptake after taking account of planning issues and other practical constraints suggests a more modest figure of 14.1% of demand. These figures exclude marine contributions such as offshore wind farms. It is virtually certain that installed renewable capacity will continue to grow under the influence of Government incentives and rising energy prices. In 2009 Suffolk

[101] East of England Energy Group: Carbon Capture and Storage (CCS), accessed at http://www.eeegr.com/carbon-capture-and-storage-ccs.html

[102] DECC: Underground Coal Gasification in the UK, Department of Energy & Climate Change, accessed at http://coal.decc.gov.uk/en/coal/cms/publications/mining/gasification/gasification.aspx

[103] offshoreWIND.biz (2011): Oil, Gas and Renewable Sector Leads Way with jobs in Norfolk, Suffolk (UK), accessed at http://www.offshorewind.biz/2011/12/29/oil-gas-and-renewable-sector-leads-way-with-jobs-in-norfolk-suffolk-uk/

had only 2.75 MW of onshore wind generating capacity in service but a further 14.03 MW had been approved and 18.3 MW was being considered for planning permission. In Norfolk onshore wind schemes produced 21.45 MW and there was a further 46.8 MW in planning[104]. These figures support the suggestion that energy capacity from renewable sources will increase in coming years.

4.1.2. Coal

Coal provides a vital source of power for the UK energy industry, however there is no coal production or coal-based energy generation capacity in Norfolk and Suffolk[105]. In 2011 the UK imported 31.7 million tonnes of coal (steam coal, coking coal and anthracite) and exported 0.6 million tonnes[106], coal imports have exceeded coal production in the UK since 2003[107]. Coal contributes around 30% of the electricity generation within the UK; however the CO_2 emissions from its use are high. In 2011 the estimated CO_2 emissions from electricity generated via coal was 912 tonnes per GWh of electricity supplied, far greater than for oil or gas. Coal produced 108,583 GWh of electricity in the same year[108]. Most coal within Norfolk and Suffolk is supplied for domestic uses and, as there are no coal fuelled power stations in either county, is imported into the area.

Coal use and production within the UK is likely to change within the next 20 years due to changes in demand. At the national scale the demand for coal as energy fuel may increase due to increased oil prices. It may also decrease due to the associated CO_2 emissions as coal fired generation has much higher CO_2 emissions than other sources of electricity such as gas and nuclear energy. The UK Climate Change Act commits the UK to a carbon account 80% lower

[104] Renewables East (2009): East of England Renewable Energy Statistics, accessed at http://www.solaruk.net/resources/E%20of%20E%20Ren%20Energy%20Stats%20June%2009%20211209.pdf

[105] NSEA (2012): An energy supply chain strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[106] DECC (2012): Digest of United Kingdom energy statistics 2012: internet content only, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/84174/5965-dukes-2012-annex-g.pdf

[107] DECC (2012): Solid fuels and derived gases: Chapter 2, Digest of United Kingdom energy statistics (DUKES), Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65755/5952-dukes-2012-chapter-2-solid-fuel.pdf

[108] DECC (2012): Electricity: Chapter 5, Digest of United Kingdom energy statistics (DUKES), Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65818/5955-dukes-2012-chapter-5-electricity.pdf

than in 1990 by 2050[109]. This could limit the role of coal unless Carbon Capture and Storage (CCS) proves effective at reducing emissions from fossil fuel generation (CCS has the potential to reduce CO_2 emissions from fossil fuel power stations by up to 90%[110]). The UK government aims to decarbonise electricity generation and one measure to be introduced is to set an annual limit equivalent to 450g CO_2 per kWh for new fossil fuel powered stations[111], this may negatively impact the LEP area as building new coal powered stations may be more costly due to adaptations to account for the reduced CO_2 emissions. A major project for coal generation within the UK is planned with a capital value of £3 billion up to 2020[112].

Within Norfolk and Suffolk there is not currently any coal based electricity generation, however the Norfolk and Suffolk Energy Alliance (NSEA) notes that significant coal reserves have been found in the Southern North Sea (SNS) basin. The existing infrastructure could be easily adapted to allow for coal gasification, meaning that Norfolk and Suffolk would be well placed to exploit this new opportunity. Opportunities have been identified for the Bacton gas terminal due to its eight pipelines that tie it to 74 fields. Alternative suggestions include a CCS hub around the Thames gateway; this is likely to benefit the New Anglia LEP area less than the use of the Bacton gas terminal[112].

4.1.3. Nuclear

Nuclear power makes a significant contribution to electricity generation in Suffolk with a total generating capacity of 1,188 MW. There is no capacity for nuclear power in Norfolk at present. There are plans for further expansion of nuclear power at Sizewell in Suffolk, with potential spends of £6 billion capital value of new build[113]. This is expected to result in a peak of 5,600

[109] The National Archives (2008): The Climate Change Act 2008. Report for HM Government, accessed at http://www.legislation.gov.uk/ukpga/2008/27/contents

[110] NSEA (2012): An energy supply chain strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[111] DECC: Planning our electric future: a White Paper for secure, affordable and low-carbon electricity, Department for Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48129/2176-emr-white-paper.pdf

[112] NSEA (2012): An energy supply chain strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[113] NSEA (2012): An energy supply chain strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

jobs during construction and 900 permanent direct jobs. Although some of these jobs, especially during construction, are likely to involve people from outside the local area, it is estimated that at least 40% of the jobs could be supplied locally[114].

Sizewell B provides 3% of the UK's electricity and has saved an estimated 67 million tonnes of CO_2 since 1995. Existing nuclear power facilities are being decommissioned, however, as indicated above there are plans for further development at Sizewell[115].

4.1.4. Mineral resources

The main minerals extracted within the LEP area of Norfolk and Suffolk are sand and gravel, although other minerals are also worked here as shown in Table 4.1.d. There is significant marine dredging off the East Coast for sand and gravel, and between 1998 and 2007 over 88 million tonnes of sand and gravel were extracted from this region. The Marine Management Organisation (MMO) estimates that 45% of all marine dredged sand and gravel in the UK comes from this region. In 2011 the total removal of marine aggregates from East Coast dredging was 5.2 million tonnes, however only 148,483 tonnes (less than 3%) was landed on the East Coast, in Ipswich, which is the only port currently handling marine aggregates in Suffolk. Landing of marine aggregates is largely determined by demand, with most going to Greater London or the near continent. Suffolk does not have any significant supply of secondary aggregates, although it does have eight asphalt batching plant facilities, 19 concrete batching plants and 25 aggregates recycling facilities, as well as a number of mobile operators who provide crushing and screening equipment on development sites[116]. There are 52 active sand and gravel workings within the LEP area of Norfolk and Suffolk. Norfolk has a broader base of mineral extractions than Suffolk and extracts greater quantities of minerals as shown in Table 4.1.4.a. Suffolk has the opportunity to receive marine dredged material which Norfolk does not.

[114] EDF Energy (2012): Initial Proposals and Options Consultation Document: Sizewell C Stage 1 Pre-Application Consultation, accessed at http://sizewell.edfenergyconsultation.info/wp-content/uploads/Consultationdocument.pdf

[115] NSEA (2012): An energy supply chain strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[116] Suffolk County Council (2012): Suffolk Local Aggregates Assessment, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Suffolk%20Local%20Aggregates%20Assessment%20Final%20Draft%20v%2017-12-12.pdf

Table 4.1.4.a: Mineral extractions in Norfolk and Suffolk		
Minerals	**Norfolk**	**Suffolk**
Sand and gravel	Land won extractions of 2.98 million tonnes per annum 2008. 36 active sand and gravel workings (widespread distribution but clusters around King's Lynn, in the north of Breckland and around Norwich). Sand and gravel production has averaged 2.39 million tonnes per year in the 10 years up to and including 2008	Land won extractions of 1.83 million tonnes per annum 2008. 16 active sand and gravel workings (mostly around Ipswich). Marine sand and gravel are extracted off the east coast and landed at Ipswich, 154,141 tonnes of marine sand and gravel were landed in Ipswich East and West bank terminals in 2005. This is 10% of the total sand and gravel sales within Suffolk. This figure has been stable for some years
Chalk	In 2008 there were three active chalk sites	In 2004 there were two active chalk quarries (The chalk land bank is estimated to contain more than 40 years supply. Very low demand for chalk in Suffolk, extracted in small quantities)
Clay	In 2008 there was one active clay site	Not currently extracted
Silica sand	Sibelco is the only company extracting sand and is situated east of King's Lynn Expected production rate of 450,000 tonnes per year	Not currently extracted
Carstone (a type of sandstone, often used in the construction of roads)	In 2008 there were four quarries Carstone production in 1989 to 2008 was 0.24 million tonnes per year, and averaged 0.16 million tonnes in 1999-2008	Not currently extracted
Sources: Norfolk County Council (2010): Norfolk Minerals and Waste Development Framework, Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2025, accessed at http://www.norfolk.gov.uk/consumption/groups/public/documents/general_resources/ncc078476.pdf Suffolk County Council (2011): Minerals & Waste Development Framework, Waste Core Strategy including Development Management Policies, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Minerals%20and%20Waste%20Development%20Framework/Waste%20Core%20Strategy/Waste%20Core%20Strategy.pdf Suffolk County Council (2012): Suffolk Local Aggregates Assessment, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Suffolk%20Local%20Aggregates%20Assessment%20Final%20Draft%20v%2017-12-12.pdf		

Note: Land won refers to minerals extracted from the land as opposed to the sea

In 1995 annual sales of sand and gravel peaked in Suffolk at around 1.9 million tonnes. Recently this has decreased and has not exceeded 1.2 million tonnes since 2009. Over the past 10 years the sale of sand and gravel has averaged 1.39 million tonnes in Suffolk. In Norfolk sales of sand and gravel were 1.8 million tonnes in 2008. The total sales in the UK of sand and gravel was 72

million tonnes in 2008; Norfolk and Suffolk provided around 4.5% of the UK's sand and gravel sales. Sales of sandstone in Norfolk were 257,000 tonnes in 2008, 2.1% of the UK total. Sales of recycled aggregate were 213,800 tonnes in 1998 in Suffolk; this increased to 554,700 tonnes in 2002, but then dropped to 480,000 tonnes in 2003[117]. Norfolk is one of the most important national sources of silica sand (more than 10% of total outputs and a larger proportion of glass sand production). Sibelco is the only company extracting sand in the area and is situated east of King's Lynn.

As well as income, mineral extraction provides employment within the LEP area; this industry employed 482 people in the two counties in 2008. This was 1.6% of the total number of people employed in the mineral industry in the UK[118].

The mineral industry within Suffolk relies on imports by neighbouring counties, generally where the demand is located close to the county boundaries. 193,000 tonnes of sands and gravels were exported to the rest of the East of England in 2009. Suffolk imports and exports sand and gravel, and in 2009 69% of the sand and gravel consumed in Suffolk was produced in the East of England. Suffolk imported 272,000 tonnes of land won sand and gravel from nearby counties, such as Essex, Cambridgeshire and Peterborough. In 2009 Suffolk exported 163,000 tonnes of sand and gravel, all of which went to areas within the East of England. Suffolk imports marine dredge and marine borne aggregates via Ipswich docks. There is limited demand in Suffolk for chalk and with no active brick works clay and chalk are not imported in any significant quantities. Suffolk has no indigenous hard rock and relies on importing this material, mainly by rail from other areas within the East of England. Most of the crushed rock imported into Suffolk in 2009 came from Leicestershire[117]. Much of the silica sand produced in Norfolk is exported for ceramics and glass production. Within Norfolk, the demand for sand and gravel related products are related to the four largest settlements (Norwich, King's Lynn, Thetford and Great Yarmouth)[119].

Mineral extraction is known to have adverse effects on the local environment, particularly through onsite noise, dust and light pollution, as well as reducing the biodiversity and landscape quality. Pollution may also indirectly affect the water quality of the area. Offsite effects of mineral extraction also include noise and dust pollution, as well as disturbance to local communities and the impact of HGV movement on public highways. The marine environment can be particularly affected by mineral extraction if it occurs in sensitive areas. Despite the negative impacts of minerals it is important to note that quarrying is a temporary undertaking and, in the long run, can provide benefits to communities and the environment, such as open

[117] Suffolk County Council (2012): Suffolk Local Aggregates Assessment, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Suffolk%20Local%20Aggregates%20Assessment%20Final%20Draft%20v%2017-12-12.pdf

[118] ONS (2008): Mineral Extraction in Great Britain, 2008, Office for National Statistics, accessed at http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-49800

[119] Norfolk County Council (2010): Norfolk Minerals and Waste Development Framework, Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2025, accessed at http://www.norfolk.gov.uk/consumption/groups/public/documents/general_resources/ncc078476.pdf

spaces and recreational opportunities as well as habitat restoration[120]. Within Norfolk mineral extraction works will be avoided adjacent to protected or sensitive areas[121], which will reduce the adverse environmental effects of the extractions.

Changes in the extraction of minerals in Norfolk and Suffolk can be caused by a variety of both internal and external factors. Norfolk County Council aims to maintain a landbank of minerals within Norfolk of: 7 to 10 years for sand and gravel, 10 years for carstone and 15 years for silica sand. Currently the landbank for sand and gravel within Norfolk is sufficient to meet the county's need for only the next 5.4 years; therefore demand needs to decrease in order for the County Council to meet its target, or more sand and gravel will need to be imported. The other minerals currently meet the targets[121]. Due to increasing fuel prices, transport of minerals, particularly sand and gravel which are expensive to transport, will become more costly. This may decrease demand from companies. It is less costly to transport marine dredged material, which may become more popular. There are wharves in Lowestoft suitable for marine aggregates which are not currently being used. As demand increases with economic growth there is the capacity for more aggregates to be extracted and landed in Suffolk at Lowestoft than are being currently landed. Sales of recycled aggregates are not expected to increase significantly in Suffolk as industry predicts that this could only make up a maximum of 30% of total aggregate demand[122], however, it is likely that there will be an increased need to supply local aggregates for growth related infrastructure. Norfolk is required to provide a total of 3.18 million tonnes of aggregates and rock per year to the East of England Plan for growth related infrastructure[121].

4.1.5. Peat

Peat extraction and sales have been decreasing within the UK. The total area of land used for peat extraction in the UK was 10,690 ha in 2009; this was a decrease from 14,980 ha in 1994. 1.6 million m^3 of peat were sold in 1999 and 760,000 m^3 in 2008 in the UK. Historically peat was used as stable litter and fuel to heat houses but since the mid-1960s the use of peat has become more popular in compost. Peat content in compost peaked in 1997 at 96% but has since decreased due to pressures from the government. The total volume of peat used in the UK in horticulture in 2007 was around 3 million m^3, less than half of which came from within the

[120] Suffolk County Council (2007): Final Sustainability Appraisal Report. Report for the Minerals Core Strategy of Suffolk County Council's Minerals & Waste Development Framework, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Minerals%20and%20Waste%20Development%20Framework/Minerals%20Core%20Strategy%20DPD/Final%20Sustanbility%20Appraisal%20Report.pdf

[121] Norfolk County Council (2010): Norfolk Minerals and Waste Development Framework, Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2025, accessed at http://www.norfolk.gov.uk/consumption/groups/public/documents/general_resources/ncc078476.pdf

[122] Suffolk County Council (2012): Suffolk Local Aggregates Assessment, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Suffolk%20Local%20Aggregates%20Assessment%20Final%20Draft%20v%2017-12-12.pdf

UK. Within England, horticulture consumes 2.4 million m^3 of peat each year[123]. Despite a voluntary reduction target successfully reducing peat use, the market is still only 57.5% peat free[124]. Peat is still sold for fuel and is important in the whisky industry[123]. Within Norfolk and Suffolk peat forms in fen habitats, where there are high ground water levels[125].

In the East of England 36,636 ha of peat were mapped in 1987, 35% of the total area of peat within England and Wales. The majority of this peat was in Fenland in Cambridgeshire (24,000 ha), however, there are also areas of peat within Norfolk and Suffolk, as demonstrated by Figure 4.1.5.a.

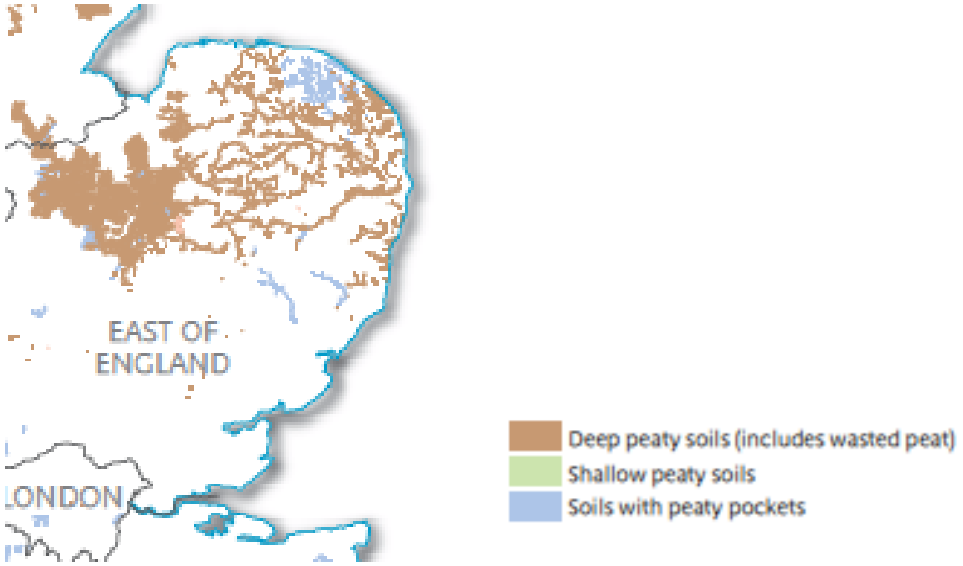

Figure 4.1.5.a: The location and depth of the East of England's peatlands. Source: Natural England (2011): England's peatlands: carbon storage and greenhouse gases, accessed at http://publications.naturalengland.org.uk/publication/30021

More than half of the peat use in the UK is currently imported from countries such as Ireland and the Baltic states[126]. The fens within Norfolk and Suffolk are probably the closest source of peat for the majority of South and Central England; therefore it is possible that a proportion of any peat extracted from this area is exported to other regions. It is unlikely that a significant quantity of peat is extracted from the Norfolk and Suffolk area as most lowland peatlands are

[123] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

[124] Defra (2011): The Natural Choice: securing the value of nature, Department for the Environment, Food & Rural Affairs, accessed at http://www.official-documents.gov.uk/document/cm80/8082/8082.pdf

[125] Natural England: Peat, accessed at http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/englands/peat.aspx

[126] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

used for agriculture[127] and, although this contributes to the degradation of the peat, therefore limits its extraction.

External factors driving changes in the UK's peatland include policy, demand and the efforts taken to protect these areas. Both policy and demand will determine the amount of peat extracted from UK sources in the future, however, demand may not influence extraction very strongly as a large quantity of peat is currently imported. Policy may lessen peat extraction through a reduction in extraction licences[128]. The need to protect and restore the UK's peatlands has been recognised by a number of organisations and will consequently reduce the availability of peat for extraction. The IUCN UK Peatland Programme exists to promote peatland restoration in the UK and advocates the benefits of peatland[129]. The Peat Project is also working to protect peatlands; it is a joint partnership between Natural England, Defra, the Environment Agency, Forestry Commission, the Welsh Assembly Government, Countryside Council for Wales and Northern Ireland Environment Agency. It aims to provide and share information to promote more peatland restoration and improve the way we restore peatlands[130]. There are four known sites where management of peat is taking place in Norfolk and Suffolk, these are; Redgrave and Lopham Fen, Mid Yare Valley, Broads fen management in the Bure marshes and Sutton fen. Managers include the RSPB, Natural England and the Wildlife Trust[131]. Defra has a target to reduce peat use to zero by 2030 using a variety of voluntary phase-out targets[132].

Threats to peat include; cultivation, agricultural improvement, afforestation, drainage, burning, overgrazing, abandonment and extraction of peat for use as a growing medium or fuel. All of these threats cause degradation to peat, reducing the quality of the habitat it provides and causes the release of stored carbon into the atmosphere as CO_2, which contributes to the emission of greenhouse gases. Restoration of peat significantly reduces its CO_2 emissions, and should result in a return to active peat formation with ongoing carbon sequestration, however re-wetting peatlands could increase emissions of other gases such as methane and nitrous oxide[127].

[127] Natural England (2011): England's peatlands: carbon storage and greenhouse gases, accessed at http://publications.naturalengland.org.uk/publication/30021

[128] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

[129] IUCN: About the Peatland Programme, International Union for Conservation of Nature, accessed at http://www.iucn-uk-peatlandprogramme.org/about/AboutPeatlandProgramme

[130] Natural England: Peat, accessed at http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/englands/peat.aspx

[131] The Peat Compendium: Project locations, accessed at http://peatlands.org.uk/?q=map/node

[132] Defra (2011): The Natural Choice: securing the value of nature, Department for Environment, Food & Rural Affairs, accessed at http://www.official-documents.gov.uk/document/cm80/8082/8082.pdf

4.1.6. Renewable energy

The UK renewable energy industry is currently relatively strong and represents an attractive market for investors. The Department of Energy and Climate Change (DECC) estimated that between April 2011 and July 2012 there were confirmed and planned investments worth around £12.7 billion and around 22,800 jobs in the UK renewables industry[133]. According to the Renewable Energy Association (REA) the renewable energy industry was worth £12.5 billion to the UK economy, supported 110,000 UK jobs and facilitated exports worth £1.6 billion in 2010 to 2011[134]. The UK renewables market is the second most attractive in the world for offshore wind investment, fifth most attractive in the overall wind index and ranked fifth most attractive for all renewables out of 40 countries[133].

After Aberdeen, the East of England is the second largest centre for the UK energy industry. There are 1,688 companies that have existing or potential capacity to operate within the energy sector; this is equivalent to 19% of the total number of businesses within the LEP area of Norfolk and Suffolk. Planned investments of £271 billion are predicted in new energy projects by 2020 and around £30.8 billion of this will be within the LEP area[135]. The UK's densest area of offshore development is between the Humber, Greater Wash and Thames Estuary[135], placing Norfolk and Suffolk at the heart of the world's largest offshore wind development. With a growing bio-fuels market and plans for the storage of gas and captured carbon in the Southern North Sea, the area has an energy business worth billions[135].

Within England, the East is the region with the highest electrical generating capacity from renewable sources per unit of GVA with £16.11 million kW/GVA, and the second highest electricity generation of £28.34 billion kWh/GVA from renewables. 52% of this capacity is from 'other bioenergy' and 31% from wind (mostly from three large offshore wind farms). As well as these energy generation methods, the East of England produces 19% of the UK's landfill gas capacity, 13% of the UK's sewage gas capacity and 12% of the UK's 'other bioenergy'[136].

Within Norfolk and Suffolk the majority of energy comes from nuclear power and natural gas (Tables 4.1.6.a and 4.1.6.b). The greatest producers of renewable energy are dedicated biomass and onshore wind facilities. The information in Table 4.1.6.b for renewables does not include offshore wind which is likely to provide large quantities of energy as there is a large wind farm

[133] DECC (2012): Annual Energy Statement 2012, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65633/7086-annual-energy-statement-2012.pdf

[134] REA (2012): Renewable Energy: Made in Britain, Renewable Energy Association, accessed at http://www.r-e-a.net/resources/rea-publications

[135] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[136] DECC (2011): Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2011, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65917/6481-renewable-electricity-2011-et-article.pdf

in the area (the East Anglia Array). Offshore energy generation for Norfolk and Suffolk has a total capacity of 817.2 MW, representing 54% of UK capacity[137].

Table 4.1.6.a: Summary of energy capacity in Norfolk and Suffolk, 2012

County	Total capacity (MW)	Natural gas (MW)	Nuclear power (MW)	Coal (MW)	Renewables (MW)
Suffolk	1,248	60	1,188	0	62.2
Norfolk	818	818	0	0	143.6
Total	2,066	878	1,188	0	205.8

Source: NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy %20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

Table 4.1.6.b: Summary of onshore renewable energy capacity and generation in Norfolk and Suffolk, 2012

County	Total capacity		Dedicated biomass		Landfill gas		Onshore wind		Hydro		Photo-voltaics	
	GWh/yr	MW	GWh/yr	MW	GWh/yr	MW	GWh/yr	MW	GWh/yr	MW	GWh/yr	MW
Suffolk	293.2	62.2	162.3	23.2	56.5	10.7	74.4	28.3	0	0	0	0
Norfolk	576.5	143.6	294.2	42	56.5	10.8	225.7	85.9	0	0.01	4.4	5.0
Total	869.7	205.8	456.5	65.2	113.0	21.5	300.1	114.2	0	0.01	4.4	5.0

Source: NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

Notes: GWh/yr refers to energy generation, MW refers to energy capacity

The renewables industry within the East of England is important for the economy of the area as it provided around £2.9 billion in sales in 2010 to 2011 and employed around 21,500 people. Geothermal energy produced the greatest sales and the most employment, followed by wind (Table 4.1.6.c).

[137] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy %20Supply%20Chain%20Strategy% 20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

Table 4.1.6.c: Low carbon and environmental goods and services (LCEGS) East of England (2010-2011)				
Renewables	**Sales (£million)**	**Employment**	**Imports (£million)**	**Exports (£million)**
Biomass	578	4,941	467.6	724
Geothermal	1,008	7,508	700.4	1,005
Hydro	54	485	39.8	68
Photovoltaic	358	2,698	670.3	1,341
Renewable consulting	51	478	65.7	66
Wave and tidal	10	65	5.1	8
Wind	846	5,325	716.6	1,655
Total	2,905	21,500	2,665.5	4,867
Source: BIS (2012): Low carbon environmental goods and services (LCEGS) Report for 2010/11, Department for Business Innovation & Skills, accessed at http://www.bis.gov.uk/assets/BISCore/business-sectors/docs/l/12-p143-low-carbon-environmental-goods-and-services-2010-11.pdf				

Sources of dedicated biomass energy production within Norfolk and Suffolk include brewery and food waste and poultry litter. Adnams Bio Energy Ltd. creates around 1.2 million m^3 of biomethane from brewery and food waste. This produces 9.6 million kWh of energy and avoids 120,000 tonnes of CO_2 emissions every year. Once the biogas is upgraded to around 97% biomethane it is injected into the grid[138]. Energy Power Resources (EPR) plant in Eye, Suffolk, produces 12.7 MW from 140,000 tonnes of chicken litter per year. Their plant at Thetford, at 38.5 MW is the largest chicken litter fuelled plant in the UK, consuming 420,000 tonnes of litter each year[139]. The Broads area in Norfolk could provide significant sources of biofuels, with fen vegetation potentially providing 25% of the fuel needs of a biofuel energy plant; however, it has uncertain financial feasibility[140].

Off the East coast there are three major wind farms being planned and built with up to £50 billion of expenditure anticipated over the next ten years. The East Anglia Array wind farm is a 7.2 GW, 1,200 turbine development 25km off the coast of East Anglia[141]. The Dogger Bank wind farm is potentially the world's largest offshore wind project. If fully developed the 8,660 km^2

[138] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

[139] EPR Ltd (2013): Assets, Energy Power Resources, accessed at http://www.eprl.co.uk/assets/ely/overview.html

[140] Natural England (2012): Valuing Ecosystem Services: Case studies from lowland England, Annex 2: Reconnecting the Broads and fens: Norfolk, accessed at http://publications.naturalengland.org.uk/publication/2319433

[141] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

area could contain more than 2,000 wind turbines and provide 13 GW of electricity (10% of the UK's electricity requirements)[142]. Hornsea wind farm will contribute 4% of the UK's total energy demand at 4 GW in an area of 4,735 km^2 [143]. Lowestoft and Great Yarmouth are ideally placed to service the construction and operation of these three wind farms and were awarded one of five national Centres for Offshore Renewable Engineering (CORE) status. Offshore wind has a capital value of £23 billion in Norfolk and Suffolk, onshore wind has a capital value of £74 million[144]. There are onshore wind turbines in Lowestoft and Kessingland[144]. The Broads area contains two wind farms that have sufficient generating power for more than 2,500 homes[145]. Onshore wind produces 114.2 MW of energy in Norfolk and Suffolk.

According to the REA the UK renewables energy industry facilitated exports worth £1.6 billion in 2010 to 2011[146]. In the same year the UK's exports were greater than imports for renewables by £2.2 billion, mainly due to wind exports (Table 4.1.6.c)[147]. As the East of England is the region with the highest generating capacity per unit of GVA in England from renewables[148] it is unlikely that the region imports renewable energy, and probably exports it.

[142] Royal Haskoning Enhancing Society: World's largest wind farm: Dogger Bank:, accessed at http://www.royalhaskoning.co.uk/en-gb/fields/industryandenergy/Energy/Pages/dogger-bank-offshore-wind-farm.aspx

[143] SMart Wind: The Zone, accessed at http://www.smartwind.co.uk/the-zone.aspx

[144] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[145] Natural England (2012): Valuing Ecosystem Services: Case studies from lowland England, Annex 2: Reconnecting the Broads and fens: Norfolk, accessed at http://publications.naturalengland.org.uk/publication/2319433.

[146] REA (2012): Renewable Energy: Made in Britain, Renewable Energy Association, accessed at http://www.r-e-a.net/resources/rea-publications

[147] BIS (2012): Low carbon environmental goods and services (LCEGS) Report for 2010/11, Department for Business Innovation & Skills, accessed at http://www.bis.gov.uk/assets/BISCore/business-sectors/docs/l/12-p143-low-carbon-environmental-goods-and-services-2010-11.pdf

[148] DECC (2011): Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2011, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65917/6481-renewable-electricity-2011-et-article.pdf

The UK 2020 forecast suggests that the offshore wind total capital value will be £138 billion, onshore wind will be £8.4 billion, biomass/biofuel generation will be £5.4 million and wave and tidal generation will be £6 billion. The REA predicts that by 2020 the renewables industry could employ more than 400,000 people in the UK[149]. Based on the national forecast the renewable energy industry within the UK will increase mainly via offshore wind, and the East of England is likely to be a major centre for this growth. A £23 billion investment in offshore wind projects is planned in the East of England up to 2020[150]. The Government's target of 15% of primary energy demand coming from renewable resources[150] should help to provide an opportunity for investment in renewable generation.

The designation of six areas within Norfolk and Suffolk as Enterprise Zones is designed to encourage business development and generate jobs through a combination of financial incentives (business rate discount worth up to £275,000 over a five year period for eligible businesses that move into the area) and reduced planning restrictions (streamlined planning rules to help businesses build or expand premises) and support from the government to ensure high speed broadband is rolled out across the zone. Enterprise Zone status coupled with the awarding of Great Yarmouth and Lowestoft as a national CORE area will attract investment into the energy sector in the LEP area. The planned development of Hornsea, Dogger Bank and East Anglia Array wind farms off the East coast of the UK suggest that the production of energy from wind within the LEP area will increase as Lowestoft and Great Yarmouth will probably be the main centres for the construction and operation for these wind farms. The broad energy mix within Norfolk and Suffolk provides more business potential than many sites within the UK which will also encourage investment. Carbon Capture and Storage (CCS) is a developing technology which could use current infrastructure making it viable for this area. Anaerobic digestion for bioenergy has the opportunity for increased capacity within Norfolk and Suffolk using vegetable waste, livestock manure and fen products[151], the presence of current biofuel generators within the area will act as examples for new companies to invest in the area. The location of OrbisEnergy within Suffolk will also help to generate interest and investment in the renewable energy industry within this area[152].

[149] REA (2012): Renewable Energy: Made in Britain, Renewable Energy Association, accessed at http://www.r-e-a.net/resources/rea-publications

[150] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[151] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[152] DECC (2011): Renewable electricity in Scotland, Wales, Northern Ireland and the regions of England in 2011, Department of Energy & Climate Change, accessed at

Development of renewables may be inhibited by some aspects of Norfolk and Suffolk, such as the scarcity of sites and difficulty of obtaining planning permission, especially for sites such as onshore wind farms[153],[154]. The lack of infrastructure, including grid capacity, transport connections and coastal infrastructure, within Norfolk and Suffolk is also likely to deter investors from coming to the area. New businesses with new technology and communication requirements are likely to be put off due to the poor broadband speeds, although this is set to improve in the Enterprise Zones and more widely across the region. The frequently changing Feed-in Tariff scheme and government policy regarding renewables has made investors reluctant to invest in renewable energy in general which will affect the industry within Norfolk and Suffolk[155]. A key weakness of the UK supply chain across the energy industry is the limited levels of manufacturing and engineering capability in terms of key component manufacture and construction[152].

4.2. Water Supply-Surface Water and Groundwater

Water is a vital resource for sustained economic growth. Access to water is managed to ensure that people have access to affordable and safe drinking water and sanitation. Control of water supplies is also required so that industry needs are met without depleting water resources or damaging ecosystems[156].

The amount of water available for abstraction and consumption varies across different regions. Annual average rainfall in England and Wales is 890 mm, which only accounts for half of effective rainfall. Up to 2,500 mm of annual average effective rainfall occurs in Wales and parts of England while some parts of the East of England receive only around 200 mm[157]. Despite being one of the driest regions in England, daily domestic water consumption averaged 153

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65917/6481-renewable-electricity-2011-et-article.pdf

[153] NSEA (2012): An Energy Supply Chain Strategy for Norfolk & Suffolk, Norfolk and Suffolk Energy Alliance, accessed at http://www.orbisenergy.net/Assets/Files/Content/Energy%20Supply%20Chain%20Strategy%20Norfolk%20&%20Suffolk%20-%20FINAL.pdf

[154] DTI (2007): Meeting the Energy Challenge: A White Paper on Energy: Chapter 5 Electricity Generation, Department of Trade and Industry, accessed at http://webarchive.nationalarchives.gov.uk/+/http:/www.berr.gov.uk/files/file39569.pdf

[155] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

[156] Defra: Water abstraction estimates, Department for Environment, Food & Rural Affairs, accessed at: http://www.defra.gov.uk/statistics/environment/inland-water/iwfg12-abstrac/

[157] Environment Agency (2008): Water resources in England and Wales-current state and future pressures, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho1208bpas-e-e.pdf

litres per person across the East of England in 2008-09; slightly above the national average of 150 litres per person[158]. Overall consumption of water is expected to increase due to predicted population and economic growth.

Current levels of abstraction are generally below the licenced capacity suggesting that there is room to meet the expected increasing demand for water (see Table 4.2.a). Current sustainability issues, however, suggest that water resources are already deteriorating. This implies that the region is over licenced and that future water needs will require a more efficient use and allocation of water.

[158] Essex & Suffolk Water (2010): Final water resources management plan 2010-2035, accessed at http://www.eswater.co.uk/_assets/documents/ESW_FINAL_Water_Resources_Plan_-_V27.pdf

Table 4.2.a: Licensed volume (*) and actual abstraction (**) in New Anglia for District/Borough Councils by sector in m³ per year (2012)

District/borough council	Aquaculture	Agriculture - direct spray irrigation	Agriculture - spray irrigation storage	Agriculture - other	Industrial	Energy production	Environmental	Public water supply
Babergh*	645,900	2,157,753	1,566,089	533,883	756,762	49,196,160	7,916,164	61,227,545
Babergh**	12	883,733	408,034	114,724	160,926	29,517,696	7,515,950	41,345,333
Breckland*	1,793,562	4,631,999	6,171,143	76,912	1,094,508	0	7,578,764	6,520,737
Breckland**	652,713	1,422,938	2,249,587	18,067	526,891	0	2,580,419	4,974,416
Broadland*	0	4,795,458	668,194	1,324,466	1,667,050	0	287,640	29,342,847
Broadland**	0	1,454,518	179,030	548,050	675,416	0	44,454	25,114,990
Great Yarmouth*	0	718,586	530,604	301,675	54,788	293,284,800	0	485,0000
Great Yarmouth**	0	231,392	57,477	58,616	27,686	224,922,238	0	4,510,024
Ipswich*	0	6,420	0	0	912,334	0	0	268,2016
Ipswich**	0	2,183	0	0	258,506	0	0	120,7170
Kings Lynn*	3,311,280	11,982,880	7,915,288	543,261	11,985,049	0	138,056,822	26,857,750
Kings Lynn**	1,103,760	15,482,010	2,882,192	180,057	4,527,424	0	1,438,211	18,524,668
Mid Suffolk*	20,000	608,052	1,309,834	756,963	6,373,917	0	802,492	8,631,423
Mid Suffolk**	2,634	178,053	439,074	339,091	3,918,290	0	65,153	7,138,923
North Norfolk*	0	8,321,567	1,494,612	1,346,865	1,768,482	17,000	119,450	9,740,858
North Norfolk**	0	2,499,020	425,939	495,363	1,364,003	0	0	8,380,828
Norwich*	0	121,600	0	0	8,503,502	50,261,502	26,280	1,550,000
Norwich**	0	18,283	0	0	2,757,900	0	0	772,443
South Norfolk*	174,900	3,025,360	1,269,571	1,083,549	2,179,664	0	930,000	15,625,312
South Norfolk**	10,225	596,509	123,926	457,033	1,025,907	0	18,908	11979,221
St Edmundsbury*	638,020	287,027	1,646,102	49,603	211,847	0	41,669,638	8,159,590
St Edmundsbury**	350,260	142,672	536,404	28,338	184,501	0	3,102,776	1,904,392
Suffolk Coastal*	6,000	10,657,841	4,197,764	1,100,463	7,353,052	0	415,000	16,262,283
Suffolk Coastal**	2,931	5,340,930	2,107,105	399,470	2,455,680	0	0	8,830,373
Waveney*	0	1,281,067	270,862	260,743	1,171,279	0	62,160	17,820,713
Waveney**	0	290,251	71,179	139,437	574,177	0	537	10,016,821

Source: The Environment Agency (2013). Dataset obtained by request, correct as of 2012

Key: * Licensed volume. ** Actual abstractions (averages for period 2004 -2010, or if the license has not been in existence all of that time, it will be an average of start date -2010)

Water supplies in the New Anglia area are from Anglian Water, covering Norfolk and much of the west and south of Suffolk, and Essex and Suffolk Water, which serves most of eastern Suffolk.

Anglian Water has six Water Resource Zones (WRZs) within and extending outside the Norfolk and Suffolk area. They are:

- Fenland (WRZ5);
- North Norfolk Coast (WRZ6);
- Norfolk Rural (WRZ7);
- Norwich and the Broads (WRZ8);
- Cambridgeshire and West Suffolk (WRZ9); and
- East Suffolk and Essex (WRZ10).

WRZ5 (Fenland) has limited reliable water resources and is supplied by a range of sources around its periphery. The central area is supplied from a chalk aquifer, while the west is supplied by a transfer from Rutland Water via Peterborough. In northwest Norfolk the Sandringham Sands aquifer provides water for blending with high nitrate chalk groundwater to ensure water quality compliance. There are some concerns that abstraction is impacting chalk spring flows along the edge of the aquifer, although the Environment Agency has not required any sustainability changes to Anglian Water licences. Some sustainability changes have been made to licences that could be affecting wetlands along the western edge of the North Norfolk Coast SPA and SAC.

Year-round demand is greatest from King's Lynn, with seasonal demand adding pressure in the seaside towns of Heacham and Hunstanton. Domestic demand in WRZ5 is expected to increase from 26 Ml/d to 29 Ml/d (mega litres per day), with commercial demand staying steady at 18 Ml/d. Leakage is expected to be controlled at around 13 Ml/d. The King's Lynn Planning Zone is predicted to have a deficit by 2036-37 of -1.58 Ml/d at times of peak demand (at average demand there is still a forecast surplus of 0.22 Ml/d). A transfer from Hunstanton Planning Zone could be used to address peak demand issues, should any arise[159].

WRZ6 (North Norfolk Coast) is supplied mainly from the chalk aquifer. Some sustainability issues have been provisionally identified and a precautionary reduction in abstractions of 2.8 Ml/d from the chalk near to Sheringham and Beeston Common SAC has been made. Further sustainability reductions may be required in relation to the Upper Thurne Broads and Marshes SAC. Demand in WRZ6 is particularly influenced by seasonal holiday use. Domestic demand is expected to increase from 14 to 16 ML/d, while commercial demand is expected to remain steady at 5 Ml/d and leakage to be controlled at about 5 Ml/d. Four of the planning zones are forecast to have deficits by 2036-37. They are:

[159] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

- Aylsham: -0.61 Ml/d (average) and -0.75 Ml/d (peak);
- Foulsham: -0.14 Ml/d (average) and -0.06 Ml/d (peak);
- Sheringham: -2.17 Ml/d (average) and -1.34 Ml/d (peak); and
- Stalham: -1.38 Ml/d (average) and -1.19 Ml/d (peak).

Anglian Water plans to manage these deficits by water transfers. The Water Resources Management Plan (WRMP) identifies a desalination scheme as the only large scale feasible option for generating additional supplies if possible additional groundwater sources prove to be of poor quality. This is potentially linked to the gas transfer complex at Bacton. Issues of local transfer of water between the small catchments could be addressed by the relocation of treated wastewater to the catchment from where it was abstracted. Metering, demand management and leakage control provide the other main options for addressing forecast deficits[160].

WRZ7 (Norfolk Rural) is also supplied by abstractions from the chalk aquifer. The zone contains a large number of small wetland conservation sites, many of which are included in the Norfolk Valley Fens SAC, although no sustainability reductions in licensed volumes have been required. Current demand is driven by domestic demand, but also rural industries such as poultry rearing and tourism. Peak demands in dry years present challenges to the existing supply network because of the limited treated water storage capacity across the zone and lack of inter-connection between storage reservoirs and towers. Domestic demand is expected to increase from 20 to 23 Ml/d by 2036-37, with commercial demand expected to decline steadily from 7 to 5 Ml/d, and leakage controlled at 7 Ml/d. Two of the Planning Zones are expected to have forecast deficits by 2036-37:

- Dereham: -0.38 Ml/d (peak); and
- Wymondham: -5.81 Ml/d (average) and -2.01 Ml/d (peak).

The preferred approach to addressing the forecast deficits is through demand management (leakage control, household metering and promotion of water efficiency)[160].

WRZ8 (Norwich and the Broads) again relies on chalk groundwater, for both direct abstractions in rural areas and for baseflow to the River Wensum to supply Norwich. Environmental concerns mean that the Environment Agency may seek sustainability reductions to the river intake west of Norwich, while conservation sites including the Yare Broads and Marshes SAC, Bure Broads and Marshes SAC, Ant Broads and Marshes SAC and the lower part of the River Wensum SAC have all been investigated. Demand in WRZ8 is dominated by Norwich, with mixed urban household and light industrial use. Additional demand from tourists in this WRZ is small, as most visitors tend to stay in nearby larger holiday resorts. Domestic demand is expected to increase from 41 to 47 Ml/d by 2036-37, with commercial demand remaining steady at about 9 Ml/d. Leakage is expected to be controlled at around 12 Ml/d. There are

[160] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

three planning zones with forecast deficits by 2036-37[161]:

- Hethersett: -0.58 Ml/d (average);
- Lyng: -0.72 Ml/d (average); and
- Norwich: -10.47 Ml/d (average) and -7.38 Ml/d (peak).

The preferred approach for addressing forecast deficits includes maintaining demand management (leakage control, household metering and promotion of water efficiency); combined with transfers from other WRZs, potentially pressure reduction and utilisation of urban groundwater sources. Investigation is also being carried out on the potential for wastewater reuse.

WRZ9 (Cambridgeshire and West Suffolk) relies on the chalk aquifer. Demands are greatest around the commercial centres of Newmarket, Bury St Edmunds, Thetford, Haverhill and Sudbury. Continued economic growth is expected through both housing and light industrial developments. Domestic demand is expected to increase from 46 to 52 Ml/d by 2036-37, while commercial demand is expected to remain steady at 14 Ml/d. Leakage will be controlled at around 17 Ml/d. There are two planning zones with forecast deficits[161]:

- Bury St Edmunds: -3.64 Ml/d (average) and -3.47 Ml/d (peak);
- Haverhill: -1.23 Ml/d (average) and -0.97 Ml/d (peak).

The preferred water management options are centred on demand management, but also include pressure reduction and transfers[161].

WRZ10 (East Suffolk and Essex) is again supplied by groundwater abstraction from the chalk aquifer. Here the aquifer is confined meaning it can be more fully exploited. Anglian Water also has an entitlement for a bulk supply from Essex and Suffolk Water. Demand is centred in urban areas, such as Ipswich, and the Haven Gateway planned growth area around the hinterland of Felixstowe. Domestic demand is expected to increase from 76 to 85 Ml/d, with commercial demand remaining steady at around 25 Ml/d and leakage controlled at about 23 Ml/d. Only the Ipswich planning zone in East Suffolk has forecast deficits of -20.18 Ml/d (average) and -3.69 Ml/d (peak). This is mainly due to increased demand due to planned growth and the predicted impact of climate change on reservoir supplies. The preferred water management options are based on demand management and water efficiency, combined with an aquifer storage recovery scheme at Bucklesham and potential use of discharge re-use at Ipswich[161].

Anglian Water identifies climate change as the biggest risk they face over the next 25 years. The predicted increase in rainfall in the winter and reduction in the summer are identified as the most significant changes. These predicted changes have been included in the estimated

[161] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

deployable output and forecast demand figures[162]. Key growth areas relevant to New Anglia have been identified as[162]:

- A14 growth corridor; and
- Haven Gateway Growth area.

Anglian Water has allowed for 22,000 new homes per year over the 25 year planning period; a total of 560,000 new properties[162].

Essex and Suffolk Water supplies 0.3 million customers in the Suffolk supply area, with this comprised of three Resource Zones (RZs): Hartismere, Blyth and Northern/Central[163].

The Hartismere RZ sources all of its water from groundwater, both the chalk aquifer and crag sources. This zone was particularly affected by the 1995-97 droughts, which resulted in improvements being made to enable water to be easily transferred around the zone. The RZ includes the town of Eye. By 2034-35, there is expected to be a surplus in dry years of 0.45 Ml/d, reduced from 1.93 Ml/d in 2009/10 (assuming no headroom requirement). When the targeted headroom requirement is taken into account then there is a shortfall of up to 0.33 Ml/d[163].

The Suffolk Blyth RZ takes water from the chalk aquifer and crag sources. It includes the towns of Saxmundham, Framlingham, Peasenhall and the southern side of Halesworth. Small sustainability changes have been required near to the Alde-Estuary, and potentially near to Leiston-Aldeburgh SSSI and Sizewell Marshes. This zone accounts for around 14% of non-domestic demand, mainly due to the location of two power stations. The Blyth zone would have a surplus in dry years of +3.08 Ml/d (no headroom) or +1.75 Ml/d (with headroom) by 2034-35, reduced from +3.36 Ml/d (no headroom) or +2.34 Ml/d (with headroom) in 2009-10[163].

The Suffolk Northern/Central RZ is dominated by domestic demand from the urban areas of Lowestoft, Great Yarmouth, north Halesworth, Bungay and Beccles. Seasonal demand is affected by the tourist trade and the annual pea harvest in late June/early July. As a result, this zone accounts for almost 80% of all non-household demand in the Suffolk area. Unlike the other two RZs, this zone takes 70% of its water from surface water (Waveney, Bure and groundwater fed lakes at Ormesby Broad and Lounds Ponds/Fritton Lake) and just 30% from groundwater. Investigations into environmental impacts of abstraction have resulted in sustainability changes near to Geldeston Meadows SSSI and Trinity Broads SSSI. By 2034-35 there would be a deficit in this resource zone of 1.86 Ml/d (no headroom) or 4.20 Ml/d (with headroom) in dry years. This compares with a surplus of 14.79 (no headroom) or 11.88 (with headroom) in 2009-10. One solution to reducing this deficit is investigation into the North Lowestoft Groundwater Scheme[163].

[162] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

[163] Essex & Suffolk Water (2010): Final water resources management plan 2010-2035, accessed at http://www.eswater.co.uk/_assets/documents/ESW_FINAL_Water_Resources_Plan_-_V27.pdf

More than two-thirds of commercial water demand in Suffolk is made up of food and drink manufacture (19%), other services (19%), hotels, bars and restaurants (17%), and agriculture, horticulture, forestry and fishing (14%). There has been a significant decline in demand for water between 2000 and 2010 for food processing and packaging, power generation, and laundry services (due to site closures). This trend is expected to continue to 2014/15, with demand from agriculture, horticulture, forestry, fishing and food and drink manufacture predicted to reduce by 10 to 21%. Demand from hotels, bars and restaurants is predicted to increase by 1.3%. Over the longer-term, forecast demand for each sector is[164]:

- Food and drink sectors: -2.3% to -2.6% per year; and
- Hotels, bars and restaurants: +1.4% to +2.0% per year.

Over abstraction is the main environmental impact in most areas with limited water resources in Norfolk and Suffolk. Other threats to water supply arise from chemical run-off from agriculture, chemical imbalances due to discharges of poorly treated waste water, sedimentation and eutrophication, presence of invasive species caused by water transfers and man-made changes to water bodies[165].

Catchment Abstraction Management Strategies (CAMS) set out processes which aim to balance the anthropogenic and environmental water requirements both in the present and in the future in order to comply with the Water Framework Directive (2000/60/EC). They have been initiated under the supervision of the Environment Agency. CAMS consider how much freshwater resource is reliably available, how much water the environment needs and the amount of water already licensed for abstraction. This aids identification of areas where water is potentially available for abstraction[166]. Within this framework, SACs and SSSIs are features that might affect abstraction in CAMSs. Table 4.2.b provides a summary of the conservation areas within CAMSs and Table 4.2.c summarises water availability in the different CAMS. These tables portray the number of conservation areas in CAMSs areas with a likely need for water and the diminishing water resources due to over-use.

Table 4.2.b: Conservation areas within Catchment Abstraction Management Strategies (CAMS) areas

CAMS Area	Features that may affect water availability		
	No. Water-related SPA/SAC/Ramsar	No. Water-related SSSIs	No. Local features
East Suffolk CAMS[1]	3 SAC/SPAs (Bencare to Easton Bavents; Minsmere to Walberswick; Alde Ore). 1 SAC (Dew's Pond). 2 SPA/Ramsar (Deben Estuary, Orwell	41 SSSIs	192 County Wildlife Sites

[164] Essex & Suffolk Water (2010): Final water resources management plan 2010-2035, accessed at http://www.eswater.co.uk/_assets/documents/ESW_FINAL_Water_Resources_Plan_-_V27.pdf

[165] Environment Agency (2009): Water for life and livelihoods: river basin planning: summary of significant water management issues: Anglian river basin district, accessed at http://www.environment-agency.gov.uk/static/documents/Research/anglianswmidoc_1953860.pdf

[166] Environment Agency (2008): Water resources in England and Wales-current state and future pressures, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho1208bpas-e-e.pdf

	Estuary).		
North West Norfolk CAMS[2]	1 SAC (Dersingham Bog). 1 SAC/SPA/Ramsar (Roydon Common).	2 SSSIs	2 BAP chalk streams 13 wildlife sites
Broadland Rivers[3]	3 SACs (Yare Broads and Marshes, Norfolk Valley Fens, River Wensum). 1 SPA (The Broads). 2 SPA/Ramsar (Broadland, Breydon Water). 1 Ramsar (Redgrave & Lopham Fens).	25 SSSIs	394 County Wildlife Sites

Sources: [1]Environment Agency (2008): Water abstraction getting the balance right: The East Suffolk Catchment Abstraction Management Strategy, accessed at http://cdn.environment-agency.gov.uk/gean0108bnou-e-e.pdf
[2] Environment Agency (2005): The North West Norfolk Catchment Abstraction Management Strategy, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0305bqyu-e-e.pdf (number of local features likely to be under-estimated as CAMS gives examples rather than complete list)
[3] Environment Agency (2006): The Broadland Rivers Catchment Abstraction Management Strategy, accessed at http://www.environment-agency.gov.uk/static/documents/GEAN0306BKIZ-e-e.pdf
Notes: Number of SSSIs also include SAC/SPA; may be some overlap of county sites as these are not listed for all management units

Table 4.2.c: Catchment Abstraction Management Strategies (CAMS) areas, abstraction and water availability

CAMS Area	No. licences >20 m^3 per day	Main water users	Water availability (target status)
East Suffolk CAMS[1]	486	Agriculture Food processing Retail activities	3 water management units over-abstracted 8 over-licensed 9 no water available 0 water available (2013)
North West Norfolk CAMS[2]	213	Water diverted into Ely-Ouse Essex Transfer Scheme Public Water Supply (42% of water licensed) Agriculture (28%) Fish farms (14%) Industry (16%) Private Water Supply (1%) Environment (1%)	2 water management units over-abstracted 4 over-licensed 12 no water available 2 water available (no target status given)
Broadland Rivers[3]	>800	Agricultural businesses Retail activities Mineral extraction Food production Brewing Agrochemical production	0 water management units over-abstracted 10 over-licensed 8 no water available 0 water available (2016)

Note: Target status refers to meeting 'good' status by the date shown
Sources: [1] Environment Agency (2008): Water abstraction getting the balance right: The East Suffolk Catchment Abstraction Management Strategy, accessed at http://cdn.environment-agency.gov.uk/gean0108bnou-e-e.pdf
[2] Environment Agency (2005): The North West Norfolk Catchment Abstraction Management Strategy, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0305bqyu-e-e.pdf (number of local features likely to be under-estimated as CAMS gives examples rather than complete list)
[3] Environment Agency (2006): The Broadland Rivers Catchment Abstraction Management Strategy, accessed at http://www.environment-agency.gov.uk/static/documents/GEAN0306BKIZ-e-e.pdf

Based on the information in Table 4.2.b and Table 4.2.c, meeting future needs for water is likely to be determined by the technology available for improving efficiency rather than increasing supply. Desalination plants could address issues of seasonal shortages and increase the amount of available water, especially in coastal touristic areas. This option is however, a last resort due to the high-cost and a potentially large environmental footprint of this process[167]. Recent technological advances may offer possible solutions.

Water recycled by combined grey water treatment in Thames Water's Ford plant provided enough water to flush the toilets in the Olympic Park about 80,000 times per day. Demand for tap water in the Park was reduced by almost 58%. Recycling waste water also allows for biogas generation that can be used to power industries or used in the recycling process, significantly reducing emissions as well[168].

A reduction in water leaks would contribute to the amount of available water. Pressure sensors fitted inside high pressure pipes are able to help water companies to regulate pressure according to demand; reducing pipe bursting by more than 15%[169]. This is a significant improvement as leakages caused by burst pipes are currently a major source of water loss and fixing leaks is costly and disruptive.

Metering will improve customer awareness of the water they use. Demand management and increasing consumer's awareness on water issues are effective instruments for reducing water deficits. Current campaigns such as Anglian Water's 'Drop 20'[170] focus on educating consumers in water processes, both the natural (cycle) and the one taking place in treatment plants, and on how to save water. Metering is also being promoted. Metering has been a source of friction, to some extent, as consumers often fear that a meter will increase their water bills. Evidence suggests that the opposite is occurring as consumers are paying an average of £100 less per year by paying for what they use rather than by the size of their property[171]. The Environment Agency estimates a 13% reduction in water use in metered households compared to unmetered ones. Wessex Water is trialling smart meters to assess how consumers respond to having an indoor meter with use tracking. The devices will send data to phones or computers making it easier for consumers to manage their spending and thereby their water demand.

[167] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

[168] Ashcroft, M. (2012): Water works: green solutions for a blue planet. Report for Green Futures, accessed at: http://www.forumforthefuture.org/greenfutures/shop/special-edition/water-works

[169] Randall, I. (2012): Water works: green solutions for a blue planet. Report for Green Futures, accessed at: http://www.forumforthefuture.org/greenfutures/shop/special-edition/water-works

[170] Anglian Water website: Drop 20 Campaign http://www.anglianwater.co.uk/environment/using-water-wisely/88223C4D331840B7857C03E14040C323.aspx

[171] Water Works: Green solutions for a blue planet. Report for Green Futures, accessed at: http://www.forumforthefuture.org/greenfutures/shop/special-edition/water-works

4.3. Food

The land use covering the largest area in the UK is agriculture with around 17.1 million ha, equivalent to 70% of total area in 2011[172]. This is higher than the EU-27 average of about 50%, including France with 54.5% and 50% for Germany and Spain[173]. In 2010 the agri-food sector accounted for an estimated GVA of £86 billion in the UK, which is equivalent to 6.8% of total GVA. Food and drink manufacturing and retail accounted for almost 50% of this total and agriculture contributed around 8%. Total net income from farming was £4.38 billion in 2011 in the UK after a 4.3% decline from the period 2008-2010[172].

The institutional environment surrounding food production plays an important role in determining the quantity and type of food produced. Different instruments such as direct subsidies, agricultural management schemes and other types of market interventions are commonly used at the national or EU level to shift supply and promote good practice[174]. Self-sufficiency and cheap food availability were thought to be essential for economic revival and were promoted from the 1940's to the 1980's. This corresponds with a period of agricultural intensification and significant technological improvements, leading to domestic production meeting up to 70% of domestic demand in the 1980's. The last decades however, correspond with a period of declining self-sufficient ratios between domestic production and consumption to around 60% as environmental concerns begin to influence agricultural policy[175].

UK consumption is roughly met by 60% locally produced and 40% imported food. In 2011, food imports accounted for £36.7 billion. Lightly processed foods took up the largest share with £16.8 billion, closely followed by highly processed foods with £13 billion. Unprocessed foods only accounted for £6.8 billion[172]. Exports were almost half of total imports in 2011. In this case, highly processed foods were the main exports with a total value of £10.3 billion, followed by lightly processed at £6.2 billion and unprocessed foods at £1.6 billion[172]. The EU is the main importer of British food; eight out of the top 10 buyers are from the EU. Exports are currently being promoted by industry and public sector agencies as a way to stimulate economic growth[176].

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[172] Defra (2011): Agriculture in the United Kingdom 2011, Department for Environment, Food & Rural Affairs, accessed at http://webarchive.nationalarchives.gov.uk/20130123162956/http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-crosscutting-auk-auk2011-120709.pdf

[173] Eurostat (2009): Key figures on Europe, 2009 edition, accessed at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-EI-08-001/EN/KS-EI-08-001-EN.PDF

[174] Angus, A et al (2009): Agriculture and land use: demand for and supply of agricultural commodities, characteristics of the farming and food industries for land use in the UK. Land Use Policy , 26 pp230-242

[175] Defra (2006): Food Security and the UK: An Evidence and Analysis Paper, Department for Environment, Food & Rural Affairs, accessed at http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/foodsecurity.pdf

[176] Defra (2012): Driving Export Growth in the Farming, Food and Drink Sector: A Plan of Action 2012, Department for Environment, Food & Rural Affiars, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

It is expected that factors such as competing interest for land use (food, environmental services and the energy sector), changes in agricultural patterns (more sustainable practices) and demand for more environmentally and ethically aware food will reduce self-reliance levels even further. Less land is likely to be available for agriculture and new practices may have lower outputs but would perhaps be more environmentally friendly[177].

To a certain extent, this could be offset by a renewed emphasis on locally sourced food. Scepticism generated by recent horse meat contamination in beef-based ready meals[178] as well as increasing awareness of food air-miles is renewing the public interest in local food[179]. Demand for premium local produce acts as an economic incentive and might deter farmers from shifting land use to other non-agricultural activities or set aside subsidised land.

The organisation of domestic supply chains is characterised by retailers and supermarkets coordinating supply and demand. Farmers have limited abilities to respond to changes in demand in the short term. Evidence suggests that the rise of retail-driven supply networks is correlated to a deterioration of the small-and medium farm sector[177].

4.3.1. Agriculture

Food, drink and agriculture are the largest employment sectors across Norfolk and Suffolk with 81,000 jobs, equivalent to 12.7% of total employment in the LEP. Overall, the sector contributes over £2 billion to the local economy, which is around 9.7% of total GVA. Food and drink relies on agriculture in the New Anglia area as it forms the basis for the development of local brands[180].

Over 70% of land in the Anglian region (2.1 million ha) was farmed in 2009, with 1.6 million ha used for crops and horticulture resulting in an output of £2.5 billion. This makes the East Anglian region one of the most important agricultural regions in England. Norfolk and Suffolk are the second and third largest agricultural areas within the Eastern region, with 300,000 and 200,000 ha of crop-land respectively[181].

[177] Angus, A. et al (2009): Agriculture and land use: demand for and supply of agricultural commodities, characteristics of the farming and food industries for land use in the UK. Land Use Policy , 26 pp230-242

[178] Raithatha, J (2013): Head of Economic Development of Suffolk County Council, personal communications on 6th March, 2013.

[179] Seyfang, G (2009): Local Organic Food: the social implications of sustainable consumption, CSERGE Working Paper EDM 04-09, accessed at http://prototype2010.cserge.webapp3.uea.ac.uk/sites/default/files/edm_2004_09.pdf

[180] NewAnglia (2013): New Anglia local enterprise partnership for Norfolk and Suffolk: sector growth strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[181] Environment Agency (2011): The state of our environment: Agriculture and land management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Agriculture_and_Land_Management.pdf

Productivity patterns are similar to national averages for most crops and recent market dynamics favour cropping over livestock, giving shape to current farming patterns. Cereals take up around 60% of arable land in New Anglia. Farm income has improved in recent years due to increasing food prices and relatively stagnant intermediate inputs[182]. Increasing prices for staple crops in turn increases prices for animal feeds, putting livestock farmers under pressure. Thus, recent market dynamics have made cropping more profitable than livestock rearing. This however, varies across different regions and between types of crops and livestock. In 2011 for example, prices for wheat feed increased by 115% from £93 to £200 per tonne while pig farmers were losing between £20 and £30 per finished animal, and dairy and beef farmers where just covering costs[183].

Predicted population and economic growth will provide incentives to farmers to increase production. According to the Food and Agriculture Organisation (FAO), population growth estimates suggest that 70% more food will need to be produced globally by 2050 in order to sustain current consumption patterns (based on a population increase of 34%)[184]. The FAO estimates that the additional food production would come from increased yields and cropping intensity, with a relatively small proportion from expansion of arable land. In New Anglia, agriculture will need to cater for around 17% more people by 2030[185].

In the context of climate change it is not clear whether producers will be able to respond to increasing demand. Around 90% of land in New Anglia is classified as Nitrate Vulnerable Zones and these are largely located near water catchment areas. The use of fertilizers and chemical pesticides is closely monitored as poor management could lead to major impacts in water resources. It is unlikely that further intensification would take place in such areas. In addition, a third of the most productive land is at risk of flooding and changes in climatic conditions are likely to affect hydrological cycles, enhancing water scarcity in summers and prolonged heavy rains in the winters[186].

Opportunities arise for the agricultural sector by contributing to the provision and maintenance of ecosystem services. Environmental Stewardships are agri-environmental schemes that provide incentives to farmers and other land managers in England to deliver effective environmental management on their land. These schemes cover almost 50% of the Anglian

[182] Defra (2011): Family Food Survey 2011, Department for Environment, Food & Rural Affairs, accessed at http://webarchive.nationalarchives.gov.uk/20130123162956/http:/www.defra.gov.uk/statistics/files/defra-stats-foodfarm-food-familyfood-2011-121217.pdf

[183] Collinson, P (2011): Agricultural land prices hit record high. Report for The Guardian, accessed at http://www.guardian.co.uk/business/2011/apr/18/agricultural-land-prices-increase

[184] FAO (2009): How to Feed the World in 2050, Food and Agriculture Organisation, accessed at http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf

[185] Cambridgeshire County Council (2012): EEFM 2012 baseline forecasts grouped by area, accessed at http://www.cambridgeshire.gov.uk/business/research/economylab/Economic+forecasts.htm

[186] Environment Agency (2011): The state of our environment: Agriculture and land management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Agriculture_and_Land_Management.pdf

region, 90% of this land area is under Entry Level Stewardship schemes, 0.5% is under Higher Level Stewardship[187].

Even though these schemes offer new possibilities for land management, they are far from ideal and their impact for producing environmental services can be limited. In principle, stewardship schemes reward farmers for the environmental goods and services they produce. In practice, they are a financial incentive for farmers to set land aside; it is a payment to cover opportunity costs[188]. Several threats arise in cases of land heterogeneity (farmers setting aside the least productive land while continuing intensive practices in best quality land) and quality of environmental service provision (as the services are not explicitly rewarded there is not quality and quantity control that can be legitimately enforced)[188, 189].

In terms of production and land use, organic farming offers an opportunity to move away from conventional farming. Organic farming requires fewer inputs and promotes healthier soils that are less vulnerable to erosion and are more bio-diversity friendly[190, 191]. Promoting organic products has been integrated into mainstream policies because of their relative advantages in terms of environmental and health benefits compared to conventional farming[192]. This has had a positive impact on demand for organic products in recent years[193]. The size of the UK market for organic products was around £2 billion in 2005[194].

Threats to the organic sector arise from decreasing producer confidence as UK food spending declines in response to current unfavourable economic times. Higher production costs are

[187] Environment Agency (2011): The state of our environment: agriculture and land management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Agriculture_and_Land_Management.pdf

[188] Fraser, R (2009): Land heterogeneity, agricultural income forgone and environmental benefit: an assessment of incentive compatibility problems in environmental stewardship schemes. Journal of Agricultural Economics, 60 (1) pp101-201

[189] Harvey, DR (2003): Agri-environmental relationships and multi-functionality: further considerations. The World Economy, 26 (5) pp705-725

[190] Reganold, JP et al (1987): Long-term effects of organic and conventional farming on soil erosion. Nature, 330 (26) pp370-372

[191] Mäder, P et al (2002): Soil fertility and biodiversity in organic farming. Science 296 pp1964-1697

[192] Defra (2003): Changing Patterns: UK Government Framework for Sustainable Consumption and Production, Department for Environment, Food & Rural Affairs, accessed at http://collections.europarchive.org/tna/20060810193049/http:/www.defra.gov.uk/environment/business/scp/pdf/changing-patterns.pdf

[193] Seyfang, G (2007): Growing sustainable consumption communities: the case of local organic food networks. International Journal of Sociology and Social Policy, 27 (3/4) pp120-134

[194] Soil Association (2013): Organic market report, 2013, accessed at http://www.soilassociation.org/marketreport

reflected on organic products' prices which are generally higher than non-organic products[195]. Trading down to cheaper products is a common strategy employed by consumers for reducing spending while maintaining similar consumption patterns during difficult economic times. Food consumption in 2011, measured by spending per household, was 1.8% higher than in 2010 but well below food inflation rates of 5.9%. Declining consumption in real terms and a general trade down to cheaper foods, especially in low and medium income households have been the main drivers for such decline[196].

A 2% decrease in sales of organic products was recorded in 2012 in comparison to 2011 in key consumer groups[196]. Overall, deceasing sales of organic products were around 1.5% in the period 2011-12 compared to a small increase in sales of conventional products. Given the low adaptability of agriculture to short-term changes in demand, this often leads to falling prices, sometimes below costs[197]. This might be more severe for producers working within supermarket supply chains. It is reported that supermarkets and large retailers manage supply channels in a way that pushes farm gate prices down and induces several risks to farmers such as short notice, late payment and buy-back clauses in contracts for unsold products[198]. Large retailers and supermarkets control about 70% of total organic trade. It is reported that these trends are leading to producers in the organic farming market reverting to conventional farming[196].

In cases where switching to organic practices is not viable, conventional agriculture might benefit from new technologies. Such technology should aim at reducing or reversing the problems faced, such as biodiversity decline, soil degradation and reductions in water quality. Life Science and Biotechnology is a key growth sector in New Anglia and its links with agriculture could be enhanced by the recent investment of £250 million by the Biotechnology and Biological Sciences Research Council that amongst other areas will be focused on agriculture[199]. Additional technologies such as precision agriculture (which could maximise output while minimising inputs) and satellite technology (to increase crop per drop) are increasingly being implemented and offer new possibilities for agriculture in New Anglia as well[199].

Farm diversification, linking farms with the tourism and recreation sectors offer new revenue streams for farmers, favouring good land management[199]. Changes within the agricultural industry over the past decade have forced farmers to diversify in order to support their core businesses and many have achieved notable success. The Best Alternative Land Enterprise

[195] Monks, H (2008): What effect will organic food have on your wallet?. Report for The Independent, accessed at http://www.independent.co.uk/money/spend-save/what-effect-will-organic-food-have-on-your-wallet-796117.html

[196] Soil Association (2013): Organic market report, 2013, accessed at http://www.association.org/marketreport

[197] Angus, A et al (2009): Agriculture and land use: demand for and supply of agricultural commodities, characteristics of the farming and food industries for land use in the UK. Land Use Policy , 26 pp230-242

[198] Lloyd, T & Morgan, W (2007): Market power in UK food retailing. Euro Choices, 6 (3) pp22-29

[199] Defra (2012): Green food project conclusions, Department for Environment, Food & Rural Affairs, accessed at: http://www.defra.gov.uk/publications/2012/07/10/pb13794-green-food-project/

(BALE) is Suffolk's award competition for best farm diversification business and it is gaining increasing popularity in the New Anglian region. The competition is a source of ideas and knowledge for farmers who are looking to new ventures on their farm; it gives insights to new entrepreneurs on how to link agriculture to other sectors, especially the recreation and hospitality industry[200].

It is expected that the interconnection of these opportunities and threats will determine the development of the agricultural sector as an important contributor to the local economy and its links to the environment.

4.3.1.1. Cropping

The total area of productive land in New Anglia was around 680,000 ha in 2011, a decrease of 2% from 2007. Commercial crops make up the largest share with approximately 68% of total land. This represents an 18% increase since 2007. Cereals are the preferred crop option, occupying 43% of total land under crops. The remaining land was under other crops excluding cereals such as root crops (potatoes, carrots and sugar beet) and rape seed oil. Fruit and vegetables occupied around 3% of total area in 2011; 17% less than in 2007. Grassland constituted 18% of total area in 2011. This is a 4% increase compared to 2007. Table 4.3.1.a summarises this data disaggregated by Local Authority.

It is worth noting that land use patterns in New Anglia are different in comparison to UK patterns (only 28% allocated to crops and 67% to grassland) but it is similar to patterns found in England (43% of total land under crops).

Crop patterns in the UK are influenced by EU Common Agricultural Policies (CAP); its incentives and non-output related subsidies as well as market forces[201]. Before the 2000s, declining real prices for key crops such as cereals led to farmers running into losses. In response, CAP subsidies encouraged farmers to set land aside to induce supply management, increasing grassland at the detriment of crop land[201].

The last decade was characterised by increasing real prices for crops, with prices for cereals reaching their highest point in 2008. This has had an impact on the viability of livestock production as animal feed price also increased, benefiting crop-land at the expense of grassland. The period between 2000 and 2008 also corresponds to a sharp increase in grassland due to many farms with less than optimal quality land signing up to the Single Farm Payment Scheme[116].

[200] Suffolk Agricultural Association (2013): The Suffolk Show: East Anglian farmers collect awards for enterprising schemes, accessed at http://suffolkshow.co.uk/our_news/latest_news/east_anglian_farmers_collect_awards_for_enterprising_schemes

[201] Angus, A et al (2009): Agriculture and land use: demand for and supply of agricultural commodities, characteristics of the farming and food industries for land use in the UK. Land Use Policy , 26 pp230-242

In the next decade cereals are likely to continue to dominate the Anglian landscape, and a significant increase in the importance of sugar beet in the Anglian region is expected. More than 60% of the Anglian region is arable. Cropping is the main activity and rotation systems often involve cereals (barley, wheat and oats) with root crops like sugar beet because they return organic matter to the soil while preventing the development of pests[202].

Investments in the sugar beet industry are currently being made in the area of research and processing capacity[203, 204]. Furthermore, sugar beet growers have recently been granted support to continue to exercise the right of collective negotiation by the EU Members of Parliament against the monopoly held by British Sugar. Collective negotiation allows farmers to achieve greater bargaining power against the processor, ensuring stable terms of trade[205]. The UK biofuel sector is also engaging sugar beet growers to direct the excess produce to bioethanol plants. Excess produce would otherwise go to waste under current EU quotas[206]. Hence, current dynamics suggest that sugar beet will be a central crop in New Anglia's agricultural sector.

From an environmental point of view, long term changes in local climate are expected to have an overall negative impact on agriculture. Longer, drier summers and warmer, wetter winters are expected. Short-term effects of climate change might benefit some crops such as sugar beet and cereals. Industry experts believe there are opportunities, both agronomical and technological, to increase yields for most crops under warmer temperatures and a longer summer period. Nevertheless, water availability might hinder such developments and therefore these opportunities might not materialise. Water managements will be a key factor for the region's agricultural sector[207].

Local environmental concerns in East Anglia stem from agricultural concentration on water use and diffuse pollution into water bodies. In 2008 4% of the freshwater abstracted from surface and ground water was used for agriculture, this is over 35,000 mega-litres. Use of water for irrigation makes up a small proportion of total water abstraction; however it can be much more

[202] Culture of the Countryside: Major arable crops of East Anglia, accessed at http://www.cultureofthecountryside.ac.uk/resources/major-arable-crops-east-anglia

[203] Pollitt, M (2013): Beet growers urge more investment in Norfolk. Report for EDP 24, accessed at http://www.edp24.co.uk/business/farming-news/beet_growers_urge_more_investment_in_norfolk_1_1856478

[204] Pollitt, M (2012): Bright future for East Anglia's beet growers. Report for EDP 24, accessed at http://www.edp24.co.uk/business/farming-news/bright_future_for_east_anglia_s_beet_growers_1_1190110

[205] NFU (2013): MEPs vote to extend EU sugar regime, National Farmers Union, accessed at http://www.nfuonline.com/sectors/sugar/latest-news/meps-vote-to-extend-eu-sugar-regime/

[206] BBC News (2005): Sugar beet threat to biofuel unit, accessed at http://news.bbc.co.uk/1/hi/england/4551718.stm

[207] EDP24 (2013): Norfolk Farming Conference will discuss threats – and opportunities – from climate change, accessed at http://www.edp24.co.uk/mobile/business/farming-news/norfolk_farming_conference_will_discuss_threats_and_opportunities_from_climate_change_1_1882263

significant during dry weather, making up 20% of all abstraction[208].

In addition to abstraction, there are important concerns regarding water quality. Under the Water Framework Directive, 95% of our local river catchments are under pressure from diffuse pollution, while 40% are specifically 'at risk' of diffuse nitrate pollution. 90% (2.4 million ha) of the region is designated as Nitrate Vulnerable Zones. This was largely caused by high levels of nitrate-based fertilisers. In 2009, 90% of cropped land in the East of England received nitrogen fertilisers. Current efforts are systematically lowering nitrate levels in agriculture, however, water bodies show high levels of nitrogen due to historic build up. Similar patterns occur for pesticides[123].

The agri-food sector has been identified as a growth sector by the New Anglia LEP. This however is more oriented to food processing and food retail rather than production of raw materials. Growth in the agricultural sector is also expected but the strategy sets out important principles regarding sustainability and seeking new practices that will allow economic growth whilst minimising the impact on the environment[209].

[208] Environment Agency (2011): The state of our environment: agriculture and land management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Agriculture_and_Land_Management.pdf

[209] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

Table 4.3.1.a: Total farmed area of crops in New Anglia by Local Authority (2010)

Local Authority	Total farmed Area (ha)			Cereals (ha)			Arable Crops (excluding cereals) (ha)			Fruit and Vegetables (ha)			Grassland (ha)		
	2007	2010	% Δ 2007	2010	% Δ 2007	% Total	2010	% Δ 2007	% Total	2010	% Δ 2007	% Total	2010	% Δ 2007	% Total
Breckland	96,156	92,469	-4	36,019	-3	39	22,724	9	25	3,524	97	4	19,910	4	22
Broadland	43,229	39,733	-8	15,758	1	40	9,299	-6	23	866	-35	2	9,517	2	24
Great Yarmouth	10,225	11,786	15	4,865	23	41	2,886	53	24	651	5	6	2,543	11	22
North Norfolk	74,201	74,891	1	31,389	6	42	20,138	14	27	1,599	-28	2	13,331	1	18
Norwich & South Norfolk	80,702	74,055	-8	31,912	2	43	16,945	1	23	829	-41	1	17,365	-9	23
King's Lynn and West Norfolk	115,006	109,742	-5	47,016	3	43	31,577	5	29	5,576	15	5	13,311	-2	12
Forest Heath	25,733	27,254	6	7,368	14	27	5,780	7	21	2,216	-5	8	6,116	40	22
Ipswich & Babergh	47,158	46,220	-2	23,578	8	51	10,027	15	22	459	-11	1	7,201	-1	16
Suffolk Coastal	70,020	64,472	-8	24,749	3	38	16,105	8	25	2,438	-29	4	13,261	-6	21
Waveney	27,015	26,657	-1	11,481	1	43	6,660	11	25	188	-72	1	6,027	7	23
Mid Suffolk	75,625	72,165	-5	40,093	2	56	18,326	20	25	725	-59	1	7,600	-6	11
St. Edmundsbury	51,268	50,355	-2	25,785	8	51	12,232	5	24	541	-36	1	6,091	5	12
East Anglia	**1,427,800**	**1,380,809**	**-3**	**641,471**	**4**	**46**	**345,804**	**10**	**25**	**34,292**	**1**	2	**230114**	**-3**	**17**
New Anglia	**716,336**	**689,798**	**-2**	**300,014**	**6**	**43**	**172,700**	**12**	**25**	**19,613**	**-17**	**3**	**122273**	**4**	**18**

Note: Δ = delta (difference between years)
Source: Defra (2010): Local authority breakdown for key crop areas and livestock numbers on agricultural holdings, Department for Environment, Food & Rural Affairs, accessed at https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

4.3.1.2. Livestock

Pigs and poultry are the most important livestock sectors in New Anglia. This is measured by percentage change in numbers of animals. As Table 4.3.1.b shows, pig rearing increased by 3.2% between 2007 and 2010 while poultry increased by 7.7% during the same period. Pig and poultry production are important in rural East Anglia due to the proximity of production to grain feed[210]. A significant reduction in sheep rearing is also clear in Table 4.3.1.b. This is more pronounced in Suffolk with a reduction in the sector of around 23%, whilst Norfolk experienced a 2% decline. Cattle production has remained the same overall, with a slight reduction of 1.1% in the number of animals in Suffolk.

There is an overall decline in livestock rearing across all sectors taking place in Norwich and South Norfolk, Ipswich and Babergh, Mid Suffolk and Broadland (even though there is a small increase in the pig sector of 1.7%). This is consistent with a decline in total agricultural land in the same Local Authorities portrayed in Table 4.3.1.a. In Breckland, King's Lynn, Forest Heath, Suffolk Coastal, Waveney and St. Edmundsbury an increase in a given sector is accompanied with a similar decrease in other sectors. Even though these dynamics cannot be fully explained here, this might suggest that some producers shift production in response to price changes[211]. The only Local Authority experiencing an overall increase in all sectors is Great Yarmouth, which is also experiencing an increase in total agricultural land (see Table 4.3.1.a). This might suggest an expansion of the agricultural sector on previously set aside land.

Environmental concerns regarding livestock rearing are centred on two key areas. The first is emissions from housed livestock and spreading slurries and manures that can impact air quality. Methane is produced in digestive processes of livestock and animal manures. Methane has a global warming potential 21 times greater than CO_2 and methane emissions are regulated by Integrated Pollution Prevention and Control (IPPC) legislation under the Environmental Permitting Regulations (EPR). East Anglia's intensive pig and poultry farms account for 43% of the nationally issued EPR permits for production of pigs and 37% of the national permits for poultry[210]. The second concern is livestock rearing contributing to soil pollution. Agricultural emissions are responsible for two-thirds of the nitrogen deposition which leads to over-enrichment and acidification of sensitive soil habitats and fresh waters, such as heathlands and The Broads. Livestock rearing contributes to this hazard when waste is mismanaged. Ammonia emissions however have been reduced by 30% since 2007 and this is attributed to improvements in waste management[210].

[210] Environment Agency (2011): The state of our environment: agriculture and land management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Agriculture_and_Land_Management.pdf

[211] Defra (2012): Farm Accounts in England – Results from the Farm Business Survey 2011/12, Department for Environment, Food & Rural Affairs, accessed at http://webarchive.nationalarchives.gov.uk/20130123162956/http:/www.defra.gov.uk/statistics/files/defra-stats-foodfarm-farmmanage-fbs-publications-farmacc-2012-overview-121218i.pdf

Table 4.3.1.b: Number of Livestock per type and change (%) from 2007 to 2010 in New Anglia												
Local Authority	**Number of livestock**											
	Cattle			**Sheep**			**Pigs**			**Poultry**		
	2007	**2010**	**% Δ**	**2007**	**2010**	**% Δ**	**2007**	**2010**	**% Δ**	**2007**	**2010**	**% Δ**
Breckland	17965	17561	-2.2	38886	36804	-5.4	225266	228620	1.5	5579534	6603544	18.4
Broadland	16112	15353	-4.7	11964	11699	-2.2	43369	44119	1.7	1408373	1131831	-19.6
Great Yarmouth	2662	3718	39.7	1015	1254	23.5	1737	2708	55.9	626338	651425	4.0
North Norfolk	14763	13826	-6.3	24582	23116	-6.0	70328	62448	-11.2	2703141	2534494	-6.2
Norwich & South Norfolk	29405	28068	-4.5	17283	14233	-17.7	121126	86290	-28.8	3449041	3257273	-5.6
King's Lynn and West Norfolk	12306	9839	-20.0	20406	18105	-11.3	96859	100767	4.0	240467	347685	44.6
Forest Heath	2811	3683	31.0	14762	5932	-59.8	28444	36369	27.9	846474	726391	-14.2
Ipswich & Babergh	4962	3877	-21.9	16815	13949	-17.0	16197	12247	-24.4	153492	130671	-14.9
Suffolk Coastal	11651	11419	-2.0	15604	15031	-3.7	88777	93444	5.3	1248387	1290967	3.4
Waveney	8452	7880	-6.8	10599	11196	5.6	23670	18799	-20.6	774477	1205537	55.7
Mid Suffolk	8994	8213	-8.7	8867	6522	-26.4	174979	190517	8.9	4024938	3860709	-4.1
St. Edmundsbury	4472	4546	1.6	13813	8484	-38.6	47743	56227	17.8	724083	948960	31.1
Suffolk	**41342**	**39618**	**-1.1**	**80460**	**61115**	**-23.3**	**379810**	**407603**	**2.5**	**7771851**	**8163235**	**9.5**
Norfolk	**93213**	**88367**	**0.3**	**114136**	**105210**	**-3.2**	**558686**	**524952**	**3.9**	**14006894**	**14526252**	**5.9**
New Anglia	**134555**	**127985**	**-0.4**	**194596**	**166325**	**-13.2**	**938497**	**932555**	**3.2**	**21778745**	**22689486**	**7.7**
Source: Defra (2010): Local authority breakdown for key crop areas and livestock numbers on agricultural holdings, Department for Environment, Food & Rural Affairs, accessed at https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june												

4.3.2. Fisheries and aquaculture

The provision of food from marine fisheries is lower now than at any time in the last century. Landings into UK ports were around 1.2 million tonnes in 1948 and declined slightly, to just over 1 million tonnes in 1970. The total weight of landings has declined steadily since that time and, in 2008, landings were only 538,000 tonnes[212].

According to the Local Economic Assessment Update for Norfolk, agriculture, forestry and fishing enterprises made up 11% of all VAT and PAYE registered enterprises in Norfolk in 2012[213]. Sea fisheries have mainly targeted demersal species such as cod and rays using long-lines, gill and trammel nets, with crabs and lobster potting in the summer months[214]. The majority of fishermen within The Wash fish for cockles, mussels and shrimps. Demand for all three species, has increased rapidly in recent years leading to investment in vessels and sophisticated equipment both at sea and onshore. This is mainly related to increasing demand from Continental markets. In turn this has put pressure on stocks particularly sedentary cockles and mussels[214].

Along the North and East Norfolk coast fishermen cultivate mussels and pacific oysters, whilst others are engaged in the offshore whelk, crab and lobster fisheries. Many boats stop fishing during the winter months, while others fish for herring. Cod, rays and dogfish make up a large proportion of the landings in Lowestoft, with the long-line vessels fishing up to 60 miles offshore, weather permitting. Lowestoft is the largest port within the Authority's District and accounts for the greatest proportion of landings, particularly of the demersal species, although landings have diminished over recent years. The Suffolk harbours of Southwold, Aldeburgh and Felixstowe fish for cod, plaice, rays, sole, crabs and lobsters. The rivers Deben, Stour and Orwell are fished for shrimps, sole and eels and provide sheltered water for the cultivation of oysters[214].

As with many other sectors, climate change poses an ongoing concern for fisheries. It may result in changes in species and/or movement of species out of an area. Although overall negative effects are expected, the movement of fish may bring new fish species into the area which may benefit commercial fisheries.

At the European level, limits to fishing activity are defined by the European Union's Common Fisheries Policy (CFP), which is influenced by considerations of commercial fish stocks maintenance and also by political considerations. The means of limiting catches (fishing days, discards, mesh size, etc.) are not always effective in terms of sustainability of either stocks or

[212] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

[213] Norfolk County Council (2012): Local economic assessment for Norfolk: 2012 update, accessed at http://www.norfolk.gov.uk/view/NCC106434

[214] Eastern IFCA: Fisheries Overview, Eastern Inshore Fisheries and Conservation Authority, accessed at http://www.eastern-ifca.gov.uk/index.php?option=com_content&view=section&layout=blog&id=4&Itemid=43

the industry. Local regulations are also in place, which are more amenable to effective partnership between the local regulator (Eastern Sea Fisheries Joint Committee) and fishermen.

In line with the Marine and Coastal Access Act, the UK is in the process of developing a network of Marine Conservation Zones (MCZs)[215]. The first tranche, 31 sites of a recommended 127, are due for designation this year. Within the first tranche is the Stour and Orwell Estuaries in Suffolk. The rest of the recommended sites on the Suffolk and Norfolk coast have been put on hold for further investigation. By protecting areas of the sea it is hoped that the ecological status of features, habitats and species will improve and become more abundant. This is likely to have a positive spill over affect which could positively impact sectors such as fisheries and tourism, however it is feared that some fishing effort will be negatively affected in the short term due to increased protection in certain sites. Although only one site will be designated in the New Anglia region this year, it is likely that more MCZ designations, as well as other forms of protected area will be implemented in the future.

The growth in other sectors can have an impact on the fisheries sector. Great Yarmouth is England's principal support port for offshore energy in the Southern North Sea and the East Anglia Array wind farm project. Growth in this sector may lead to increased port activity, increased number of wind turbines and increased travel between the two, which may negatively impact fisheries and fishing area. Other ports, such as Felixstowe, are major European cargo ports. It is suggested that within New Anglia, the ports and logistics sector is set to expand which may also put pressure on fisheries and decrease fishing effort. The New Anglia Sector Growth Strategy also suggests that the tourism sector will grow in future years[216]. It is possible that as a result of declining fish stocks and increasing opportunities in the tourism sector people will choose to join the tourism sector rather than the fisheries sector.

Aquaculture has been supported within the Common Fisheries Policy. 14% of water licensed for abstraction in North West Norfolk CAMS area was for aquaculture in 2005[217]. It is expected that the human consumption of fish which is produced in aquaculture is set to rise in the coming years. Within the UK the majority of existing finfish aquaculture activity for food is located in Scotland, although it is increasing in areas of Wales and England. Shellfish culture is spread more evenly throughout the UK. The total value of the shellfish produced in the UK in 2010 is estimated at about £25.5 million (31,500 tonnes). This represents an 11% decrease compared with 2009 (figures do not include hatchery/nursery seed production for on-growing, much of which is exported). According to Cefas the total UK value of aquaculture finfish production in 2010 was £484 million, an increase from 2009 of £29 million[218].

[215] Natural England: Marine Conservation Zones, accessed at http://www.naturalengland.org.uk/ourwork/marine/mpa/mcz/default.aspx

[216] NewAnglia (2013): New Anglia local enterprise partnership for Norfolk and Suffolk: sector growth strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[217] Environment Agency (2005): The Norfolk West Norfolk Catchment Abstraction Management Strategy, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0305bqyu-e-e.pdf

[218] Cefas (2012): Finfish news number 13, Summer/Autumn 2012, Centre for Environment, Fisheries & Aquaculture Science, accessed at http://www.cefas.defra.gov.uk/publications/finfishnews/ffn13.pdf

In England mussels are the main species farmed although production decreased by a third in 2010 compared with 2009, and the total was the lowest for over 10 years. Production of native oysters increased significantly by 65% compared with preceding years. Pacific oyster production declined by 20%, but still represents the third highest recorded annual total[219]. According to Mee (2006)[220] there are prospects for using decommissioned offshore wind farms for aquaculture production (finfish and other species), which would open up new sites for finfish farming in the UK. Investment and advancements have been made both in the aquaculture and fisheries sectors recently. Recent years have seen major improvements in the aquaculture sector as well as heavy investment in vessels and sophisticated equipment in the sea fisheries sector. It is likely that these developments draw from the advanced manufacturing sector.

4.3.3. Game and wild food

Game and wild food shot, trapped or harvested within the UK include[221]:

- Red deer (Cervus elaphus);
- Roe deer (Capreolus capreolus);
- Fallow deer (Dama dama);
- Brown hare (Lepus europaeus);
- Mountain hare (Lepus timidus);
- Pheasant (Phasianus colchicus);
- Grey partridge (Perdix perdix);
- Red-legged partridge (Alectoris rufa);
- Red grouse (Lagopus lagopus);
- Mallards (Anas platyrhynchos) (and other ducks);
- Salmon (Salmo salar) and trout (Salmo trutta) (and other fish);
- Honey; and
- Mushrooms (particularly chanterelle - Cantharellus cibarius, cep - Boletus edulis and hedgehog mushrooms - Hydnum repandum).

Within the UK 480,000 people shoot live quarry and this activity supports the equivalent of 70,000 full time jobs. Shooters spend £2 billion each year and the industry is worth £1.6 billion

[219] SeaFish (2012): The Seafish guide to aquaculture, accessed at http://www.seafish.org/media/publications/SeafishGuidetoAquaculture_201211.pdf

[220] Mee, L (2006): Complementary benefits of alternative energy: suitability of offshore wind farms as aquaculture sites, Inshore Fisheries and Aquaculture Technology Innovation and Development, accessed at http://www.seafish.org/media/Publications/10517_Seafish_aquaculture_windfarms.pdf

[221] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

to the UK economy. Shooting is involved in the management of two thirds of the rural land area with 2 million ha being actively managed for conservation because of shooting. Shoot providers spend £250 million a year on conservation and shooters spend 2.7 million work days on conservation[222].

Table 4.3.3.a shows the prevalence of sport shooting across the different British regions and from this it is clear that the East of England is among the most popular areas for shooting with the greatest number of gun days provided in England and the second highest number of gun providers in England. The East of England is the region with the third highest total Gross Value Added (GVA) from sport shooting[223].

The game and wild food industry provides opportunities for the natural environment, one of which is the control of deer numbers. There are currently more deer in the UK than at any time since the last ice age and these high numbers pose a threat to biodiversity as well as accidents on the road and crop damage. In Thetford researchers identified a necessary cull of roe and muntjac deer of 60% and 53% of their current population respectively[224]. Increased shooting of these animals and sale of their meat will reduce numbers of deer thereby protecting the environment and creating more income for the local area. The wild food industry may also benefit conservation by increasing the number of protected areas as well as the numbers of people involved in conservation activities. Currently there are approximately 2 million ha actively managed for conservation because of shooting.

[222] PACEC (2006): The economic and environmental impact of sporting shooting, Public and Corporate Economic Consultants. Report for British Association for Shooting and Conservation, accessed at http://www.shootingfacts.co.uk/pdf/pacecmainreport.pdf

[223] Mee, L (2006): Complementary benefits of alternative energy: suitability of offshore wind farms as aquaculture sites, Inshore Fisheries and Aquaculture Technology Innovation and Development, accessed at http://www.seafish.org/media/Publications/10517_Seafish_aquaculture_windfarms.pdf

[224] UEA (2013): First in-depth deer census highlights need for increased culls, University of East Anglia, accessed at http://www.uea.ac.uk/mac/comm/media/press/2013/March/deer-cull-research

Table 4.3.3.a: The extent of shooting by UK country and region and its contribution to the economy (2006)				
Region of the UK	**Gun days provided (million)**	**Number of providers**	**Number of guns**	**Total GVA supported (£million)**
South East	1.4	6,100	130,000	250
East	**1.7**	**10,000**	**97,000**	**140**
Gr. London	0.0	480	6,600	76
South West	0.9	10,000	110,000	270
West Midlands	1.4	3,400	85,000	92
East Midlands	0.8	4,800	80,000	120
York/Humber	0.5	2,700	68,000	110
North West	0.7	2,900	46,000	160
North East	0.4	3,100	50,000	61
England	7.8	44,000	510,000	1,300
Wales	0.6	2,700	110,000	73
Scotland	1.5	8,800	200,000	240
Northern Ireland	0.3	5,000	31,000	45
UK	10	61,000	48,000	1,600
Source: PACEC (2006): The economic and environmental impact of sporting shooting, Public and Corporate Economic Consultants. Report for British Association for Shooting and Conservation, accessed at http://www.shootingfacts.co.uk/pdf/pacecmainreport.pdf				

Threats to the natural environment associated with the game and wild food industry include the reduction in numbers of species necessary for a healthy ecosystem. One example is the reduction in the numbers of spawning salmon which is attributed to the capture at sea and estuarine netting of this species[225].

Changes to game and wild food in the past have been caused by a variety of different drivers. In the case of game birds, changes to their habitat management are often related to changes in their populations. Changes to the honey productivity of the UK has been due to changes in the popularity of the activity but it is also affected by the presence of the mite *Varroa destructor* which was recorded in Britain for the first time in 1992. This mite increases the susceptibility of bees to harmful diseases, thereby increasing bee mortality. Current prices suggest there is a strong demand for honey (£8.31/kg in 2009); therefore national honey productivity should continue to rise with demand. Challenges facing the industry include climate change, disease and landscape change[225].

[225] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

4.4. Fibre

4.4.1. Timber

Within the UK as a whole the area of woodland has increased due to afforestation for timber production, leading to a dominance of coniferous species[226]. There are approximately 144,428 ha of woodland that is above 0.1 ha in size in the East of England, representing 7.6% of the land area. East of England woodland is fragmented and composed of small blocks, with a total of 7,767 woods over 2 ha and a mean wood area of 14.6 ha. This woodland is calculated to be worth £1.3 billion (including direct market benefits from timber and wood products, renewable energy, recreation and tourism, and housing)[227]. The region has a diverse woodland resource with broadleaved woodland as the dominant type (61%) but also areas of conifer woodland (22%), mixed woodland (11%) and open space within woodland and felled areas (6%). Coriscan pine is the main conifer species and oak the main broadleaf species in the area. The Forestry Commission owns or leases 26,096 ha woodland (18%) within the East of England, the rest is owned by the public sector (local authorities), farmers and other land owners and voluntary organisations, communities, charities, social enterprises and cooperatives (e.g. Wildlife Trust, RSPB, Woodland Trust, National Trust, community forests)[228]. The East of England relies on pine species (Corsican and Scots) due to the soil and climate[228].

The level of timber production within Norfolk and Suffolk from thinning and felling from public and private sector forestry is shown in Table 4.4.1.a with forecast predictions to 2026.

Table 4.4.1.a: Average annual thinning plus felling for public and private sector timber across all species

Period	Norfolk total annual volume	Suffolk total annual volume	Annual income from thinning and felling (based on £31.5/m³)
	Volume (cubic metres over bark)		
2007-2011	161,753 (Forestry Commission only)	116,615 (Forestry Commission only)	£5,095,219 (Forestry Commission only)
2012-2016	276,115	156,304	£13,621,198
2017-2021	248,913	178,687	£13,469,400
2022-2026	303,307	150,900	£14,307,520

Sources: InCrops Ltd (2010): Low carbon supply chains for forest products in the East of England, accessed at http://www.incropsproject.co.uk/documents/Resources/InCrops%20Timber%20Supply%20Chain%20project%20report%20October%202010%20%28NXPowerLite%29.pdf
Santon Downham Forest Enterprise website http://www.santondownham.org/forestenterprise.html

[226] UK NEA (2011): Chapter 8 Woodlands, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

[227] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, NewAnglia Local Enterprise Partnership for Norfolk and Suffolk, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

[228] InCrops Ltd (2010): Low carbon supply chains for forest products in the East of England, accessed at http://www.incropsproject.co.uk/documents/Resources/InCrops%20Timber%20Supply%20Chain%20project%20report%20October%202010%20%28NXPowerLite%29.pdf

The National Character Areas (NCAs) within Norfolk and Suffolk are shown in Table 4.4.1.b and the area of woodland within them where known[229, 230]. The boundaries of the NCAs do not correspond to the county boundaries but the area of the ones shown is mainly within Norfolk and Suffolk. The NCA with the greatest woodland is the Brecks (which includes a proportion of Thetford Forest), followed by South Suffolk and North Essex Claylands (which lies mainly outside the Norfolk/Suffolk boundary). Maps from the Forestry Commission show that Thetford Forest contains the majority of the woodland within the East of England. It also shows that Thetford Forest is a significant woodland for England as a whole[231]. Thetford Forest is composed of approximately 65% Corsican pine[232]. From the Natural England Landscape Cover map for Norfolk and Suffolk, combined coniferous woodland accounts for 25,880 ha and broad leaved, mixed and yew woodland makes up 59,459 ha. The total area of woodland within Suffolk equal to or greater than 0.1 ha is 31,435 ha (8.3% of the land area)[233]. Within Norfolk the total area of woodland 0.1 ha and over is 52,740 ha (9.8% of the land area)[233].

Within Thetford Forest the current programme is to harvest 190,000 m^3 of wood per year. The timber fetches between £36 per m^3 and £47 per m^3 depending on its grade and market[234]. Using the mid value of £31.5 per m^3 the annual income from thinning and felling in Norfolk and Suffolk has been calculated (Table 4.4.1.a). Timber worth more than £4 million is harvested from Thetford Forest alone each year. An annual income from timber between 2012 and 2016 in Norfolk and Suffolk is predicted to be over £13.6 million.

Timber woodlands such as Thetford Forest provide a variety of opportunities to the area. Increased timber production may improve the variety of habitats and attract more visitors which will help to secure and enhance ecological networks. Woodlands also provide opportunities for local farm businesses as they can generate heat from woody biomass from forest waste for woodchip boilers, this may benefit habitat management. Restructuring the forest to provide trees at different heights will improve the habitat; this is being planned by the managers of Thetford Forest. Thetford Forest provides areas for dog walking, mountain biking, horse riding, motor rallying, archery and husky sledging. The forest has a diverse range of rare plants and animals, such as the woodlark and nightjar.

[229] Natural England: East of England National Character Areas, accessed at http://www.naturalengland.org.uk/publications/nca/eastofengland.aspx

[230] Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished document

[231] Forestry Commission (2011): National Forest Inventory - Great Britain distribution of woodland 0.5ha and over, accessed at http://www.forestry.gov.uk/pdf/GB_Map.pdf/$FILE/GB_Map.pdf

[232] InCrops Ltd (2010): Low carbon supply chains for forest products in the East of England, accessed at http://www.incropsproject.co.uk/documents/Resources/InCrops%20Timber%20Supply%20Chain%20project%20report%20October%202010%20%28NXPowerLite%29.pdf

[233] Forestry Commission (2002): National Inventory of Woodland and Trees England: County Report for Suffolk, accessed at http://www.forestry.gov.uk/pdf/suffolk.pdf/$FILE/suffolk.pdf

[234] Santon Downham Forest Enterprise, accessed at http://www.santondownham.org/forestenterprise.html

The contribution of the timber industry within Norfolk and Suffolk to the GVA is not available as this industry is grouped with agriculture and fishing, however the gross income can be estimated as in Table 4.4.1.a.

Table 4.4.1.b: Woodland within National Character Areas in Norfolk and Suffolk

National Character Area and No.	Area of woodland (ha)	Woodland details	Timber production details
76 North West Norfolk	6,539	Contains significant areas of semi-natural woodland. 3% is coniferous plantation which is mainly on the area of Greensand in the west, although some former commercial plantation has been felled to enable the restoration of the Greensand heathland and mire complexes. A very small proportion of the woodland in the west of the NCA is replanted ancient woodland.	Commercial timber production takes place on the Sandringham Estate and the other large estates (e.g. at Holkham, Houghton).
77 North Norfolk Coast	Very low	There is little woodland in the NCA with the exception of Holkham Pinewoods. There is no Ancient Woodland.	There is minimal commercial timber production in the NCA beyond local sales of firewood.
78 Central North Norfolk	8,091	Some of the deciduous woodland, as at the Lion's Mouth at Felbrigg, has SSSI status but much is coniferous plantation. The woodland area includes some Ancient Woodland, especially in the extreme north and west of the NCA, and also Ancient Replanted Woodland.	There is commercial timber production at sites along the Cromer-Holt ridge and the afforested area around Buxton-Cawston-Marsham.
79 North East Norfolk and Flegg	1,014	The wooded area is low relative to other Norfolk NCAs. There is little Ancient Woodland with the exception of small areas in the Strumpshaw Buckenham area and a larger area of Ancient replanted woodland at Bacton Woods.	There is minimal commercial timber production in the NCA, excepting the Forestry Commission plantation at Bacton Woods.
80 The Broads	4,727	No woodland information	No woodland information

82 Suffolk Coast and Heaths	8,733	About 12% of the woodland cover is on an ancient woodland site.	There is a small amount of commercial hardwood timber production (approximate production 500m^3/yr) and extensive tracts of conifer plantation. The Forestry Commission has extensive forest holdings in this area totalling some 3,110 ha. Known locally as the 'Sandlings forests', they include: Rendlesham (1426 ha), Tunstall (1170 ha) and Dunwich Forests (514 ha). In 2010/11 the Sandlings Forests will produce 15,000 tonnes of timber. Annual output will increase slightly as the rest of the crops replanted following the 1987 storm come into production cycles.
83 South Norfolk, High Suffolk Claylands	7,093	About 28% of all woodland is on ancient woodland sites, and there are not significant areas of new planting. Many ancient woodlands were replanted with conifers in previous decades, and a very slow programme of restoration to natural vegetation means that the proportion of conifer is expected to slowly fall.	There is little large-scale timber production, but coppice products (especially firewood) are produced. Timber production is often secondary to other woodland uses such as game or nature conservation.
84 Mid Norfolk	3,857	Although sparse there are a variety of woodland types: mixed woodland or pasture woodlands (oak and beech) on heavier soils and conifers on the lighter sands. Ancient Woodland accounts for 19% of the area of the 1999 NIWT cover which is just below 700 ha. The largest remaining block of ancient woodland in Norfolk is Foxley Wood which lies in the Mid Norfolk NCA.	There is little commercial timber production in this area with the Forestry Commission Legal Estate declining by 239 ha since 2002 and covering just 195 ha in 2010 (that is a mixture of leasehold and freehold tenure)
85 The Brecks	28,988	About 32% (9,281 ha) of the NCA's woodland stock is broadleaved, and of this 2.6 per cent (247 ha) is recorded as ancient semi-natural woodland.	Predominantly large-scale commercial conifer plantations. The woodlands are major producers of softwood products and these are commonly used for construction and fencing materials.

86 South Suffolk and North Essex Claylands	13,925	There are few large woods (that exceed 8 ha), with more occurring in the north of the area. Ancient deciduous woods including those of notable importance occur on the plateau areas. Over 50% of the woodland SSSI's are in favourable condition although browsing and over-grazing by deer is a particular problem in this NCA.	No mention of timber production
Source: Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished and Natural England: East of England National Character Areas, accessed at http://www.naturalengland.org.uk/publications/nca/eastofengland.aspx			

Timber from Thetford Forest is used by many different markets including construction, fencing and pallet manufacture. Smaller diameter material is used in the manufacture of chipboard. Fencing is the most important market locally and the popularity of timber products such as decking is also evident. Some of the higher grade timber is used as roof trusses. Heaps of chippings on the forest floor are either left to compost down for use as mulch in gardening, or to be partially seasoned prior to their use as power station fuel[235]. Paper products are not made from the material available from Thetford Forest, due to the large transport distances and the preferred tree species being Spruce, which is not grown here[235]. Within the UK as a whole timber is used to produce pulp and paper and wood-based panels mainly, but also goes to fencing and wood fuel as well as 'other' uses[236].

Timber use in construction (new builds and repairs, maintenance and improvements) in the UK in 2007 totalled 6.4 million m^3. In the East of England between 2009 and 2021 it is expected to total 9.8 million m^3, which equates to approximately 750,000 m^3 per year (11.7% of the UK total in 2007). In 2007 622,000 m^3 was used solely in new builds within the UK, 220,000 new dwellings were started in this year and the average timber per dwelling was 2.8 m^3. Within the East of England between 2009 and 2021 349,000 new dwellings are predicted. If the average timber per dwelling is the same for the East of England as it is for the UK then this equates to approximately 26,846 dwellings per year using 75,153 m^3 per year. The ratio of new builds to repairs, maintenance and improvements in the UK is around 1:9 [237].

The East of England is influenced by a number of growth zones (Cambridge, Milton Keynes and East Thames Corridor) which will use significant quantities of timber for construction and

[235] Santon Downham Forest Enterprise, accessed at http://www.santondownham.org/forestenterprise.html

[236] Forestry Commission (2012) Forestry Statistics 2012: UK Grown Timber, accessed at http://www.forestry.gov.uk/website/forstats2012.nsf/TopContents?Open&ctx=AAE83F6D1BF93E5380257A3200575E08

[237] InCrops Ltd (2010): Low carbon supply chains for forest products in the East of England, accessed at http://www.incropsproject.co.uk/documents/Resources/InCrops%20Timber%20Supply%20Chain%20project%20report%20October%202010%20%28NXPowerLite%29.pdf

energy[237]. Timber is becoming increasingly popular as a construction material, as it is possible to achieve up to an 86% reduction in greenhouse gas emission by increasing the amount of timber in buildings[238]. The use of timber in construction also contributes to fixing carbon from the atmosphere.

Planting of new forests has been identified as a means of increasing carbon storage and achieving climate change mitigation. Faster growing species will fix carbon more quickly and produce utilisable timber sooner. The carbon is then fixed as long as the timber is used, for example, in construction[239].

The estimated standing biomass/carbon stock in the East of England held in trees amounts to 8.4 million tonnes of carbon or 30.7 million tonnes of CO_2. There are a total of 75,340 ha of broadleaved woodland in the East of England and 37,942 ha of conifer woodland. The potential net carbon uptake associated with existing woodland is ~484 $ktCO_2$ (kilo tonnes of carbon dioxide) per year for conifer woodland and 527 $ktCO_2$ per year for broadleaved woodland. To include the area of woodland planted since 1998 an additional 43 $ktCO_2$ per year must be included[240]. Some of the waste from timber felling in Thetford Forest is used as fuel in the innovative biomass power station a few miles from Santon Downham. Branches, needles and twigs are chipped by a local firm and sold for mixing in with other fuels such as the litter from chicken farms[241].

Biomass energy demand is likely to increase in the future, however conservative estimates of hardwood (broadleaved) timber indicate there is more than 100,000 m^3 of un-utilised hardwood timber in the East of England plus a similar volume of wood that could be used sustainably for wood fuel. There are over 16 million oven dried tonnes of woodland fuel resource technically available from woodlands bigger than 2 ha in the East of England. Between 2012 and 2016 there will be around 258,000 oven dried tonnes technically available annually[240]. These figures suggest that despite increased demand, current areas of woodland will be sufficient to meet timber needs, at least initially.

Climate change is expected to influence the composition and character of woodlands due to: changes in temperature altering growing seasons and the degree of frost damage, moisture deficit affecting trees with different seasonal moisture requirements and drought tolerance (snowfall can damage trees of protect them from winter desiccation), and wind which can cause physical damage and affect tree growth form. Combinations of wind and temperature also drive

[238] ECCM (2006): Forestry Commission Scotland Greenhouse Gas Emissions Comparison – Carbon benefits of timber in construction, The Edinburgh Centre for Carbon Management, accessed at http://www.forestry.gov.uk/pdf/Carbonbenefitsoftimberinconstruction.pdf/$file/Carbonbenefitsoftimberinconstruction.pdf

[239] UK NEA (2011): Chapter 8 Woodlands, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

[240] InCrops Ltd (2010): Low carbon supply chains for forest products in the East of England, accessed at http://www.incropsproject.co.uk/documents/Resources/InCrops%20Timber%20Supply%20Chain%20project%20report%20October%202010%20%28NXPowerLite%29.pdf

[241] Santon Downham Forest Enterprise, accessed at http://www.santondownham.org/forestenterprise.html

tree-line and forest limits. Despite these predictions there is limited evidence of major climate related change in the composition of UK forest and woodlands. This is most likely to be because most tree species are long lived and adapted to cope with considerable climate variability and are relatively resilient to the small changes in climate that have already occurred[243].

The influence of pests and diseases on timber production can be significant. Red Band Needle Blight affects conifer species, including the main species within the East of England, Corsican pine. This disease has been found to reduce the growth rate of Corsican pine leading to a medium to long term reduction in yield. Focus has been on use of resistant species and good stand management rather than fungicide treatment in the UK. It has been shown that the disease does not have a negative effect on the timber properties, but reduces yield due to slower growth rates[242]. Other diseases and pests reducing the productivity of trees within the UK are: Dutch Elms Disease (caused by the fungus *Ophiostoma novo-ulmi*), Sudden Oak Death (caused by the fungus *Phytophthora ramorum*) and Acute Oak decline thought to be due to either a single virulent disease or a combination of low-virulence diseases[243].

Timber production in Norfolk and Suffolk is also threatened by habitat restoration as some areas within the LEP area are being returned to heathland and acid mire which may replace areas for timber production.

The UK was the third largest net importer (imports less exports) of forest products in the world in 2010, behind China and Japan[244, 245]. However, the UK timber imports trade may be decreasing[246]; this could be due to increased global demand for timber making it more expensive to import or increased production of timber from within the UK.

4.4.2. Reed and Thatch

Thatched properties form an important part of village cultural heritage within the UK and probably add up to a national capital asset of approximately £12.5 billion[247]. In 1988 over 500

[242] InCrops Ltd (2010): Low carbon supply chains for forest products in the East of England, accessed at http://www.incropsproject.co.uk/documents/Resources/InCrops%20Timber%20Supply%20Chain%20project%20report%20October%202010%20%28NXPowerLite%29.pdf

[243] UK NEA (2011): Chapter 15 Provisioning Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=6Hsc6TF7XGI%3d&tabid=82

[244] Forestry Commission (2012): Forestry Statistics 2012, accessed at http://www.forestry.gov.uk/website/forstats2012.nsf/LUContentsTop?openview&RestrictToCategory=1

[245] Forestry Commission (2012): Forestry Facts & Figures, accessed at http://www.forestry.gov.uk/forestry/infd-7aqf6j

[246] TTJ (2012): Downward trend in UK import volumes accelerates, Timber Trades Journal, accessed at http://www.ttjonline.com/news/downward-trend-in-uk-import-volumes-accelerates/

[247] National Society of Master Thatchers: Introduction, accessed at http://www.nsmtltd.co.uk/

people were employed full time throughout England and Wales in the thatching industry[248]. Thatch roofs characterise certain areas within the UK, within Norfolk and Suffolk these areas include the National Character Areas (NCAs) of North East Norfolk and Flegg, East Anglian Chalk, the Broads, South Norfolk and High Suffolk Claylands, North Norfolk, Suffolk Coast & Heaths, Central North Norfolk and Mid Norfolk. The Broads is considered the main area of thatch in East Anglia[249].

Within Norfolk and Suffolk many of the thatched properties are over 400 years old. They are either thatched with Norfolk (water) reed or long straw. Norfolk reed grows alongside the rivers and broads and long straw is grown from a variety of wheat[250]. Quality reed for thatching comes from reed beds which are cut every year or every two years[251]. Sedge is used for the dressing along the top of a thatched roof[249].

There is a history of reed cutting in the North Norfolk coast area and it plays an important part in the long shore economy there. Historically the seasonal work brought in much needed income during winter when there wasn't much other work and it allowed people to obtain an income locally. Sedge can be harvested in the summer, thereby providing reed cutters with another source of income outside of the reed cutting period[250].

The thatching and reed and sedge cutting industries are threatened by a number of factors, one of the most significant of these being the abundance of cheap reed from abroad. It is estimated that 80% to 90% of the reed used in the UK for thatching comes from abroad. Within the last 15 years there has only been a 5% increase in the price of a bundle of reeds, making it difficult to earn a living as a thatcher. Another problem facing this industry is the reduction in the number of young cutters entering the trade[250]. Without a regular influx of workers the skills and knowledge required to maintain the industry will be lost. The risks associated with thatch as a roofing material also inhibit the growth of this industry, every year over 50 historic thatched buildings out of an estimated stock of 24,000 properties are destroyed through preventable fires breaking out in thatch. These tend to be caused by deep thatch coupled with a central chimney from a multi-fuel stove[252].

In order to improve the reed and thatch industry grant funding must be available. Natural England currently offers £60 per ha for maintenance or restoration of reed beds through their Higher Level Stewardship scheme, listing one of the uses of reed beds as the production of

[248] Rural Development Commission (1988): The Thatcher's Craft (1988), accessed at http://www.hct.ac.uk/PDF/CraftPublications/Crafts/THE%20THATCHERS%20CRAFT%20-%2001_tcm2-18962.pdf

[249] Natural England: East of England National Character Areas, accessed at http://www.naturalengland.org.uk/publications/nca/eastofengland.aspx

[250] Master Thatchers in Suffolk and Norfolk: Reed and Straw Thatching Services, accessed at http://www.thatch.net/thatchers/thatch_material.htm

[251] The North Norfolk Reedcutters Association: Welcome, accessed at http://www.norfolkreed.co.uk/index.htm

[252] National Society of Master Thatchers: Introduction, accessed at http://www.nsmtltd.co.uk/

material for thatching[253]. This scheme encourages landowners to manage their reed beds but does not help reed cutters and thatchers directly. Within the Higher Level Stewardship handbook it is mentioned that special funding may be available for projects such as conservation and restoration of historic buildings; however this does not specify thatch and will not provide money to the reed cutters and thatchers directly. Other suggestions for improving the reed and thatch industries suggested by the North Norfolk Reedcutters Association include improved marketing and information to the general public about reed cutting and thatch[251].

Reed and sedge cutting play a role in the environment as they alter the habitat of reedbeds. There have been conflicting arguments in the role of reed cutting for environmental benefit (see Graveland (1999)[254]; Schmidt, et al (2005)[255] and Cowie et al (1992)[256]). It is widely accepted that numbers of breeding bird species, such as Reed and Sedge Warblers together with small mammals decline in the summer following reed cutting, however, these declines are relatively short term, and there is evidence that many reed birds favour edge reed habitat or younger and more open areas. These areas are created by reed cutting, leading to a varied habitat structure[257]. Some species do prefer interior reedbed habitats, such as Purple Heron and Spoonbill, however, with careful management of cutting regimes to create sufficient edge habitat whilst maintaining some interior habitat areas can lead to environmental benefits[254]. Reed management has also been found to increase floristic diversity in reed beds[255]. With conservation as a priority it has been suggested that removal of 30% of the reed annually would be adequate in providing more benefits than harmful impacts, as long as the cutting pattern creates a high degree of desirable edge habitat[254]. Table 4.4.2.a outlines the main benefits and conflicts of commercial reed cutting and conservation.

Table 4.4.2.a: The benefits and conflicts of using commercial reed cutters for conservation

Benefits	Conflicts
• Assist a struggling industry • Longer-term sustainability and potential income • Bring conservation together with local people/industry • More efficient cutting as high levels of professional expertise and skill	• A perceived loss of control • Shortage of cutters available • Issues with site access • Potential conflict over the timing and area of cutting

Source: White G (2009): The future of reedbed management, RSPB Information and Advice note, Version 7, July 2009, accessed at www.rspb.org.uk/Images/Reedbed_management_tcm9-255077.pdf

[253] Natural England (2013): Higher Level Stewardship: Environmental Stewardship Environmental Handbook: Fourth Edition, accessed at http://publications.naturalengland.org.uk/publication/2827091?category=45001

[254] Graveland, J (1999): Effects of reed cutting on density and breeding success of Reed Warbler *Acrocepahlus scirpacaeus* and Sedge Warbler *A. schoenobaenus*. Journal of Avian Biology, 30 pp469-482

[255] Schmidt, et al (2005): Reed cutting affects arthropod communities, potentially reducing food for passerine birds. Biological Conservation, 121 pp157-166

[256] Cowie, et al (1992): The effects of conservation management of reed beds. II. The flora and litter disappearance. Journal of Applied Ecology, 29 pp277-284

[257] White G (2009): The future of reedbed management, RSPB Information and Advice note, Version 7, July 2009, accessed at www.rspb.org.uk/Images/Reedbed_management_tcm9-255077.pdf

4.4.3. Hemp

There is only one processor of hemp in the UK and this is Hemp Technology (previously Hemcore Ltd.) based in Halesworth, Suffolk[258],[259]. Transport costs are significant in the production of hemp with local transport rates of around £12 per tonne (increases in fuels costs suggest this value will increase)[260]; therefore the proximity of Norfolk and Suffolk to the only hemp processor in the UK makes production of hemp in this area viable.

The UK yield figures for hemp vary between 3.5t/ha (tonnes per hectare) to 7.5t/ha between 2000 and 2003[258]. Within the UK, hemp produced gross margins of around £470/ha when receiving £245 from the Arable Area Payment Scheme in 2004. This fell to £225/ha gross margin under the Single Payment Scheme in 2005, and when 50% of the processing subsidy was removed under the Single Payment Scheme the gross margin became approximately £180, thereby remaining competitive with other arable break crops such as winter oil seed rape[258].

Hemp is a low input crop, yields vary between season and it can be vulnerable to wet weather at harvest. Increased fertiliser does not increase yields. It has few pest and disease problems, although weed competition in early establishment can lower yields. In the short-term good yields can be achieved, weather permitting, by good crop management and the avoidance of crop losses rather than by using yield boosting inputs. In the longer-term plant breeding should bring better varieties with higher yield and possibly better fibre qualities. Hemp has a low environmental footprint. Its open habit, spring sowing and height makes it good for birds, small mammals and some wild flowers.

Hemp Technology provide hemp fibre for automotive, insulation and paper industries, hemp matting for horticulture and landscaping (BioMat), hemp based construction products, and horse bedding (Hemcore, Rapport and Flaxcore)[259].

4.5. Ornamental Resources

No data

[258] ADAS (2005): UK Flax and Hemp production: the impact of change in support measures on the competitiveness and future potential of UK fibre production and industrial use. Report for Defra, accessed at http://archive.defra.gov.uk/foodfarm/growing/crops/industrial/pdf/flaxhemp-report.pdf

[259] Hemptechnology: Home Page, accessed at http://www.hemptechnology.co.uk/

[260] ADAS (2005): UK Flax and Hemp production: the impact of change in support measures on the competitiveness and future potential of UK fibre production and industrial use. Report for Defra, accessed at http://archive.defra.gov.uk/foodfarm/growing/crops/industrial/pdf/flaxhemp-report.pdf

4.6. Genetic resources

Norfolk and Suffolk host a large number of areas with high levels of biodiversity importance. The area is characterised by 11 National Character Areas (NCAs)[261] which have distinct features, such as the dykes, channels, grazing marshes and open waters of the Broads; the grass and heather heaths, forests and broken soils of the Brecks, the hard and soft cliffs, reedbeds, saltmarshes and grazing marshes of the North Norfolk Coast, and the soft sand and shingle shores of Suffolk Coast and Heaths[262].

The Broads covers an area of 30,100 ha spanning both Norfolk and Suffolk, and is Britain's largest protected wetland and is designated as a National Park. The habitats of the Broads support high levels of biodiversity including species of conservation concern, such as water voles, brown hares, swallow-tail butterflies, fen orchids and bitterns[263]. A biodiversity audit has been carried out for the Broads, which classified the various habitat types into their relative importance by the number of priority species which they support[264].

The relative importance of key habitats for biodiversity is as follows (in order of importance): fen, wet grassland, wood pasture, woodland, small standing waterbodies, heathland, littoral and lake margins, coastal, sand dune, brownfield, arable, and reedbed.

Fenland habitat is recognised as the most important, supporting 246 priority species, followed by wet grassland with 203 priority species associations. The audit showed that in total 11,067 taxa have been recorded in the Broads, with 1,519 of these listed as priorities for conservation[263].

The Brecks is a unique area with distinctive wildlife heritage and covers 102,000 ha split almost equally across Norfolk and Suffolk. The high levels of biodiversity found in the region are undoubtedly related to the distinct climate, geology and historic land use of the area. The soils are characteristically sandy, free draining and nutrient poor. The area has low rainfall and an almost semi-continental climate with temperature extremes[265]. With the development of 20th

[261] Natural England: East of England National Character Areas, accessed at http://www.naturalengland.org.uk/publications/nca/eastofengland.aspx

[262] Wild Anglia (2011): Application for LNP status: Norfolk and Suffolk Local Nature Partnership, accessed at http://www.norfolkbiodiversity.org/pdf/reportsandpublications/ANNEX%201%20%20Application%20for%20LNP%20Status.pdf

[263] The Broads Authority (2009): Broads Authority Biodiversity Action Plan Framework Document, The Broads Authority, accessed at http://www.broads-authority.gov.uk/broads/live/managing/broads-biodiversity-action-plan/BiodiversityActionPlanframeworkdocument.pdf

[264] Panter, C et al (2011): Biodiversity audit and tolerance sensitivity mapping for the Broads. Report for the Broads Authority, accessed at http://www.broads-authority.gov.uk/broads/live/authority/publications/conservation-publications/Broads_Biodiversity_Summary_Report.pdf

[265] Dolman, et al (2010): Securing Biodiversity in Breckland: Guidance for conservation and research: First report of the Breckland Biodiversity Audit, accessed at

century agricultural advances, the dry, low-fertility soils were able to be farmed, and the area is now a major producer of vegetables and cereals, covering over 60% of the land area[266]. In terms of habitat the area is largely dominated by dry heathland and grassland communities, with areas of forestry plantation and woodland[266].

A biodiversity audit for the Brecks found almost 13,000 species have been recorded from Breckland, of which over 2,000 are listed as priority species for conservation. Of these, 72 species have their UK distribution restricted to, or have a stronghold in, Breckland. This showed that a staggering 28% of all the priority BAP species in the UK occur in Breckland[267]. Iconic keystone species such as the woodlark and nightjar breed in the open heaths and recently felled areas. The open arable ground also provides important breeding habitat for around 60% of the UK's stone curlew population[266]. However, there have been huge losses of species and habitats in the last 60 years, with the remaining habitat fragmented causing species isolation and the landscape representing barriers to dispersal[266].

Within Norfolk there are currently eight RAMSAR sites (an international designation which recognises the importance of their wetland habitats, 12 (124,654 ha) Special Areas of Conservation (SAC) and seven (105,152 ha) Special Protection Areas (SPA), either within or that intersect the Norfolk boundary. There are also 21 National Nature Reserves (NNRs) within Norfolk. National landscape designations are also vital to conservation effort. In Norfolk the Norfolk Coast Area of Outstanding Natural Beauty (AONB) is of particular importance to biodiversity. The AONB covers inter-tidal, coastal and agricultural land with a total area of over 450 square kilometres. Norfolk also has over 800 Sites of Special Scientific Interest (SSSIs), of which just over 50% are in favourable condition (Table 4.6.a). At a statutory level Local Nature Reserves (LNR) are designated by local authorities. There are currently 27 LNRs in Norfolk. There are also 1,300 County Wildlife Sites in Norfolk, of which 61% are in Positive Conservation Management[268].

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=BRECKLAND_Report.pdf

[266] Natural England (2012): National Character Area profile, 85. The Brecks, accessed at http://www.naturalengland.org.uk/publications/nca/the_brecks.aspx

[267] Dolman, et al (2010): Securing Biodiversity in Breckland: Guidance for conservation and research: First report of the Breckland Biodiversity Audit, accessed at http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=BRECKLAND_Report.pdf

[268] Norfolk Biodiversity Information Service (2013): Norfolk County Council, personal communication

Table 4.6.a: Status and area of Sites of Special Scientific interest (SSSI) in Norfolk and Suffolk (compiled 2013)									
Status	**No. of sites**			**Site status (%)**			**Area (ha)**		
	Norfolk	**Suffolk**	**Total**	**Norfolk**	**Suffolk**	**Total**	**Norfolk**	**Suffolk**	**Total**
Favourable	441	325	766	52	47	50	27,600	14,500	42,000
Unfavourable recovering	304	236	540	36	34	35	20,000	14,400	34,400
Unfavourable no change	73	48	121	9	7	8	1,200	500	1,700
Unfavourable declining	30	67	97	3	10	6	800	1,700	2,500
Part destroyed	-	5	5	-	1	0.5	-	20	20
Destroyed	-	5	5	-	1	0.5	-	30	30
Total	848	686	1,534	100	100	100	50,000	31,000	81,000
Source: Natural England (2013): Sites of Special Scientific interest (SSSI), Reports and statistics, accessed at http://www.sssi.naturalengland.org.uk/Special/sssi/report.cfm?category=C,CF									

Suffolk is well known for its extensive coastline habitats which include shingle beaches, saline lagoons, estuaries and saltmarsh. Suffolk also contains significant tracts of lowland heathland, on a scale that is significant on both national and international levels. The majority of the heathland falls within the Brecks in the west and the Sandlings on the east coast. Suffolk is rich in ancient woodlands, species rich meadows, grazing marsh and reedbed. SPAs designated for their bird interest cover 27,404 ha of Suffolk (over 7%) and SACs designated for their significant habitat interest cover 6,385 ha[269]. Suffolk also has 6 RAMSAR sites and the Suffolk Coasts and Heaths AONB which covers 40,000 ha of wildlife-rich wetlands, ancient heaths, and windswept shingle beaches[270]. Suffolk also features 36 Local Nature Reserves covering an area of 463 ha. There are a total of 686 SSSIs, of which nearly 50% are in favourable condition in Suffolk (Table 4.6.a). In terms of County Wildlife Sites, Suffolk has 900 sites (20,000 ha), of which 57% are in Positive Conservation Management[271].

The main threats to biodiversity are related to climate change, land use change whether from development or agriculture, pollution from agriculture and water abstraction. The impacts of invasive non-native species are also of concern to biodiversity, and are discussed in more detail in section 5.4. These pressures lead to a range of detrimental effects of biodiversity, such as habitat loss and degradation, habitat fragmentation and isolation, and increased disturbance to sensitive sites and species.

The impacts of climate change which are predicted to result in hotter, drier summers and milder, wetter winters, in terms of the effects on biodiversity are varied and in many cases

[269] Suffolk Biological Records Centre: Protected sites in Suffolk, accessed at http://www.suffolkbrc.org.uk/public_html/node/39

[270] Suffolk Coasts and Heaths Area of Outstanding Natural Beauty: Welcome to the AONB, accessed at http://www.suffolkcoastandheaths.org/

[271] Hooton S (2013): Senior Ecologist Suffolk County Council, personal communication

unknown. For example, within the Brecks, climate change may lead to increased growth of perennial gasses previously controlled by winter frost, which will negatively affect species requiring open ground. It may also lead to benefits for certain habitats in terms of increasing winter ground-water recharge[272]. The low-lying nature of the Broads together with its proximity to the coast makes it particularly vulnerable to climate change and sea level rise[273]. Increasing water salinity levels may lead to changes in species composition and threaten those species adapted for freshwater environments.

With a predicted population increase of 17% by 2030 in the New Anglia area[274], the need for additional housing developments together with other forms of development poses a significant threat to biodiversity. The potential for growth to be sustainable, providing mitigation against the detrimental impacts of development, such as increasing linkages between fragmented habitats, and increasing wildlife areas within or adjacent to developments, is ultimately reliant on strategic design. It is important for developers to work together in order for large scale connectivity and benefits to occur. There are already Green Infrastructure projects in place across Norfolk and Suffolk, and a guidance for practitioners to ensure nature is considered in the planning process was released by The Wildlife Trusts and Town and Country Planning Association (TCPA) called 'Planning for a healthy environment: good practice for green infrastructure and biodiversity'[275]. However, the uptake of this guidance and communication between developers is needed to ensure real benefits for biodiversity are achieved[276, 277].

The Community Infrastructure Levy (CIL) also represents an opportunity for the creation of new habitats and biodiversity offsetting, by using the levy to fund habitat creation projects[278].

[272] Dolman, et al (2010): Securing Biodiversity in Breckland: Guidance for conservation and research: First report of the Breckland Biodiversity Audit, accessed at http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=BRECKLAND_Report.pdf

[273] The Broads Authority (2009): Broads Authority Biodiversity Action Plan Framework Document, The Broads Authority, accessed at http://www.broads-authority.gov.uk/broads/live/managing/broads-biodiversity-action-plan/BiodiversityActionPlanframeworkdocument.pdf

[274] Cambridgeshire County Council (2012): EEFM 2012 baseline forecasts grouped by area, accessed at http://www.cambridgeshire.gov.uk/business/research/economylab/Economic+forecasts.htm

[275] Town and Country Planning Association, and The Wildlife Trusts (2012): Planning for a healthy environment – good practice guidance for green infrastructure and biodiversity, The Town & Country Planning Association and The Wildlife Trusts, accessed at http://www.wildlifetrusts.org/news/2012/07/06/planning-healthy-and-natural-environment

[276] White D (2013): Green Infrastructure Officer, Norfolk County Council, personal communications

[277] Bishop H (2013): Wild Anglia Local Nature Partnership Coordinator, personal communications

[278] Wild Anglia (2011): Application for LNP status: Norfolk and Suffolk Local Nature Partnership, accessed at http://www.norfolkbiodiversity.org/pdf/reportsandpublications/ANNEX%201%20%20Application%20for%20LNP%20Status.pdf

Although the impact of development on County Wildlife Sites in Norfolk was found to be relatively small[279], the proposed development for the next 20 years is likely to increase the threats to County Wildlife Sites[280], especially as these sites are not protected by law, and thus are more vulnerable to increasing developmental pressures.

The threats of agriculture to biodiversity include intensification through removal of hedgerows and other habitats and increasing chemical applications to increase yield which then leads to pollution.

The Government's agri-environment schemes provide farmers with incentives to carry out practices which can have positive effects for biodiversity, such as leaving field margins free from chemical application, re-setting hedgerows and growing less intensive crops. However, potential changes to the Common Agricultural Policy (CAP reform) leading to a reduction in available funding for such schemes is potentially a severe threat to UK wildlife, and may also impact some of the work which has already taken place under the schemes[281]. Currently over 50% of both Norfolk and Suffolk is managed under agri-environment schemes (Table 4.6.b).

Table 4.6.b: Land under agri-environment schemes and designated areas in Norfolk and Suffolk 2012

County	Land use	Area (ha)	% of county
Norfolk	Total area/Total area under LMS	537,521	79.6
	Agriculture: Entry Level Stewardship (ELS)	187,004	34.8
	Agriculture: Combined ELS and Higher Level Stewardship (HLS)	111,228	20.7
	Agriculture: HLS	4,593	0.9
	Agriculture: Environmentally Sensitive Areas (ESA)	7,701	1.4
	Agriculture: Countryside Stewardship Scheme (CSS)	3,721	0.7
	Agriculture: total in agri-environment schemes	314,247	58.5
	Designated sites: Sites of Special Scientific Interest (SSSI)	36,940	6.9
	Designated sites: Special Areas of Conservation (SACs)	23,155	4.3
	Designated sites: Special Protection Areas (SPAs)	27,839	5.2
	Designated sites: Ramsar sites (wetlands of international importance)	25,354	4.7
Suffolk	Total area/Total area under LMS	381,242	67.3
	Agriculture: Entry Level Stewardship (ELS)	126,565	33.2
	Agriculture: Combined ELS and Higher Level Stewardship (HLS)	66,796	17.5
	Agriculture: HLS	1,560	0.4
	Agriculture: Environmentally Sensitive Areas (ESA)	8,333	2.2

[279] Hiskett, J (2007): Impact of development on County Wildlife Sites and other areas of semi-natural habitat. Report for Norfolk Wildlife Trust, accessed at http://www.norfolkwildlifetrust.org.uk/Documents/Reports/Impact_of_Development_on_CWS.aspx

[280] Norfolk Wildlife Trust (2009): Assessment of threats to County Wildlife Sites, accessed at http://www.norfolkwildlifetrust.org.uk/Wildlife-in-Norfolk/Habitat-explorer/County-Wildlife-Sites.aspx

[281] The Wildlife Trusts (2012): New threat to UK countryside, accessed at http://www.wildlifetrusts.org/news/2012/11/15/new-threat-uk-countryside-0

Table 4.6.b: Land under agri-environment schemes and designated areas in Norfolk and Suffolk 2012			
County	**Land use**	**Area (ha)**	**% of county**
	Agriculture: Countryside Stewardship Scheme (CSS)	1,290	0.3
	Agriculture: total in agri-environment schemes	204,545	53.7
	Designated sites: Sites of Special Scientific Interest (SSSI)	23,162	6.1
	Designated sites: Special Areas of Conservation (SACs)	6,114	1.6
	Designated sites: Special Protection Areas (SPAs)	14,089	3.7
	Designated sites: Ramsar sites (wetlands of international importance)	8,377	2.2
Sources: Natural England (2012): Norfolk, Agri-Environment Schemes: Key Information, scheme uptake and expenditure data, accessed at http://publications.naturalengland.org.uk/category/3573102#content Natural England (2012): Suffolk, Agri-Environment Schemes: Key Information, scheme uptake and expenditure data, accessed at http://publications.naturalengland.org.uk/category/3573102#content			

There is also the possibility of increasing the capacity to process biomass for energy within the LEP area. This form of potentially green energy from recycling biological mater such as chicken droppings may have negative impacts to nutrient sensitive sites such as chalk grasslands[282]. Sensitive placement of these processing plants is needed, to ensure that emissions are not causing harm to biodiversity.

Population and economic growth will ultimately lead to increased pressure on water availability. As many of the biodiversity rich areas are water sensitive, they are vulnerable to any changes in water availability, and with increasing climate change, this is likely to become even more of an issue. The Broads Biodiversity and Water Strategy[283] highlights the importance of appropriate management of water resources on a catchment and regional scale in order to meet the Government's target to halt biodiversity loss. Their future strategy includes the aim of reducing pressures on the water catchment, to provide benefits for everyone.

There are also increasing pressures from tourism to sensitive sites, with many of the biodiversity rich areas being concentrated in hotspots[284]. Plans to encourage more tourism to the LEP area may put strain on areas which are already close to or exceeding visitor limits. There is a need to manage sensitive areas in order to direct visitors away from particularly sensitive areas, such as those important for particular species of breeding birds, whilst maintaining and promoting enjoyment of the natural environment. It is important for management to be flexible and allow both the ecosystems and their visitors to flourish.

[282] Hooton S (2013): Senior Ecologist, Suffolk County Council, personal communications

[283] The Broads Authority (2013): Broads Biodiversity and Water Strategy 2013, accessed at http://www.broads-authority.gov.uk/broads/live/authority/publications/conservation-publications/Broads_Biodiversity_and_Water_Strategydraft.pdf

[284] The Broads Authority (2009): Broads Authority Biodiversity Action Plan Framework Document, The Broads Authority, accessed at http://www.broads-authority.gov.uk/broads/live/managing/broads-biodiversity-action-plan/BiodiversityActionPlanframeworkdocument.pdf

The importance of creating larger and better connected areas of natural habitat is now recognised as a key strategy for maintaining biodiversity and enabling wildlife to adapt to climate change. There are several initiatives under way which aim to increase the creation of ecological networks and the use of landscape-scale approaches to conservation (such as the RSPBs Futurescapes[285] and the Wildlife Trust's Living Landscapes[286]). Wild Anglia is also driving a landscape scale approach to increasing protection for biodiversity, and has collaboratively developed an ecological network map which highlights areas of priority for habitat creation and restoration and areas which could act as buffers for fragmented habitats (Figure 4.6.a). These networks are based on work carried out by the Norfolk[287] and Suffolk Biodiversity Partnerships[288].

[285]RSPB (2010): Futurescapes, Space for nature, land and life, accessed at http://www.rspb.org.uk/futurescapes/

[286]Wildlife Trusts (2009): A living landscape: a call to restore the UK's battered ecosystems, for wildlife and people, accessed at http://www.wildlifetrusts.org/sites/wt-main.live.drupal.precedenthost.co.uk/files/A%20Living%20Landscape%20report%202009%20update.pdf

[287]Land, R (2006): Report of ecological network mapping project for Norfolk. Report for Norfolk Wildlife Trust and Norfolk Biodiversity Partnership, accessed at http://www.norfolkbiodiversity.org/pdf/ecologicalnetworks/Ecological%20network%20mapping%20project%202006.pdf

[288] Suffolk Wildlife Trust and Suffolk Biological Records Centre: Suffolk ecological networks project mapping methodology. Report for Suffolk Biodiversity Partnership, accessed at http://www.suffolkbrc.org.uk/public_html/sites/default/files/Ecological%20Networks%20Methodology.PDF

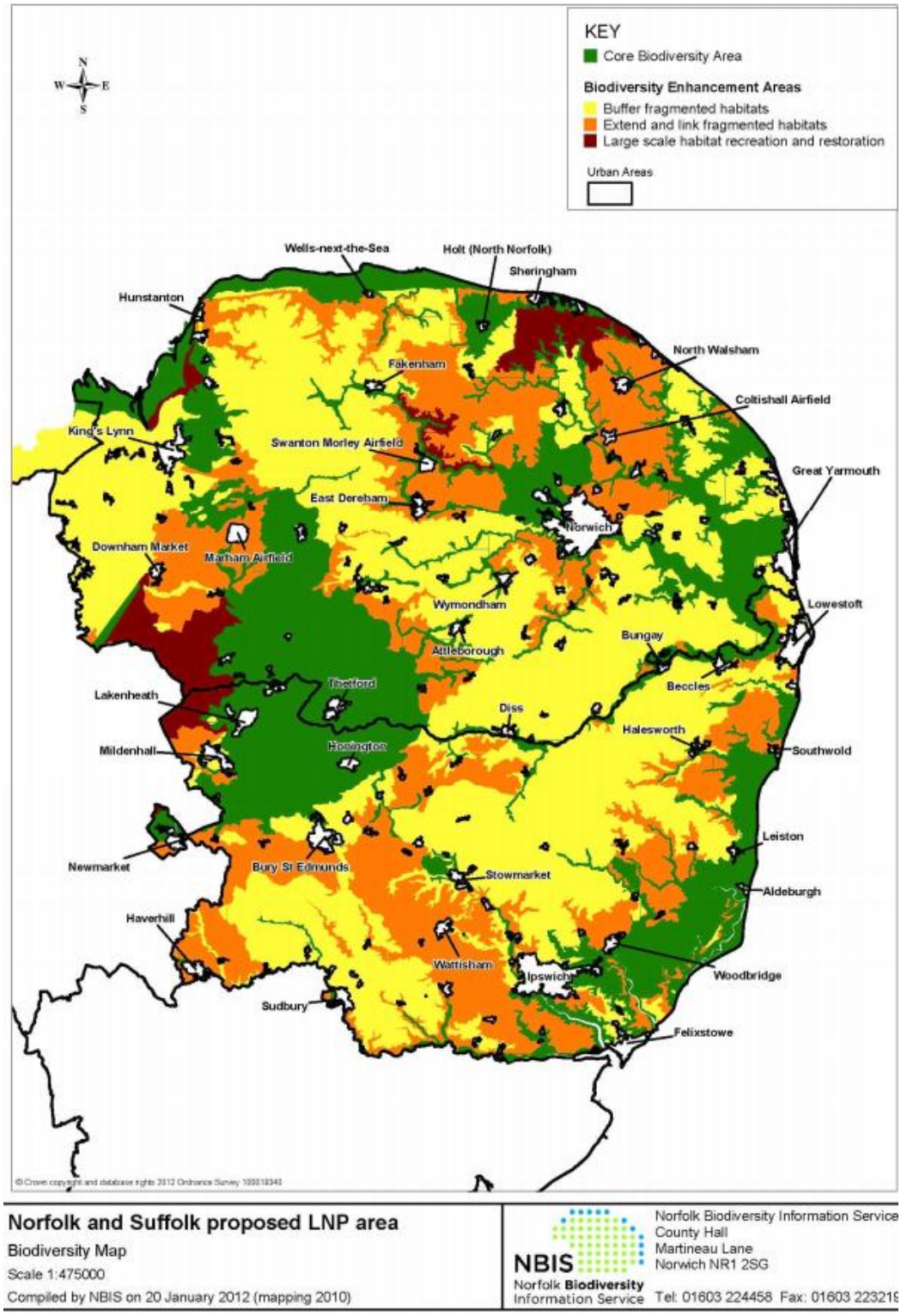

Figure 4.6.a: Biodiversity enhancement areas for Wild Anglia area. Wild Anglia (2011): Application for LNP status: Norfolk and Suffolk Local Nature Partnership, accessed at http://www.norfolkbiodiversity.org/pdf/reportsandpublications/ANNEX%201%20%20Application%20for%20LNP%20Status.pdf

5. Regulatory services

5.1.Climate

5.1.1. Global climate change mitigation

Human activities causing increased emissions of Green House Gases (GHGs) have been linked to global climate change. Climate change is likely to produce variations in seasonality patterns, with predicted long-term effects of summers becoming warmer and winters being characterised by heavier rainfall with regions prone to flooding[289]. These anthropogenic changes to the global climate are affecting physical and biological systems in the natural environment. Our knowledge regarding the long-term effects of these changes is limited, however, changes in natural processes have already been noted including increasing temperatures, rising sea-levels, hydrological changes, and other dynamics. These are having a significant impact on our natural and institutional environment[290].

The UK is committed to making significant reductions in emissions of CO_2 and other green-house gases. The Climate Change Act[291] requires a reduction in carbon emissions (compared to the 1990 baseline) of 80% by 2050. There is a concern that such reductions may impose limitations to sustained economic growth unless important changes take place to the principles underlying such growth. This in turn may lead to a range of opportunities and threats, both for the economy and the environment.

One significant threat associated with climate change and economic growth is food security, which is a matter of concern in some developed countries, including the UK. Changes in the UK food industry provide a good example of how growth strategies can incorporate sustainability, but at the expense of being increasingly exposed to external threats. The underlying concerns regarding food security are[292]:

[289] Suffolk Flood Risk Management Partnership (2012): Suffolk Local Flood Risk Management Strategy, accessed at: http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Emergency%20and%20Safety/Civil%20Emergencies/2012_01_23%20Suffolk%20LFRMS.pdf

[290] Rosenzweig, C et al (2007) Assessment of observed changes and responses in natural and managed systems. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry, M.L. et al , Eds., Cambridge University Press, Cambridge, UK, 79-131.

[291] HM Government (2008): Climate Change Act 2008, accessed at http://www.legislation.gov.uk/ukpga/2008/27/pdfs/ukpga_20080027_en.pdf

[292] Defra (2006): Food Security and the UK: An Evidence and Analysis Paper, Department for Environment, Food & Rural Affairs, accessed at http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/foodsecurity.pdf

- The reduction in self-sufficiency (self-sufficient ratio of domestic production and consumption has been in decline over the last decade);
- Disruption to domestic food supplies; and
- Farmers going out of business. The increasing purchasing power of supermarkets and their retail driven supply networks are often accused of driving farmers out of business.

The Strategy for Sustainable Farming and Food (SSFF) is the Government's policy framework on farming issues. It is a comprehensive and long term blueprint for the future development of the industry. It identifies how Government will work with the food chain to secure a sustainable future for English farming and food industries as viable industries contributing to a better environment, an attractive countryside, and healthy and prosperous communities[293]. Though the SSFF does not define a particular structure of farming its emphasis is on a competitive and environmentally sensitive farming sector that is responsive to the market; where profitability matters more than production; sustainability more than size; and efficiency more than self-sufficiency[293].

Such emphasis is likely to encourage high value food derived from better approaches to farming (free range, organic, etc.) however, it might leave the bulk of consumption to imports, threatening food security even further. Issues of land degradation and CO_2 emissions would be exported beyond our control threatening to offset the efforts for reducing CO_2 we make at home at the expense of self-reliance.

Despite these threats, CO_2 emissions are decreasing on a per capita basis, while the economy continues its natural trend. New Anglia could play a leading role in moving towards a low carbon economy. CO_2 emissions per person in New Anglia have decreased in recent years, similar to National and European trends. The period 2008 to 2009 was characterised by a sharp decline in CO_2 emissions from 8 to 7.4 tonnes per person per year. This was primarily driven by reductions in energy consumption in the industrial sector due to diminishing activity. Sustained growth in the use of renewables was the other key factor explaining the strong decrease in greenhouse gas emissions in 2009[294].

A hard winter increased heating days in 2009, however, domestic CO_2 emissions declined in this year. This might be attributed to improvements in housing (insulation, double gazing etc.) and the gradual shift to more environmentally friendly fuels[293]. Economic recovery in 2010 boosted CO_2 emissions but this was probably contained by the increasing use of renewable energy resources[295]. Table 5.1.1.a summarises CO_2 emissions in New Anglia's main sectors in the

[293] Defra (2006): Food Security and the UK: An Evidence and Analysis Paper, Department for Environment, Food & Rural Affairs, accessed at http://archive.defra.gov.uk/evidence/economics/foodfarm/reports/documents/foodsecurity.pdf

[294] European Environment Agency (2011): Why did greenhouse gas emissions fall in the EU in 2009? EEA analysis in brief, accessed at http://www.eea.europa.eu/publications/european-union-greenhouse-gas-inventory-2011

[295] European Environmental Agency (2013): Higher EU greenhouse gas emissions in 2010 due to economic recovery and cold winter, accessed at http://www.eea.europa.eu/pressroom/newsreleases/higher-eu-greenhouse-gas-emissions

period 2005 to 2010, and indicates that CO_2 emissions per person have been decreasing since 2006 in both counties within the LEP area.

By 2080 climate change is predicted to cause a 3.6°C rise in average summer temperature (a 9°C increase on the hottest day); a 20% increase in winter rainfall and similar decrease in summer rainfall; and significantly higher sea levels (e.g. by 37 cm at Southwold) in the East of England. Such changes threaten people directly, through heat stress, flooding and extreme weather events, and indirectly via economic disruption, water shortages and accelerated coastal erosion[296].

Table 5.1.1.a: CO_2 emissions (tonnes per person) by sector for Norfolk and Suffolk 2005 to 2010

County	Year	Industry and commercial	Domestic	Road transport	Total
Norfolk	2005	3.3	2.5	2.4	8.3
	2006	3.3	2.5	2.4	8.3
	2007	3.2	2.4	2.3	8.1
	2008	3.2	2.4	2.3	8.0
	2009	3.0	2.2	2.2	7.4
	2010	3.3	2.3	2.1	7.9
Suffolk	2005	3.6	2.5	2.3	8.4
	2006	3.6	2.5	2.3	8.4
	2007	3.3	2.4	2.3	8.0
	2008	3.2	2.3	2.2	7.8
	2009	3.2	2.1	2.1	7.4
	2010	3.4	2.3	2.1	7.7

Source: DECC (2013): Per capita local CO_2 emission estimates; industry, domestic and transport sectors, Department of Energy & Climate Change, accessed at https://www.gov.uk/government/publications/local-authority-emissions-estimates

The Green Economy Pathfinder[297] is an overarching strategy at the LEP level which aims to build upon the region's existing resources and expertise to support growth in a sustainable manner. The key principles of the Pathfinder are; to sustain long-term growth with efficient and sustainable use of resources, to be more resilient to economic shocks and to exploit the region's comparative advantages in low carbon economic activities. There are a variety of possible ways for the region to achieve significant gains in low carbon markets, such as renewable energy, eco-tourism, low-carbon advanced manufacturing and local food production-retail networks.

Norfolk and Suffolk's landscape is characterised by agriculture. Volatile food markets and recent concerns over imported food-products are increasing demand for local produce and the

[296] Suffolk Flood Risk Management Partnership (2012): Suffolk Local Flood Risk Management Strategy, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Emergency%20and%20Safety/Civil%20Emergencies/2012_01_23%20Suffolk%20LFRMS.pdf

[297] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

food sector will need to cater for 17% more people by 2030[298]. Projected population growth and economic development is expected to put more pressure on already strained resources. Environmental Stewardships are agri-environment schemes which provide funding to farmers and other land managers in England to deliver effective environmental management on their land. These schemes cover almost 60% of Norfolk's land area[299] and 53.7% in Suffolk[300]. Ecological networks are being designed to connect fragmented habitats, buffer areas and core areas to enhance biodiversity and aid wildlife re-colonisation[301]. Conservation areas, including SSSIs, SACs, SPAs and Ramsar sites currently cover about 21.1% of the total area in Norfolk and 13.6% in Suffolk.

Some other initiatives to enhance the capacity of the environment to recover and enable its production of goods and services can be summarised as follows:

- The Bumblebee Conservation Trust is working with farmers countrywide to create networks for bumblebees to re-populate the countryside[302].
- The Environment Bank has introduced a 'habitat banking' scheme which will identify degraded land and habitats which can be enhanced or restored by developers. This scheme aims to create economic incentives for restoring, creating and enhancing habitats[303].
- The Suffolk Coastal District Council identified that large areas of the council do not have Accessible Natural Greenspace (ANG) sites of more than 2 ha within 300 metres of their home (neighbourhood level), while just 20% to 25% have sufficient access at the District and sub-regional levels[304].

Land use changes taking place in the region intend to accommodate growth with environmentally sensitive planning, contributing to further carbon reductions. The Broads is the UK's largest protected wetland and its importance for conservation has been recognised

[298] Cambridgeshire County Council (2012): EEFM 2012 baseline forecasts grouped by area, accessed at http://www.cambridgeshire.gov.uk/business/research/economylab/Economic+forecasts.htm

[299] Natural England (2012): Norfolk, Agri-Environment Schemes: Key Information, scheme uptake and expenditure data, accessed at http://publications.naturalengland.org.uk/category/3573102#content

[300] Natural England (2012): Suffolk, Agri-Environment Schemes: Key Information, scheme uptake and expenditure data, accessed at http://publications.naturalengland.org.uk/category/3573102#content

[301] Norfolk Wildlife Trust (2005): Making Spaces for wildlife and people. creating an ecological network for Norfolk, accessed at http://www.norfolkbiodiversity.org/pdf/ecologicalnetworks/Revisedreport.pdf

[302] Bumblebee Conservation Trust: Managing your land for bees, accessed at http://bumblebeeconservation.org/get-involved/managing-your-land/

[303] Environment Bank: Habitat banking is the future of nature conservation in the UK, accessed at http://www.environmentbank.com/docs/Habitat-Banking-in-the-UK-The-Environment-Bank-Ltd.pdf

[304] Suffolk Coastal District Council (2011): Green Infrastructure Strategy for Suffolk Coastal District Council, accessed at http://scdc.onesuffolk.net/assets/Documents/LDF/C4e/GI/SCDC-GI-ReportMayfinal.pdf

with 71.4 km² of land designated as Special Areas of Conservation (SACs)[305]. Carbon stored in the Broads is estimated at 38.8 million tonnes in soil and 1.1 million tonnes in vegetation[306]. Intensive use of land for agriculture will continue with its associated damage in the form of green-house gas emissions. Estimates for 2007 suggest that UK agriculture generated a net value of £650 million per year in environmental value but the sector contributed to more than £2.07 billion in emissions[307].

5.1.2. Local climate regulation

Yearly average temperatures in Norfolk and Suffolk oscillate between 9°C and around 10.5°C compared to the UK mean annual temperature range of around 7°C in Shetland to over 11°C in the extreme south-west of England and the Channel Islands. Mean seasonal temperatures in the New Anglia area range from 5°C to 8°C during winter months and from 19°C to 22.5°C in the summer. These are comparable to the values found in the London area, the warmest area in the UK[308].

Norfolk and Suffolk have been affected by at least 40 significant weather events in the past eight years, with varying levels of severity and impacts. Most of these events were related to strong winds and flooding. Heavy snow and heat waves affected the region to a lesser extent[309].

January 2013 was an unusually cold month across the UK and the lowest temperature of -13°C was recorded in Norfolk[310]. Disruption of transport networks by snow and flood events, especially roads, is thought to have an effect on the local economy by affecting local businesses' productivity and profitability. Businesses are not able to function properly as deliveries get delayed and employees are not able to travel to work or are severely delayed. Most businesses

[305] Panter, C et al (2011): Biodiversity audit and tolerance sensitivity mapping for the Broads. Report for the Broads Authority, accessed at http://www.broads-authority.gov.uk/broads/live/authority/publications/conservation-publications/Broads_Biodiversity_Summary_Report.pdf

[306] LCIC and UEA (2010): Towards a GHG reduction strategy for the Broads – derivation of emission estimates, technical report supporting strategy, Low Carbon Innovation Centre and University of East Anglia. Report for the Broads Authority, accessed at: http://www.broads-authority.gov.uk/broads/live/managing/climate-change/climate-change-adaptation-panel/climate-change-carbon-audit/BA_Final_Techincal_Report.pdf

[307] Jacobs, in association with Scottish Agricultural College and Cranfield University (2008): Environmental accounts for agriculture. Report for Defra, Welsh Assembly Government, Scottish Government, and DARDNI, accessed at https://statistics.defra.gov.uk/esg/reports/envacc/SFS0601%20EnvAccForAgricultureexec.pdf

[308] Met Office (2004): Eastern England: climate, accessed at http://www.metoffice.gov.uk/climate/uk/ee/print.html

[309] Norfolk Ambition (2009): Local Climate Impacts Profile for Norfolk, accessed at: http://www.norfolkambition.gov.uk/consumption/groups/public/documents/article/ncc095340.pdf

[310] Gilani, N (2013): 'Coldest night of winter' recorded in Norfolk. Metro, accessed at: http://metro.co.uk/2013/01/16/snow-is-here-to-stay-and-so-is-the-big-freeze-3353776/

advised their employees to stay at home or closed early during this period as a precautionary measure[311].

Heat waves tend to have a detrimental effect on vulnerable groups in the population such as the elderly and the ill. According to the NHS, the 2003 heat wave caused 2,000 premature deaths in the UK and around 35,000 in Europe[312]. The economic impacts of heat waves are similar to those of severe snow events. They tend to affect transport infrastructure and overall ability to work. Buildings and infrastructure are at an increased risk of damage as temperatures escalate, especially roads, which are prone to melting when temperatures exceed 35°C as occurred in parts of England in 2003 and 2006. As well as causing costly long-term damage, this can result in economic and social disruption if roads are temporarily closed[312].

Green infrastructure represents an opportunity to mitigate the effects of climate change and adapt to increasing pressures on diminishing resources, especially in urban areas[313]. Green infrastructure refers to a planned network of open spaces that perform a range of environmental, sustainability and quality of life benefits for local communities[314]. It is multi-functional and should be in line with the character and idiosyncrasy of the region. It includes parks, open spaces, playing fields, woodlands, allotments and private gardens[315].

The importance of green infrastructure in urban areas arises from the biophysical distinctness of these areas in comparison to surrounding rural areas. For example, energy exchanges are modified to create an urban heat island, where air temperatures might be several degrees warmer than in the countryside[316]. Hydrological processes are also altered, causing an increase in the volume of surface water runoff and rainwater[317] due to the replacement of vegetation (and its services) by impervious building surfaces[318]. Green infrastructure provides services

[311] Woods, B (2013): Snow's economic impact on region is yet to be felt. Norwich Evening News 24, accessed at http://www.eveningnews24.co.uk/news/snow_s_economic_impact_on_region_is_yet_to_be_felt_1_1796068

[312] Green Suffolk (2012): Climate Change-what risk to Suffolk, accessed at http://greensuffolk.onesuffolk.net/assets/Greenest-County/Misc-Files/Climate-Change/Climate-Change-What-Risk-to-Suffolk-leaflet-1.pdf

[313] Handley, J & Carter, J (2006). Adaptation strategies for climate change in the urban environment. Report for the National Steering Group, accessed at. http://www.sed.man.ac.uk/research/cure/downloads/asccue_final_report_national_steering_group.pdf

[314]Haven Gateway: What is Green Infrastructure, accessed at http://www.haven-gateway.org/themes/green_infrastructure/gi_in_haven_gateway/what_is_green_infrastructure

[315] Natural England: Green Infrastructure, accessed at http://www.naturalengland.org.uk/ourwork/planningdevelopment/greeninfrastructure/default.aspx

[316] Bridgman, H et al (1995) Urban biophysical environments. Oxford: Oxford University Press

[317]Mansell, M (2003) Rural and Urban Hydrology. London: Thomas Telford

[318] Whitford, V et al (2001): 'City form and natural process' – indicators for the ecological performance of urban areas and their application to Merseyside, UK. Landscape and Urban Planning, 57 (2), pp91–103

such as shading, evaporative cooling, and rainwater interception as well as storage and infiltration[319].

See section 3.2.2 for information on Natural England's Accessible Natural Greenspace (ANG).

The Community Infrastructure Levy (CIL) introduced by the Planning Act 2008 came into force in 2010 as a levy on new developments to fund community infrastructure for supporting new housing and economic growth[320]. Local Authorities will manage funds collected from new builds and green infrastructure will be a key fund allocation area.

The Haven Gateway Green Infrastructure Strategy (2008)[321] set up key concepts that are being widely adopted throughout the region. Local Authorities will focus on availability of Green Infrastructure, putting special emphasis on connectivity and complementarity. Connectivity refers to ensuring that green spaces are linked to each other, to the communities and the functions that they intend to serve[322]. Complementarity refers to green spaces being adequate for the purpose they are intended and that green spaces have complementary functions. In the context of significantly reducing CO_2 emissions, these measures are expected to minimise the threats of climate change.

5.2.Flood and coastal risk management

5.2.1. Non-coastal – flooding from rivers, reservoirs, surface runoff and groundwater

Around 20% of the Anglian Region is classed as being a flood zone, and most of this area lies below sea level[323]. This includes 30% of the most productive agricultural land, around 400,000 properties (125,000 residential and 257,000 non-residential) or 11% of total properties in the area, and 18,000 other assets such as electricity transmission assets and water infrastructure. The Environment Agency reports that £61 million was spent in flood and coastal erosion risk management in 2011 and a further £49 million was budgeted for 2012 for the Anglian region[321].

[319]Gill S et al (2007): Adapting cities for climate change: the role of the green infrastructure. Built Environment, 33 (1) pp115-133

[320] Planning Portal: Community Infrastructure Levy, accessed at http://www.planningportal.gov.uk/planning/applications/howtoapply/whattosubmit/cil

[321] Haven Gateway (2008):Haven Gateway Green Infrastructure Strategy, accessed at http://www.haven-gateway.org/themes/green_infrastructure/gi_in_haven_gateway/what_is_the_haven_gateway_partnership_doing/the_haggis_strategy/download_the_strategy

[322] Babergh District Council (2012): A Green Infrastructure Framework for Babergh District, accessed at http://www.babergh.gov.uk/assets/Uploads-BDC/Economy/Strategic-Planning-Policy/LDF/Evidence_Studies/GIFramework-Aug2012.pdf

[323] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

Surface water flood risk management in England and Wales is organised under 77 Catchment Flood Management Plans (CFMPs). Five CFMPs cover Norfolk and Suffolk. These are:

- North Norfolk CFMP;
- Broadland CFMP;
- East Suffolk CFMP;
- Great Ouse CFMP; and
- North Essex CFMP.

CFMPs assess flood risk by looking at its two main components: the chance (probability) of a particular flood and the impact (or consequence) of the flood if it happened. The probability of a flood relates to the likelihood of a flood of that size occurring within a one year period, expressed as a percentage. For example, a 1% annual probability flood has a 1% or 100 to one chance of occurring in any one year, and a 0.5% annual probability flood has a 0.5% or 200 to one chance of occurring in any one year.

New Anglia's flood risk was not included amongst the highest 10 Flood Risk Areas (FRAs) in England and Wales in Preliminary Flood Risk Assessments (PFRA). Nevertheless, PFRAs recognise that there are risks of flooding from local sources across Norfolk and Suffolk[324]. In Norfolk, figures based on national surface water modelling estimate approximately 37,000 properties to be at risk from flooding during a rainfall event with a one in 200 annual chance of occurring (0.5% probability). Norwich was identified as having approximately 14,000 people at risk of flooding and was ranked 19th in a list of English settlements outside the indicative Flood Risk Areas[325]. Based on current information, Suffolk has nearly 120,000 properties predicted to be affected by surface water flooding during an extreme rainfall event with a 0.5% (1 in 200) chance of this occurring each year, and a flooding depth of 0.3 metres[326].

Table 5.2.1.a summarises the estimated flood risk in New Anglia disaggregated by CFMPs, excluding North Essex due to the marginal proportion of New Anglia falling within its limits. Despite data gaps, Table 5.2.1.a suggests that potential floods would have a significant impact on all CFMPs, with potential damage to residential and non-residential buildings as well as key infrastructure. It also suggests that the threat is likely to increase in the future.

During the period 2002-2008, Norfolk and Suffolk were affected by at least 40 significant weather events. Heavy rainfall and localised flooding are the most frequent events, closely

[324] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[325] Norfolk Country Council (2011): Preliminary Flood Risk Assessment Report, accessed at http://www.norfolk.gov.uk/view/NCC100093

[326] Suffolk Flood Risk Management Partnership (2012): Managing Flood Risk in Suffolk: a summary of the Suffolk local flood risk management strategy, accessed at: http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Emergency%20and%20Safety/Civil%20Emergencies/2012-12%20%20Managing%20Flood%20Risk%20in%20Suffolk_web.pdf

followed by windstorms and snow[327]. Over 70 villages were reported to have experienced flooding in this period. Many communities experienced repeat incidences of flooding, such as Great Yarmouth, which flooded four times in 2006. Flooded communities are likely to suffer substantial economic losses in terms of material assets, livelihood disruptions and as well as psychological trauma[325].

Table 5.2.1.a: Number of people and properties with 1% annual probability of river flooding, current and projected

Catchment Flood Management Plan Area	Number of Properties		Other			
	People	Properties	Agricultural Land (ha)	Scheduled monuments	Listed buildings	Infrastructure
East Suffolk[1]	2,300	860	3,100	110	117	Five electricity sub-stations; Two sewage treatment works; and Sections of A road and railway line
East Suffolk (projected 2100)[1]	3,500	1,500	20% increase	142	163	
Great Ouse catchment: Newmarket[2]	Nd	59	203	Nd	Nd	One sewage treatment works; Section of A road.
Great Ouse catchment: Newmarket (2110 projected)[2]	Nd	122	Nd	Nd	Nd	
Great Ouse catchment: Saffron Walden and Thetford[2]	Nd	306	10	Nd	Nd	Sewage treatment works; Fire station
Great Ouse catchment: Saffron Walden and Thetford (2110 projected)[2]	Nd	391	Nd	Nd	Nd	
Great Ouse catchment: Bury St Edmunds[2]	Nd	150	33,004	Nd	Nd	One electricity sub-station; One sewage treatment works; Section of A road
Great Ouse catchment: Bury St Edmunds (2110 projected)[2]	Nd	195	Nd	Nd	Nd	

[327] Norfolk Ambition (2009): Local Climate Impacts Profile for Norfolk, accessed at http://www.norfolkambition.gov.uk/consumption/groups/public/documents/article/ncc095340.pdf

Table 5.2.1.a: Number of people and properties with 1% annual probability of river flooding, current and projected

Catchment Flood Management Plan Area	Number of Properties		Other			
	People	Properties	Agricultural Land (ha)	Scheduled monuments	Listed buildings	Infrastructure
Great Ouse catchment: The Fens[2]	Nd	377	4,100	Nd	Nd	Three electricity sub-stations; Three sewage treatment works; and sections of A road and railway line
Great Ouse catchment: The Fens (2110 projected)[2]	Nd	991	Nd	Nd	Nd	
Great Ouse catchment: King's Lynn/South Wootton[2]	Nd	102	90	Nd	Nd	One electricity sub-station
Great Ouse catchment: King's Lynn/South Wootton (2110 projected)[2]	Nd	922	Nd	Nd	Nd	
North Norfolk catchment[3]	300	200	9,200	10	-	One electricity sub-station; and Sections of the A149 coast road and A148 Cromer to King's Lynn
North Norfolk catchment (2100 projected)[3]	400	300	Nd	Nd	Nd	
Broadland Rivers catchment[4]	1,351	652	67,007	Nd	Nd	Two electricity sub-stations; Four sewage treatment works; and Sections of the A road
Broadland Rivers catchment (2100)[4]	2,301	1,143	Nd	Nd	Nd	

Notes:
Nd = no data
Some is likely to be at tidal flood risk, or combined river/tidal flood risk (not specified in CFMP).
Sources: [1]Environment Agency (2009): East Suffolk Catchment Flood Management Plan: summary report December 2009, accessed at http://scdc.onesuffolk.net/assets/Documents/LDF/C4c/EastSuffolkCatchement.pdf
[2]Environment Agency (2011): Great Ouse Catchment Flood Management Plan: summary report January 2011, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0111btjl-e-e.pdf Data used for four sub-areas to better fit with New Anglia boundaries: Buckingham, Edlesborough/Eaton Bay and Newmarket; Saffron Walden and Thetford; Bury St Edmunds and Biggleswade/Sandy/Blunham; The Fens; and King's Lynn/South Wootton
[3]Environment Agency (2009): North Norfolk Catchment Flood Management Plan: summary report December 2009, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0909bpce-e-e.pdf

Table 5.2.1.a: Number of people and properties with 1% annual probability of river flooding, current and projected						
Catchment Flood Management Plan Area	**Number of Properties**		**Other**			
	People	**Properties**	**Agricultural Land (ha)**	**Scheduled monuments**	**Listed buildings**	**Infrastructure**

[4]Environment Agency (2009): Broadland Rivers Catchment Flood Management Plan: summary report December 2009, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0909bpck-e-e.pdf

Estimating the costs of flooding events is a difficult task because of the lack of information, the cross boundary nature of events and the multifaceted effects of flooding upon the economy and on peoples' lives. The East Coast Storm Surge during November 8-9th 2007 accumulated costs of up to £170,000 for Norfolk County Council. Great Yarmouth Borough Council incurred costs of upwards of £53,000 and North Norfolk District Council quoted damages of £289,264 to property and assets. This does not include other costs such as loss of earnings and the psychological trauma experienced by the local population[328].

Surface water flooding caused by heavy rainfall overwhelming drains, ditches and other streams is the main cause of flooding in Norfolk and Suffolk. This type of flooding is difficult to deal with because the uncertainty of events makes it difficult to predict and issue warnings. It is estimated that across England, 3.8 million properties could be at risk of surface water flooding while 1 million are at risk of flooding from rivers and the sea[329].

Areas that are prone to surface water, groundwater, and sewer flooding in New Anglia and areas that have suffered from some of these events in the past are listed below:

- Halesworth, Leiston, Knodishall, Wrentham, Needham Market, Saxmundham and Pettaugh (near Stowmarket) due to the underlying geology combined with seasonally waterlogged soils and steep slopes[330];
- Ipswich due to impermeable surfaces and blocked drains[328];
- Ipswich, Melton and Woodbridge due to sewer flooding[328;]
- Bury St Edmunds, Thetford, King's Lynn and South Wootton[331];
- Groundwater flooding has occurred in Bury St Edmunds and Newmarket[331];

[328] Norfolk Ambition (2009): Local Climate Impacts Profile for Norfolk, accessed at: http://www.norfolkambition.gov.uk/consumption/groups/public/documents/article/ncc095340.pdf

[329] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[330] Environment Agency (2009): East Suffolk Catchment Flood Management Plan: summary report December 2009, accessed at http://scdc.onesuffolk.net/assets/Documents/LDF/C4c/EastSuffolkCatchement.pdf

[331] Environment Agency (2011): Great Ouse Catchment Flood Management Plan: summary report January 2011, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0111btjl-e-e.pdf.

- The South Creake sub-area of the North Norfolk Catchment flooded where blocked culverts cause surface water and sewer flooding[332];
- Cromer and Sheringham, due to impermeable surfaces in the urban areas and short intense rainfall which the area is prone to[335];
- Mundesley is at risk of both surface water and sewer flooding[335];
- Surface water and sewer flooding have been caused in Lowestoft, Beccles, Great Yarmouth, Gorleston and Norwich due to the inadequate capacity of the sewage system, or by sewers being unable to drain freely into rivers[333];
- Risks of river and tidal flooding in settlements such as Wroxham, Hoveton, Horning and Brundall[334]; and
- River flooding from the River Wensum in Norwich.

There is also risk from the River Bure and Camping Beck at Buxton and the River Waveney at Bungay. River flooding can increase in the upper reaches of the catchment due to mill structures which restrict the flow of water, for example in Fakenham and Horstead[334]. Failure or the overwhelming of pumping stations causes localised flooding. Towns and villages at risk from the failure of pumping stations include East Dereham, Wymondham, Fakenham, North Walsham, Aylsham, Martham, Repps, Thurne, Caister, Hemsby, Upton, Winterton and Stokesby[334].

Surface water flooding is expected to take place more often in the future due to development pressures, climate change and ageing infrastructure[335]. Economic and population growth are expected to increase the pressures on existing resources, not only by increasing demand for housing but also by increasing demand for fuel and electricity, infrastructure and food, etc. Demand for water is likely to increase significantly, and the need for water disposal will increase accordingly[336].

Climate change adds to the challenge of meeting water requirements due to alterations in hydrological processes, while urbanisation increasingly reduces the capacity of the environment

[332] Environment Agency (2009): North Norfolk Catchment Flood Management Plan: summary report December 2009, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0909bpce-e-e.pdf

[333] Environment Agency (2009): Broadland Rivers Catchment Flood Management Plan: summary report December 2009, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0909bpck-e-e.pdf

[334] Environment Agency (2011): Great Ouse Catchment Flood Management Plan: summary report January 2011, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0111btjl-e-e.pdf.

[335] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[336] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf.

to deal with such events. It is predicted that summers will become up to 50% drier and winters up to 30% wetter with increasing unpredictability of rainfall[337]. It is likely that an increase in the volume of surface water runoff and rainwater will take place as a consequence of the replacement of vegetation (and its services) by impervious built surfaces[338].

Green infrastructure such as Sustainable Drainage Systems (SuDS) offers sustainable solutions for adapting cities to climate change, contributing to effective surface and groundwater management[339]. SuDS mimic nature and typically manage rainfall close to where it falls. SuDS can be designed to slow water down before it enters streams, rivers and other watercourses, they provide areas to store water in natural contours and can be used to allow water to soak into the ground, evaporate from surface water or to be lost via transpiration from vegetation[340].

In addition, even though heavy rainfall events might be difficult to foresee, local residents might reduce the impacts of future floods by knowing how to prevent them. In heavy rainfall events, local people can contribute to flood defenses by using water butts, rain gardens and ensuring permeable surfaces are present around their homes as well as avoiding drain blockages by not putting cement, fats, oils, paints, etc. down them as this can reduce the capacity of pipes[341].

Boundaries associated with water often do not match those designated by people, thus, one of the most important opportunities to minimise the effects of current and future surface water, groundwater, and drain water flooding is the development of county wide Local Flood Risk Management Strategies. Such strategies would give guidance on what is likely to be required for avoiding or containing future flood events, and who would be in charge of doing it.

Throughout England and Wales, Local Flood Risk Management Strategies are being put in place as a response to the Pitt's Review following the 2007 floods. The document calls for urgent and fundamental changes in the way the country is adapting to the likelihood of more frequent and intense periods of heavy rainfall. It calls for improvements to be made upon four key lines of action[342]:

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[337] Met Office (2004): Eastern England: climate, accessed at http://www.metoffice.gov.uk/climate/uk/ee/print.html

[338] Whitford, V et al (2001): 'City form and natural process' – indicators for the ecological performance of urban areas and their application to Merseyside, UK. Landscape and Urban Planning, 57 (2), pp91–103

[339] Gill, S et al (2007): Adapting cities for climate change: the role of the green infrastructure. Built Environment, 33 (1) pp115-133

[340] Susdrain: Sustainable drainage, accessed at http://www.susdrain.org/delivering-suds/using-suds/background/sustainable-drainage.html

[341] Suffolk Flood Risk Management Partnership (2012): Managing Flood Risk in Suffolk: a summary of the Suffolk local flood risk management strategy, accessed at: http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Emergency%20and%20Safety/Civil%20Emergencies/2012-12%20%20Managing%20Flood%20Risk%20in%20Suffolk_web.pdf

[342] Pitt, M (2008): Learning lessons from the 2007 floods, accessed at http://webarchive.nationalarchives.gov.uk/20080906001345/http://www.cabinetoffice.gov.uk/~/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_foreword_executive_summary%20pdf.ashx

- Improving quality of flood warnings through more cooperation between the Environment Agency and the Met Office to improving modelling of all forms of flooding;
- Widening the brief of the Environment Agency and Councils by stepping up their technical capabilities to lead on Local Flood Risk Management Strategies in terms of protecting communities through robust building and planning controls;
- Supporting better decision making in emergency situations by cooperation and communication between different sectors, better planning and protection of critical infrastructure such as water and power as well as higher private sector involvement in increasing openness in risk matters such as possible dam or reservoir failure; and
- Learning from similar situations abroad in terms of giving the best possible advice to people on how to look after their families and homes and how to be resilient to flooding events and/or being able to quickly bounce back after such events.

Both counties within the LEP are working towards formulating a Local Flood Risk Strategy. Suffolk has recently submitted its strategy while Norfolk has undertaken a Preliminary Flood Risk Assessment Report and the Norfolk Water Management Partnership was formed. Both strategies will include two types of flood risk management organisation.

Catchment Flood Management Plans consider all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding). Coastal flooding is covered by Shoreline Management Plans (SMPs) and is discussed in the next subsection. The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management in the long term[343].

The long term plan in both counties within New Anglia is to delegate responsibilities to key actors under the supervision of County Councils. Such strategies will rely upon the cooperation of these actors across an array of issues. Table 5.2.1.b gives a brief overview of what organisations will be involved in Flood Risk Management in New Anglia classified by flood type.

Table 5.2.1.b: Flood Risk Management in Norfolk and Suffolk with responsible organisation per flood type and key links

Flooding Type	Responsible Organisation	Coordinating with
Coastal flooding	Environment Agency	LAs, CFMPs and SMPs in terms of monitoring tidal flooding risks
Ordinary watercourses e.g. Streams and ditches	Riparian owners. Internal Drainage Boards in their areas	County Councils in terms of making sure existing and new development comply with planning regulation
Main rivers	Environment Agency	CFMPs and County Councils of in the case of trans-boundary
Reservoirs	Environment Agency	LAs, CFMPs, private companies, residents
Surface water flooding	Suffolk County Council	Developers in planning effective SuDs and Blue lanes, LLFAs as Drainage Systems Approving Bodies
Sewer flooding	Anglian Water	County Council, IDBs, residents, business organisations
Groundwater flooding	Suffolk County Council	

[343] Environment Agency (2009): Water for life and livelihoods: river basin planning: summary of significant water management issues: Anglian River Basin District, accessed at http://www.environment-agency.gov.uk/static/documents/Research/anglianswmidoc_1953860.pdf

Highway flooding	Suffolk County Council Highways Agency Ipswich B C	
Railway flooding	Network Rail	
Source: Based on data from Environment Agency: Catchment Flood Management Plans – Anglian Region, accessed at http://www.environment-agency.gov.uk/research/planning/114303.aspx; and Environment Agency: Shoreline Management Plans – the second generation (SMPs), accessed at http://www.environment-agency.gov.uk/research/planning/105014.aspx		

In addition to these actors, steering groups in both counties formed by members of key local authorities, the civic and business communities have been formed as a discussion forum for future planning and allocating funding to key projects[344].

5.2.2. Coastal flooding

New Anglia's coast is sensitive to processes of erosion and accretion, with areas of the Suffolk and Norfolk coast particularly vulnerable to long-term erosion[345]. Suffolk continuously suffers a net loss of land to the sea, with erosion affecting 54% of its coastline. In Norfolk, coast line erosion is affecting about 49% of the coastline[343]. This is portrayed in Figure 5.2.2.a using the average percentage of total coast line in the last 15 years. It is estimated that some parts of North Norfolk and Suffolk are losing about 1 metre of coast line per year due to erosion[346].

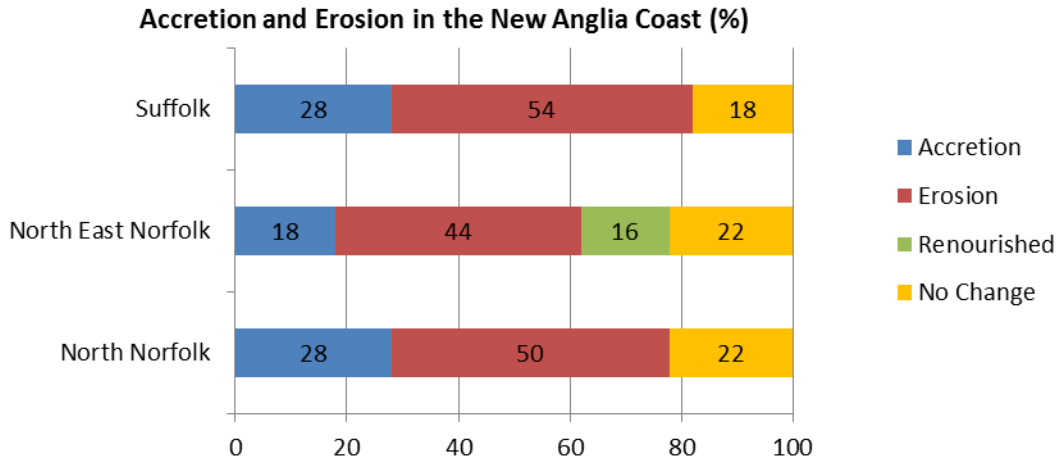


Figure 5.2.2.a: Accretion and erosion in the New Anglia Coast (%) using data from the last 15 years. Source: Environment Agency (2010): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[344] Norfolk County Council (2012): Managing flood risk, accessed at http://www.norfolk.gov.uk/view/NCC116395

[345] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[346] North Norfolk District Council: Shoreline Management Plan 6 – Kelling to Lowestoft Ness, accessed at http://www.northnorfolk.org/coastal/9871.asp

Tidal surges remain the major source of flood risk in Suffolk, where rising sea levels are exacerbated by the gradual sinking of the land. Major flood prevention schemes are currently under construction in Ipswich and Felixstowe.

The estimated number of properties at risk of tidal flooding in Suffolk and Norfolk is significantly lower in comparison to surface water flood risk with less than 1,000 properties at risk of tidal flood in each county. This is including critical infrastructure such as electricity transmission and water works stations. Such figures are expected to increase significantly in the next 100 years, especially in the River Ouse catchment, Fens and in the Broadland area. Table 5.2.2.a provides a more detailed overview of the current and future number of properties classed as under tidal flood risk in Norfolk and Suffolk.

Table 5.2.2.a: Number of people and properties within 0.5% annual probability of tidal flood risk in Norfolk and Suffolk in 2009 and projected to 2110

Catchment Flood Management Plan Area	Number of Properties		Land (ha)	Other		Infrastructure
	People	Properties		Scheduled monuments	Listed buildings	
East Suffolk (2009)[1]	900	670	40	0	11	14 electricity sub-stations; and sections of railway line
East Suffolk (2100) [1]	1,600	1,500	No change	0	29	
Great Ouse catchment: The Fens (2011)[2]	Nd	108	230	Nd	Nd	Sewage treatment works; sections of A road and railway line
Great Ouse catchment: The Fens (2110)[2]	Nd	508	Nd	Nd	Nd	
Great Ouse catchment: King's Lynn/South Wootton (2011)[2]	Nd	0	0	Nd	Nd	
Great Ouse catchment: King's Lynn/South Wootton (2110)[3]	Nd	3,591	Nd	Nd	Nd	
Broadland Rivers catchment (2009)[3]	1,822	950	Nd	Nd	Nd	5 sewage treatment works; sections of A road and railway line
Broadland Rivers catchment (2110)[3]	14,746	8,296	Nd	Nd	Nd	

Notes: Nd =no data
Sources: [1] Environment Agency (2009): East Suffolk Catchment Flood Management Plan: summary report December 2009, accessed at http://scdc.onesuffolk.net/assets/Documents/LDF/C4c/EastSuffolkCatchement.pdf
[2] Environment Agency (2011): Great Ouse Catchment Flood Management Plan: summary report January 2011, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0111btjl-e-e.pdf. (Data used for four sub-areas to better fit with New Anglia boundaries: The Fens; and King's Lynn/South Wootton)
[3] Environment Agency (2009): Broadland Rivers Catchment Flood Management Plan: summary report December 2009, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0909bpck-e-e.pdf

External drivers already affecting and likely to further impact coastal flood risk are similar to those of non-coastal flood risks. Economic and population growth are likely to put more pressure on coastal environments. Cooperation between Local Authorities and the Environment Agency to ensure that new developments not only comply with planning regulations but also contribute to climate change adaptation is increasingly vital for managing flood risk. In 2010 and 2011, 97% of total planning applications objected to by the Environment Agency on grounds of flood risks were refused by local planning authorities, suggesting that such cooperation is being forged as requested by Local Flood Risks Strategies[347].

Rising sea level is a well-documented impact of increasing average temperatures due to green-house gas emissions[348]. Global efforts are having a significant impact on reducing CO_2 emissions however, the long shelf-life of CO_2 in the atmosphere means that much of the climate change for the next 30 or 40 years has already been determined by historic emissions[349]. The predicted increase in the number of properties classed as at flood risk in Table 5.2.2.a suggests that this factor is being taken into account. Hence, tidal flood risk will persist in Suffolk and Norfolk, and places likely to be affected have been identified in Shoreline Management Plans (SMP) involving Local Authorities (LAs), Government agencies and private interests.

The extent and maintenance of erosion defences will be determined by cost effectiveness and the availability of funding. Nevertheless, management of flood and erosion defences are likely to continue to be an important funding recipient in New Anglia. In North Norfolk for example, it is estimated that withdrawing current management of flood and erosion defences will lead to the depletion of the residual life of these defences by 2020. Only the embankment at Wells is predicted to last until after 2025 under a no-management case scenario[350]. However, due to the allocation process of current coastal flood defence funding, certain areas, such as Hunstanton to Snettisham, will have to source alternative funding sources for maintaining their coastal defences, and work is currently underway to determine the likely options[351].

[347] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[348] Rosenzweig, C et al (2007) Assessment of observed changes and responses in natural and managed systems. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Parry, M.L. et al , Eds., Cambridge University Press, Cambridge, pp79-131

[349] Hulme, et al (2002): Climate change scenarios for the United Kingdom: The UKCIP02 briefing report, accessed at http://www.ukcip.org.uk/wordpress/wp-content/PDFs/UKCIP02_briefing.pdf

[350] North Norfolk District Council: Shoreline Management Plan 6 – Kelling to Lowestoft Ness, accessed at http://www.northnorfolk.org/coastal/9871.asp

[351] EDP24 News website (2011): Everyone in West Norfolk could pay for sea defences at Snettisham, Heacham and Hunstanton http://www.edp24.co.uk/news/environment/everyone_in_west_norfolk_could_pay_for_sea_defences_at_snettisham_heacham_and_hunstanton_1_814706

The most common defences in Norfolk and Suffolk are sea banks; however natural defences are becoming the preferred flood defence because they also contribute to other sustainability purposes. In the period 2008-2011, 7,534 ha of Sites of Special Scientific Interest (SSSI) and 117 ha of priority Biodiversity Action Plan (BAP) habitat, including intertidal habitats, were enhanced as a remedy for flood risk. This work contributes to the Government's Public Service Agreement (PSA) which requires 95% of all SSSIs to be in favourable condition by December 2010; and towards the Environment Agency Wetland Policy to conserve, enhance and re-create the wetland capacity of catchments as part of their contribution to rebuilding biodiversity on a landscape scale[352].

Because of the intricate connections between ecosystem services, flood risk management is likely to have an impact on, and be impacted by, other key areas concerned by future environmental planning such as water availability and quality, the incorporation of green infrastructure and other long term land use plans.

5.3.Water purification

European legislation like the Water Framework Directive sets targets for water quality. These targets are assessed using a broad range of parameters including the existence of chemicals in water, water treatment, and service reservoir integrity and network maintenance. Current water quality levels in New Anglia are generally good, with scores for drinking water above the industry average[353]. Waste water treatment is also consistently good after a significant improvement since 1989[354].

Water purification by natural processes plays a key role in maintaining these levels while keeping costs steady. A decrease in the capacity of the environment to purify water may lead to poorer quality and higher water tariffs, as it would require further treatment. It is expected that this scenario would be very detrimental to the local economy[355].

Anglian Water identifies rising nitrate trends in the chalk aquifer as the main water quality issue for the Fenland Water Resource Zone (WRZ) (WRZ5), North Norfolk WRZ (WRZ6), Cambridgeshire and West Suffolk WRZ (WRZ9). This requires water to be abstracted from

[352] Environment Agency (2011): The state of our environment: flood and coastal risk management, accessed at http://www.environment-agency.gov.uk/static/documents/Business/SOE_-_Flood_and_Coastal_Risk_Management.pdf

[353] DWI (2010): Drinking water 2009: Eastern region of England, Drinking Water Inspectorate, accessed at http://webarchive.nationalarchives.gov.uk/20120906081707/http://dwi.defra.gov.uk/about/annual-report/2009/cir09eastern.pdf

[354] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

[355] Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspm-e-e.pdf

other sources for blending and a nitrate removal plant for treating groundwater. In WRZ8 (Norwich and the Broads) the quality of groundwater abstracted from the chalk is highly variable, with some boreholes including treatment for high nitrate, pesticides, organic solvents and iron[352]. Local pollution exists around air bases that threaten groundwater in WRZ9 and treatment is required at one source works[352]. Nitrate levels in the confined chalk of WRZ10 (East Suffolk and Essex) are rarely a problem, although there are a few groundwater sources that receive rapid recharge that do have rising levels of nitrate. Table 5.3.a provides a summary of designated areas currently failing to meet good status due to water quality issues. Table 5.3.b summarises the ecological status of water bodies in Norfolk and Suffolk and the expected improvement in 2015.

Table 5.3.a: Designated sites failing to meet good status due to water quality in Norfolk and Suffolk

Protected Area Name	Reasons for failure
Benacre to Easton Bavents SPA	Inappropriate coastal management Water pollution-discharge
Benacre to Eastern Bavents Lagoons SAC	In appropriate water levels Water abstraction Inappropriate coastal management Inappropriate weirs, dams and other structures Water pollution-discharge
Broadland SPA	Drainage Inappropriate water levels Water abstraction Inappropriate ditch management Loss of reedbed Siltation Water pollution-agriculture/run-off (6) Water pollution-discharge
Minsmere to Walberswick Heaths and Marshes SAC; Minsmere to Walberswick SPA	Coastal squeeze Inappropriate coastal management Water pollution-discharge
River Wensum SAC	Inappropriate water levels Water abstraction Invasive freshwater species Inappropriate weirs, dams and other structures Water pollution – agriculture/run-off Water pollution – discharge
The Broads SAC	Drainage Inappropriate water levels Water abstraction Inappropriate ditch management Inland flood defence works Loss of reedbed Siltation Water abstraction Water pollution – agriculture/run-off Water pollution – discharge
The Wash SPA	Inappropriate fisheries Inappropriate coastal management Unknown (water quality/hydromorphology)
The Wash & North Norfolk Coast SAC	Inappropriate fisheries Coastal squeeze Fisheries Significant decline in moult counts Unknown (water quality/hydromorphology)

Waveney and Little Ouse Valley Fens SAC	Inappropriate water levels Water abstraction Inappropriate dredging Water pollution – agriculture/run-off Water pollution - discharge
Source: Based on Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district: Annex D: protected area objectives, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspq-e-e.pdf.	

Table 5.3.b: Ecological status of water ways in Norfolk and Suffolk in 2009 and predictions for 2015

Catchment	% at good ecological status or potential		% at good or high biological status		% at good chemical status		% at good status overall		% improving for one or more element in rivers
	2009	2015	2009	2015	2009	2015	2009	2015	2015
Broadland Rivers (93 rivers)	8%	9%	27%	27%	29%	100%	8%	9%	25%
Broadland Rivers (18 lakes)	17%	28%	15%	38%	75%	100%	11%	28%	56%
Cam and Ely Ouse[1] (83 river and 5 lakes)	17%	18%	27%	29%	94%	94%	17%	18%	22%
Essex Rivers[2] (125 rivers and 5 lakes)	7%	7%	33%	33%	67%	78%	7%	7%	8%
East Suffolk (65 rivers)	17%	17%	15%	15%	100 %	100%	17%	17%	11%
North Norfolk (6 rivers)	0%	0%	17%	17%	0%	0%	0%	0%	50%
North West Norfolk	15%	15%	27%	36%	0%	0%	15%	15%	16%

Source: Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspm-e-e.pdf

Notes:

[1] Includes Newmarket, Bury St Edmunds, Swaffham

[2] Also lies within county of Suffolk

Climate change is expected to threaten the capacity of the environment to purify water. It is projected to lead to an increase in low-flow events, which effect water quality due to reduced dilution of pollutants[356]. Already during summer droughts 25–33% of flow in some rivers in central and south-east England can be comprised of treated sewage effluent[357]. Climate change is also projected to lead to an increase in intensive storm events. This can lead to increased pollutant load in rivers due to increased pollutant wash-off from agricultural fields in urban

[356] UK NEA (2011): Chapter 14 Regulating Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=XPPBQJuWlzk%3d&tabid=82

[357] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

settlements. Intense storms can also lead to increased downstream pollution due to the presence of combined sewer overflow systems in the UK[358].

Population and economic growth may deepen pressures likely to be brought about by climate change. Spatial planning plays an important role in helping to meet water quality targets and ensuring that development is sustainable. The Micro-Economic Benefits of Investment in the Environment (MEBIE)[359] is a summary and review of the extensive work carried out by Natural England, highlighting the importance of environmental services, the value of the environment and green infrastructure. It highlights opportunities for spatial planning to help mitigate the effects of climate change, increasing population and economic growth on the environment's water purification capacity by investing in green infrastructure.

Green Infrastructure can provide a broad range of benefits for enhancing the capacity of the environment to purify water, for example woodlands can play a role in intercepting diffuse pollutants, particularly from farmland. This is most effective when the water passes through the root zone. Wetlands bordering rivers can also help to prevent diffuse pollution entering water courses. It is expected that blocking the artificial drainage 'grips' on upland blanket bog will restore the bogs natural filtration role, reducing sediment loading and water colouration[359].

Green Infrastructure can also help enhance water purification in more densely urbanized areas. 'Green Roofs', trees and urban greenery reduce run off during flooding. Sustainable Urban Drainage Systems (SuDs), such as swales, detention pools and sand and soil based filters are a cost-effective way of reducing pollutants entering water courses. Measures to encourage infiltration, such as permeable driveways and pavements will also reduce water run-off in rainstorms[360].

Promoting Green Infrastructure might not be enough to protect the environment water purifying capability. Other equally important issues will need to contribute to enhancing water quality. 'Growth in the Green Sector' will contribute to reducing emissions by improving existing technologies and developing new ones. Climate change is a global concern and competitive enterprises may be able to export their expertise to the international market. Supporting the further development of the sector could bring double benefits; a direct economic one whilst avoiding future costs of adaptation.

[358] Anglian Water (2010): Water Resources Management Plan, accessed at http://www.anglianwater.co.uk/_assets/media/AW_WRMP_2010_main_Report.pdf

[359] Natural England (2012): Microeconomic Evidence for the Benefits of Investment in the Environment – review, accessed at http://publications.naturalengland.org.uk/publication/32031

[360] Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspm-e-e.pdf

5.4.Disease and pest regulation

There were eight priority non-native species identified by the Environment Agency (2009) as being present in the Anglian River Basin District[361]:

- Floating Pennywort (Hydrocotyle ranunculoides);
- Signal Crayfish (Pacifastacus leniusculus);
- Topmouth Gudgeon (Pseudorasbora parva);
- Mink (Mustela);
- Japanese Knotweed (Fallopia japonica);
- Zebra Mussel (Dreissena polymorpha);
- Giant Hogweed (Heracleum mantegazzianum); and
- Himalayan Balsam (Impatiens glandulifera).

Invasive aquatic plants are a problem in the Broads, particularly the River Wensum[362] (see Table 5.4.a).

Table 5.4.a: Designated sites failing to meet good status due to invasive species

Protected Area Name	Reasons for failure
River Wensum SAC	Inappropriate water levels Water abstraction Invasive freshwater species Inappropriate weirs, dams and other structures Water pollution – agriculture/run-off Water pollution – discharge

Source: Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district: Annex D: protected area objectives, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspq-e-e.pdf

In most cases, aquatic invasive species are introduced via garden ponds, such as floating pennywort. This particular species has been a problem in the River Waveney, as it grows into thick mats which block out sunlight and prevent navigation and other recreational activities such as angling/boating etc., due to its rapid growth rates (up to 20cm per day). It is currently being eradicated from the River Waveney, where it was introduced at Diss. The costs of controlling this species once established are huge, for example, in Leicestershire it costs £80,000 per year to control floating pennywort to keep the main channel clear in the River Soar. In Norfolk the floating pennywort eradication programme costs around £45,000 per year. Its

[361]Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district: Annex D: protected area objectives, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspq-e-e.pdf

[362] Sutton-Croft M (2013): Coordinator of the non-native species initiative, Norfolk County Council, personal communication

eventual eradication will hopefully prevent further spending, and it is hoped that complete eradication will occur in 2013[363].

Japanese knotweed is a problem in brownfield sites, mainly in specific areas such as Great Yarmouth, Norwich and Kings Lynn. Giant Hogweed is an invasive plant which impacts human health due to the burning sap and is a problem in specific areas such as the River Yare in Norwich, but only tends to occur in isolated pockets[364].

Other biosecurity issues for woodlands come from the recent occurrence of ash dieback. The fungus *Chalara fraxinea* and its sexual stage *Hymenoscyphus pseudoalbidus*, causes leaf loss and crown dieback in ash trees, usually resulting in tree death[365]. The disease was first recorded in Poland in 1992 and was then found in trees imported from the Netherlands to a nursery in Buckinghamshire in 2012. In October 2012 it was recorded at sites in Norfolk and Suffolk in the wider natural environment which were not associated with nursery imports. It is suspected that these cases may have been infected by wind borne sources from Europe, as a number of cases were near the east coast[365]. The importation of ash seeds, plants and trees in Great Britain and movements within Britain have been prohibited, in order to prevent further spread of the disease[366].

Non-native crayfish (signal crayfish), have almost wiped out the native white-clawed crayfish over the whole of Norfolk and Suffolk. Special Ark sites have been established for the native species in an attempt to retain populations, but such small populations remain vulnerable to introductions by signal crayfish and disease outbreaks[363].

Killer shrimp *Dikerogammorus villosus* is another species which is causing concern in the area. This invasive non-native shrimp has spread across Europe using migration corridors from the Ponto Caspian Region of Eastern Europe. There are currently four known sites in the UK where the shrimp has been recorded, one of them being Barton Broad, which is one of the Norfolk Broads, on 7th March 2012. The killer shrimp has the following direct and indirect effects on the environment[367]:

[363] Norfolk Biodiversity Partnership (2011): Co-ordinator's progress report for the period: 13 July – 16 November 2011, accessed at http://www.norfolkbiodiversity.org/pdf/progressreports/Co-ordinator's%20progress%20report%20-%2013%20July%20to%2016%20Nov%202011.pdf

[364] Sutton-Croft M (2013): Coordinator of the non-native species initiative, Norfolk County Council, personal communication

[365] Forestry Commission: *Chalara* dieback of ash (*Chalara fraxinea*), accessed at http://www.forestry.gov.uk/chalara

[366] Plant Health (2012): The Plant Health (Forestry) (Amendment) Order 2012, accessed at http://www.legislation.gov.uk/uksi/2012/2707/pdfs/uksi_20122707_en.pdf

[367] Norfolk Biodiversity Partnership (2012): Norfolk non-native species stakeholder's forum 2012, accessed at http://www.norfolkbiodiversity.org/nonnativespecies/stakeholderforum.aspx

- Declines in macroinvertebrates (e.g. native shrimps, mayflies, damselflies, leeches, chironomids, cladocera and snails), due to predation;
- Declines in fish eggs and larvae (Bullhead) due to predation;
- Less leaf processing and impacts on nutrient dynamics;
- Increase in some species, through the reduction of predators or the creation of a new food response;
- May be affecting the likelihood of catching fish; and
- Possible intermediate host for parasites of salmonid fish.

Another invasive species, the Spanish slug (*Arion vulgaris*), or killer slug has been found in Norfolk[368]. These slugs are highly invasive, and have caused severe damage in northern Europe. They have high reproductive outputs and are not affected by standard pesticides. They are cannibalistic and eat a wide variety of plants, attacking potato crop foliage, onion tops, and runner bean leaves, all of which are relatively unpalatable to common UK species.

Other potential future threats include the Chinese mitten crab, which has caused huge damage in the river Thames, by burrowing into flood defences. This could be a major issue if the species were introduced to the New Anglia area. As well as impacting flood defences it may also have negative impacts on agriculture, by destroying drainage channels[369].

Other species of concern for the future include:

- Citrus long-horn beetle;
- Oak processionary moth (in London);
- Asian hornet – preys on native bees; and
- Sacred Ibis.

Climate change is listed as posing a significant future threat to biodiversity by impacting the distribution of non-native species[370]. Changes in the climate may increase the potential for species to become established in the UK and also spread from other continents. There is also the potential for non-native species which are already present in the UK to become invasive. Climate change is already causing species to occur outside of their natural range, including some species of butterflies, marine molluscs, migratory birds and plants.

The planned expansion of ports and logistics together with the tourism sector could increase the spread of certain invasive species. In particular killer shrimp in the Broads area is easily spread by unchartered boats and recreational equipment, such as fishing gear.

[368]BBC (2013): 'Killer slugs' find in Norwich garden is a 'UK first', accessed at, http://www.bbc.co.uk/news/uk-england-norfolk-20971787

[369] Sutton-Croft M (2013):Coordinator of the non-native species initiative, Norfolk County Council, personal communication

[370] NNSS (2008): The invasive non-native species framework strategy for Great Britain, The GB Non-Native Species Secretariate, accessed at https://secure.fera.defra.gov.uk/nonnativespecies/home/index.cfm

The effects of invasive species on the economy can be severe, and affect a wide range of sectors. In Britain alone invasive species cost the economy around £2 billion per year. The Invasive Non-Native Species Strategy highlights the need for a preventative approach to reduce the future ecological, economic and financial pressures caused by invasive species[372].

An initiative to promote the prevention, control and eradication of invasive species in Norfolk was established in 2008. The Norfolk Non-Native Species Initiative (NNNSI) aims to:

- Collate and monitor data on the distribution and spread of non-native species in the county;
- Develop action plans to address the species of most urgent concern;
- Facilitate control and eradication projects at high priority sites; and
- Promote awareness of the risks and impacts associated with non-native species.

The Initiative has been established under the umbrella of the Norfolk Biodiversity Partnership and works through a stakeholders' forum composed of representatives from over 20 organisations. Part of their work has involved a garden centre accreditation scheme where garden centres join if they agree not to sell certain invasive species and put out information leaflets for the public. Work is also underway to prevent the spread of invasive species such as the killer shrimp in the Broads by raising public awareness. Promotion of the GB Non-Native Species Secretariat (NNSS) campaign, Check, Clean, Dry[371] is also underway. This aims to inform people on what to do when they remove their equipment from the water, in order to prevent the spread of invasive species to new locations and to educate people about good bio-security.

The NNNSI also prevented the spread of water primrose, which was flagged up in an ecological survey. There are less than 20 sites in the UK where this species occurs, and it is a priority species for eradication. The costs of eradication amounted to around £1,000, a fraction of the costs required to control it should it have become established in a main waterway[372].

Currently there is no similar initiative in Suffolk, although plans are under way to create a joint initiative between the two counties to increase defence for the area. This would increase preventative action thus reducing the need for expensive future control measures.

[371] NNSS: Stop the spread, The Non-Native Species Secretariate, accessed at https://secure.fera.defra.gov.uk/nonnativespecies/checkcleandry/documents/check-clean-dry-poster.pdf

[372] Sutton-Croft M (2013):Coordinator of the non-native species initiative, Norfolk County Council, personal communication

5.5.Erosion regulation

Table 5.5.a outlines the main threats to soil erosion within each National Character Area (NCA) covering the LEP area. Figure 5.5.a shows the location of the NCA areas across Norfolk and Suffolk.

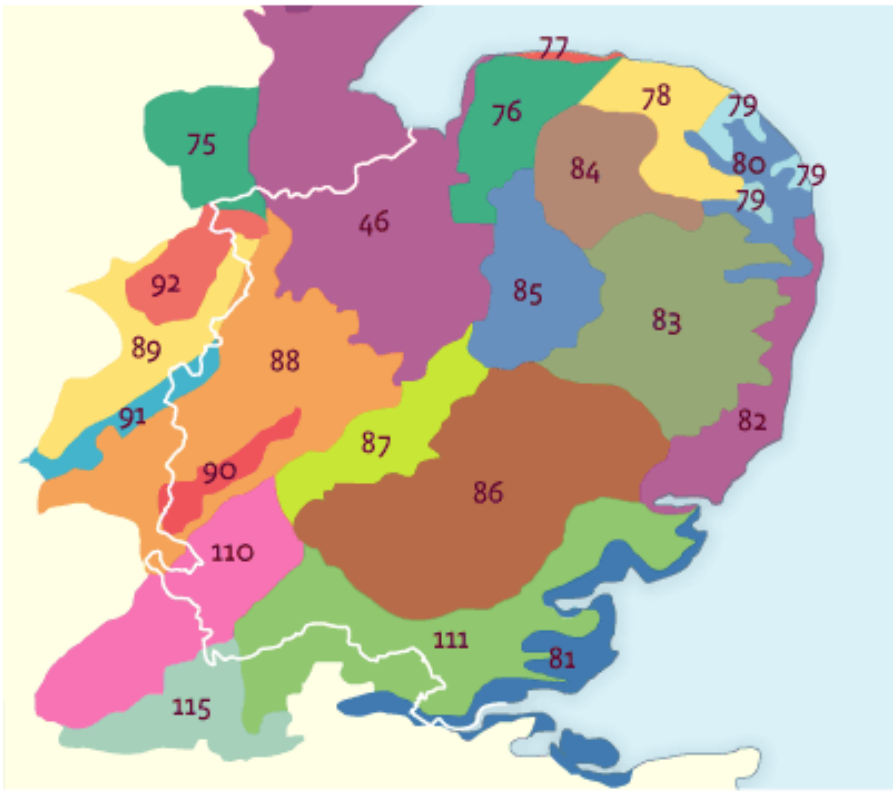


Figure 5.5.a: East of England National Character Areas
Source: Natural England: East of England National Character Areas, accessed at http://www.naturalengland.org.uk/publications/nca/eastofengland.aspx

Table 5.5.a: Soil Erosion within National Character Areas covering Norfolk and Suffolk			
Landscape Character Area Name (No.)	**Main soil type**	**Threats**	**Priority Catchments under ECFSDI* where soil erosion is a problem**
North West Norfolk (76)	Freely draining soils >90%	Around 84% of the area is subject to wind erosion. Surface water run-off is also a problem where cultivated land is left bare or exposed. Around 10% of soils are prone to compaction	North Norfolk Rivers; River Wensum; River Nar, Little Ouse and Thetford Ouse
North Norfolk Coast (77)	Around 80% loamy soils	Although most soils show resilience to soil erosion, over 18% by area are vulnerable to both wind and water erosion. Outdoor pig enterprises where ill-managed can lead to erosion	
Central North Norfolk (78)	Mainly free-draining slightly acid loamy soils of low fertility, with more fertile fen peats and alluvium associated with the river valleys	The majority of soils are at risk of erosion >90%, with the majority affected by wind erosion (80%). Compaction is also a problem affecting around 10% of the area	North Norfolk Rivers Catchment; the Bure, Ant and Muckfleet Catchment; the River Wensum Catchment; and the River Yare Catchment
North East Norfolk and Flegg (79)	Freely draining slightly acid loamy soils (approx. 90%)	There is an enhanced risk of soil erosion on moderately or steeply sloping land where cultivated or bare soil is exposed. Erosion is exacerbated where organic matter levels are low after continuous arable cultivation or where soils are compacted, with eroded soils leading to sedimentation of water courses	The Bure Ant and Muckfleet Priority Catchment; the River Yare Priority Catchment; and the Waveny Priority Catchment
The Broads (80)	Much of the area is underlain by peat, loamy and clayey floodplain soils with naturally high groundwater	The area is important for cereal production. Livestock numbers have decreased; with the use of floodplain land for free range poultry increasing. Sediment run-off form agriculture is listed as a priority area for reduction	Bure, Ant and Muckfleet Priority Catchment
Suffolk Coast and Heaths (82)	Freely draining slightly acid sandy soils cover 50% of the NCA and freely draining slightly acid loamy soils cover 16%. Clayey soils cover around 8%	The majority of the soils are susceptible to erosion. There is also widespread potential for wind erosion where soils are cultivated or left bare. Some soils are prone to compaction, especially on steeper slopes. Outdoor pig rearing is identified as an issue regarding erosion. Maize and root cropping are a particular problem in the Waveney catchment. Recent initiatives have encouraged landowners to conserve these fragile soils, particularly by protecting them from erosion and reducing runoff	Gipping and Orwell Priority Catchment; the Deben, Alde and Ore Priority Catchment; and the Waveney Priority Catchment

Table 5.5.a: Soil Erosion within National Character Areas covering Norfolk and Suffolk			
Landscape Character Area Name (No.)	**Main soil type**	**Threats**	**Priority Catchments under ECFSDI* where soil erosion is a problem**
South Norfolk and High Suffolk Claylands (83)	Soils are highly variable, with much of the NCA underlain by slightly acid loamy and clayey soils of moderate to high fertility but with impeded drainage. Glacial deposits underlay heavy chalky boulder clay soils on the plateau, with lighter, better-drained soils on the slopes of the valleys	Sediment loading is listed as a particular problem in all Priority Catchments. There is a contrast between the intense arable use of much of the land and the pasture of the river valleys (e.g. dairying remains important in the Waveney Valley). Intensive pig and poultry rearing takes place in large units, sometimes on redundant airfields	The Waveney Priority Catchment; The Yare Priority Catchment; and Deben, Alde and Ore Priority Catchment.
Mid Norfolk (84)	Soils are a combination of slowly permeable seasonally wet slightly acid loamy and clayey soils with impeded drainage	Sediment run-off from agriculture has been identified as an issue in the River Wensum Priority Catchment. The LCA is a rich and productive agricultural area that is a major producer of arable crops, including wheat, potatoes and sugar beet, which are sown on rotation with break crops of barley (for malting and feed) and oil-seed rape	The River Wensum Priority Catchment; The Yare
The Brecks (85)	Mainly sands and sandy loams which are low in natural fertility. There are also areas where drainage is impeded where gleys and peats have formed	Shallow, unstable soils are prone to wind and water erosion, especially where organic matter is low, on sloping cultivated ground or where dry, bare soil is exposed or compacted. Freely draining, slightly acid but base-rich soils may be susceptible to capping and slaking. Extensive outdoor pig rearing can expose soils. The re-establishment of hedges and provision of uncropped wildlife strips, conservation headlands, targeted arable reversion to grassland, and winter stubble through agri-environment schemes has limited soil erosion	The Little Ouse Priority Catchment (Thetford Ouse); and the River Nar Priority Catchment
South Suffolk and North Essex Claylands (86)	Lime-rich loamy and clayey soils with impeded drainage (covering 50%), slightly acid loamy and clayey soils with impeded drainage (13%), freely draining slightly acid but base-rich soils (7%)	The majority of soil types covering 92% of the NCA are at risk of erosion. The clayey soils are easily compacted by machinery or livestock if accessed when wet, increasing the risks of soil erosion by surface water run-off, especially on steeper slopes. In the priority catchments erosion is associated with light sandy soils and outdoor pig farming. Also areas with light soils as well as areas of heavier soils under maize and root cropping are susceptible to soil erosion and sand blows can occur when bare soils are dry	The Little Ouse Priority Catchment (Thetford Ouse); and the River Nar Priority Catchment

Table 5.5.a: Soil Erosion within National Character Areas covering Norfolk and Suffolk			
Landscape Character Area Name (No.)	**Main soil type**	**Threats**	**Priority Catchments under ECFSDI* where soil erosion is a problem**
The Fens (46)	Loamy and clayey soils of coastal flats with naturally high groundwater cover around 50% of the area, and loamy and sandy soils with naturally high groundwater and a peaty surface cover 28%	The soils of the coastal flats are under threat from sea level rise. Where there is high silt and sand content compaction and capping may be an issue. The loamy and sandy soils are at risk of organic matter loss where they are drained and cultivated which may lead to wind erosion.	
Sources: Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished document Natural England (2012): National Character Area profile, 85. The Brecks, accessed at http://www.naturalengland.org.uk/publications/nca/the_brecks.aspx; Natural England: Priority Catchments, accessed at http://www.naturalengland.org.uk/ourwork/farming/csf/cgs/catchments.aspx Notes: *England catchment sensitive farming delivery initiative Some NCA boundaries are outside of the LEP area, and the Priority Catchments do not line up exactly with NCA boundaries.			

Soil erosion is mainly an issue where cultivated land is left bare or exposed. Outdoor pig farming can lead to erosion where insufficiently managed. Areas with light sandy soils are particularly vulnerable to soil erosion. Compaction by farm machinery and livestock causes increased run-off in certain areas and sloping cultivated land increases the chances of soil erosion and run-off.

The drier conditions predicted to occur with climate change, together with more intense rainfall and higher wind speeds may accelerate soil erosion, especially in areas which are already vulnerable.

Careful land management especially that which is under intensive agriculture is required in order to limit soil erosion and run-off. This would provide benefits for biodiversity, climate regulation and agriculture, and limit sediment loading to rivers. There are two designated areas which are failing to meet good ecological status due to sediment loading in the LEP area (Table 5.5.b).

Table 5.5.b: Designated sites failing to meet good status due to siltation

Protected Area Name	Reasons for failure
Broadland SPA	Drainage Inappropriate water levels Water abstraction Inappropriate ditch management Loss of reedbed Siltation Water pollution-agriculture/run-off Water pollution-discharge
The Broads SAC	Drainage Inappropriate water levels Water abstraction Inappropriate ditch management Inland flood defence works Loss of reedbed Siltation Water abstraction Water pollution – agriculture/run-off Water pollution – discharge

Source: Environment Agency (2009): Water for life and livelihoods: river basin management plan Anglian river basin district: Annex D: protected area objectives, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspq-e-e.pdf

Possible management options to reduce soil erosion include:

- Increasing protective field boundary hedgerows and shelterbelts;
- Increasing the use of cover crops to limit soil exposure;
- The use of low ground pressure vehicles to reduce compaction;
- Targeted arable reversion to grassland;
- Encouraging winter stubble;
- Rotating livestock grazing to reduce compaction and fencing sensitive areas such as river banks; and

- The provision of uncropped wildlife strips.

These can be implemented through encouraging uptake of agri-environment schemes, and encouraging best practice management.

5.6.Land and soil quality

Norfolk and Suffolk are predominately rural in nature and agriculture plays a significant role in the local economy and heritage, with 58% of the most productive agricultural land in England and Wales found in the Anglian region[373]. Soil quality is essential for maintaining agricultural practices, which are important in terms of the economy as well as the landscape. Agricultural land is divided into five Grades (Grade 1 being the highest quality land) with Grade 3 subdivided into two subgrades, 3a and 3b.

In 2010 around 4,026 km^2 of the land in Norfolk was under agricultural use[374]. Grade 1 soils are a vital national resource and Norfolk contains some significant areas of Grade 1 land, particularly in the peaty soils of the Fenland area and the Broads. Grade 2 soils are distributed more widely across the county, albeit in smaller patches, but Grade 3 soils make up the majority of Norfolk's agricultural land, with smaller areas of Grade 4 ("poor quality") land, located mainly in the drier and more free-draining Brecks[375].

Around 2,871 km^2 of the land in Suffolk was under agriculture in 2010[373]. Approximately 1% of Suffolk's soils are Grade 1, with Grades 2 and 3a each at about 20%. About 45% of Suffolk's soils are classed as 'best and most versatile'[376].

There are a range of soil types in the region which dictates the sort of pressures and issues that are impacting on soil quality. Areas with free draining slightly acid loamy soils of low fertility are all valuable for aquifer recharge requiring the maintenance of good structural conditions to

[373] Environment Agency: Anglian Region, accessed at: http://www.environment-agency.gov.uk/aboutus/organisation/77998.aspx

[374] Defra (2010): Local authority breakdown for key crop areas and livestock numbers on agricultural holdings, Department for Environment, Food & Rural Affairs, accessed at https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

[375] Norfolk County Council (2010): Norfolk Minerals and Waste Development Framework, Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2013, accessed at http://www.norfolk.gov.uk/consumption/groups/public/documents/general_resources/ncc078476.pdf

[376] Suffolk County Council (2009): Waste Core Strategy Submission Final Sustainability Appraisal Report, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Minerals%20and%20Waste%20Development%20Framework/Waste%20Core%20Strategy/WCS%20Sustainability%20Appraisal%20Report.pdf

aid water infiltration[377]. The matching of nutrients to needs to prevent pollution of the underlying aquifer is needed to ensure the wider benefits for water quality.

The diverse soils of the Brecks' National Character Area (NCA) include some of the least fertile in England. They are typically sands and sandy loams (with considerable variation in the content of chalk, flint, stone, silt and clay) that freely leach nutrient inputs. However, the addition of chemical fertilisers combined with the irrigation of these easily worked soils has enabled highly productive agriculture to prevail across the NCA.

The Suffolk Coast and Heaths soils within the NCA are light, sandy and infertile although they are highly productive once fertilised and irrigated. Deeper, well drained soils are often prioritised for root crops. There can be a temptation to exploit seemingly-robust sandy soils for late or difficult harvesting of crops such as sugar beet. The resulting soil compaction and loss of structural cohesion on these sandy soils can, however, become problematic and surprisingly difficult to rectify[378]

South Suffolk and North Essex Claylands NCA's lime-rich loamy and clayey soils with impeded drainage (50% of the NCA) are at risk from topsoil compaction and poaching requiring careful management of weak topsoils to maintain a good soil structure. Minimum tillage such as direct drilling can work well in some of these soils, and careful timing of activities is required to reduce the likelihood of soil compaction.

Food security is a key concern as agricultural production will need to increase significantly over the next few years to provide for an increasing population. As the agricultural sector is one of the LEPs key growth sectors, it is important that this does not adversely affect soil structure, which is likely to have knock-on implications for other areas of the environment and economy. Increasing the uptake of agri-environment schemes to better protect soil quality combined with the development and use of precision farming technologies with accurate application of inputs such as fertilisers, herbicides etc. are some of the ways soil quality can be protected.

5.7.Air-quality

The activities and processes which generate air pollution link closely to those that generate carbon emissions which is high on the political agenda. It is important to consider air quality alongside policies for climate change.

Under the Environment Act 1995[379] all Local Authorities (LAs) are obliged to review and assess air quality. The Air Quality Strategy (AQS)[380] for England, Scotland, Wales and Northern Ireland,

[377] Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished document

[378] Suffolk County Council (2009): Waste Core Strategy Submission Final Sustainability Appraisal Report, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Minerals%20and%20Waste%20Development%20Framework/Waste%20Core%20Strategy/WCS%20Sustainability%20Appraisal%20Report.pdf

[379] HM Government (1995): Environment Act 1995, accessed at http://www.legislation.gov.uk/ukpga/1995/25/contents

published in January 2000 and revised in 2007, set out national air quality objectives. The UK monitors and models air quality to assess compliance with the air quality limit and target values set out in the EU legislation above. The results of the assessment are reported to the commission on an annual basis. If a LA finds any places where the objectives are not likely to be achieved, it must declare the area an Air Quality Management Area (AQMA).

Businesses within an AQMA may be affected by this designation due to:

- Road charging;
- Parking restraints;
- Increased restrictions on waiting and loading times;
- Taxes to encourage moving goods by rail; and
- The review of planning applications by a pollution control team.

For the purpose of monitoring and reporting air pollution, the UK has been divided into 43 zones. There are 28 agglomeration zones (large urban areas) and 15 non-agglomeration zones. New Anglia is situated within the 'Eastern' non-agglomeration zone.

Air pollution is described on a scale of 1-10 where one corresponds to 'Low' pollution and 10 corresponds to 'Very High' pollution[381]. At low levels of pollution, Defra recommends that people can enjoy their usual outdoor activities. This includes those at risk, such as adults and children with heart or lung problems. It is noted that very sensitive individuals may experience health effects even on 'Low' air pollution days. The overall air pollution index for a site or region is determined by the highest concentration of five pollutants which are considered to be of concern to human health. These are shown in Table 5.7.a.

Table 5.7.a: Air pollutants in the UK considered to be of concern to human health	
Sulphur dioxide	All non-agglomeration zones within the UK complied with the critical levels for annual mean and winter mean SO_2 concentration, set for protection of ecosystems. (These are not applicable to built-up areas).
Nitrogen dioxide	The majority of zones and agglomerations in the UK had locations with measured or modelled annual mean NO_2 concentrations higher than the annual mean limit value (40 µg m^{-3}). This included the Eastern zone which exceeded the annual mean limit value, or annual mean limit value plus margin of tolerance. All non-agglomeration zones within the UK complied with the critical level for annual mean NO_X concentration, set for protection of vegetation. Annual mean concentrations of NO_2 were typically lower in 2011 than in 2010. 2010 was a relatively high year for this pollutant; cold winter weather increased fuel use and therefore emissions.
PM10 Particulate matter (< 10µm)	All zones and agglomerations complied with the annual mean limit value of 40 µg m^{-3} for PM10.
PM2.5 Particulate	Annual mean concentrations of PM 2.5 were within the target value of 25 µg m^{-}

[380] Defra (2007): The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Department for Environment, Food & Rural Affairs, accessed at http://archive.defra.gov.uk/environment/quality/air/airquality/strategy/documents/air-qualitystrategy-vol1.pdf

[381] Defra website: About Air Pollution, accessed at: http://uk-air.defra.gov.uk/air-pollution/

matter (< 2.5µm)	^{3} in all zones and agglomerations.
Ozone:	For ozone, there is a target value based on the maximum daily 8-hour mean. There is also a long-term objective for protection of human health, based on the maximum daily 8-hour mean. All 43 zones and agglomerations were compliant with this target value. However, all 43 zones and agglomerations were above the Long-Term Objective (LTO) for health.
Source: Defra (2012): Air Pollution in the UK 2011, Department for Environment, Food & Rural Affairs, accessed at http://uk-air.defra.gov.uk/library/annualreport/viewonline?year=2011_issue_2	

Air Quality Forecasts are issued on a regional basis for three different area types:

- In towns and cities near busy roads;
- Elsewhere in towns and cities; and
- In rural areas.

The UK is currently facing a case in the UK Supreme Court over its failure to cut air pollution in line with legal limits. It is suggested that some parts of the UK, such as London, will not reach compliance until between 2020 and 2025. Pollution from road traffic, particularly diesel fumes, is the most significant cause of poor air quality in most cities. Defra also notes that pollution blown over from Europe and the Sahara contributes to air pollution. Agriculture also contributes significantly to emissions of greenhouse gases and other pollutants, as well as being one of the sectors which any potential climate change will affect the most[382]. Nitrous oxide and methane are the most significant greenhouse gases from farming. Agriculture is responsible for 66% of the UK's nitrous oxide emissions and 46% of UK methane emissions[383]. Other contributors to air pollution include food manufacturing, engineering, printing and paper trade as well as the growing service sector which all impact air quality to some extent. However, emissions from industry have improved and air quality in urban areas tends to be most affected by local road traffic[384].

In 2008 Norfolk had five AQMAs. Four of these have been declared to be due to nitrogen dioxide (NO_2), caused principally by road traffic; three of these AQMAs are located in Norwich and one is in King's Lynn. One AQMA has been declared near East Wretham due to elevated levels of particulate matter (PM10); investigation by Breckland District Council has demonstrated that the most likely cause of this is wind-blown soil. Planning permission will only be granted in areas nearing AQMA threshold limits if an Air Quality Impact Assessment shows that the

[382] Defra (2012): Air pollution from farming: preventing and minimising, Department for Environment, Food & Rural Affairs, accessed at: https://www.gov.uk/reducing-air-pollution-on-farms

[383] Defra website: About Air Pollution, accessed at: http://uk-air.defra.gov.uk/air-pollution/

[384] Environment Agency (2008): Environmental report: strategic environmental assessment of the draft river basin management plan for the Anglian river basin district: appendices, accessed at http://www.environment-agency.gov.uk/static/documents/Research/Environmental_report_appendices.pdf

development in question and its associated activities would not increase air pollution to unacceptable levels, as defined in the National Air Quality Strategy[385].

Air quality in Suffolk is generally good with highly localised exceptions associated with concentrations of road traffic in town centres. Measured particulate pollution is within national limits, but there are currently nine AQMAs across the county reflecting local concentrations of the irritant gas nitrogen dioxide reaching the threshold. Four of these are in Ipswich and the remainder are in Woodbridge, Sudbury, Newmarket, Felixstowe and Great Barton[386]. There is ongoing Investment into methods for reducing air pollution. Increased knowledge of air quality, as well as new programmes which can be implemented to benefit air quality, bring potential for improvements. For example the green infrastructure approach may help to reduce the urban heat island effect, energy conservation, carbon sequestration and improve air-quality[387]. Furthermore, the installation of a new Urban Traffic Management Control (UTMC) system in Ipswich will help to reduce air quality problems. This system is computer controlled allowing reactive traffic management. According to Travel Ipswich the system will be able to[388]:

- Coordinate traffic signals;
- Operate variable-message signs to give drivers information on special events, or warnings of congestion or accidents;
- Give real time information to bus passengers;
- Make it possible to give late running buses priority at junctions; and
- Monitor air quality.

Air quality in urban areas tends to be most affected by local road traffic movements. Until 2007 any improvements in air quality were offset by the growth in vehicle numbers[386]. Since 2007 the number of vehicles has fallen slightly and vehicle emission standards are becoming tighter. However, New Anglia is home to major UK ports, namely Felixstowe, where potential growth in port activity has been predicted. Increased port activity may ultimately increase traffic flow through the region.

Progress has been made which may have the potential to counteract the negative impacts which may arise due to increased port activity. For example, the port of Felixstowe announced improvements in all its key environmental measures in 2011, including carbon emissions and

[385] Norfolk County Council (2010): Norfolk Minerals and Waste Development Framework, Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2013, accessed at http://www.norfolk.gov.uk/consumption/groups/public/documents/general_resources/ncc078476.pdf

[386] Suffolk Observatory (2011): The State of Suffolk Report: The Environment, accessed at http://suffolkobservatory.info/JSNASection.aspx?Section=77&AreaBased=False

[387] UK NEA (2011): Synthesis of Key Findings, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

[388] Travel Ipswich website, Urban Traffic Management Control, accessed at http://www.travelipswich.co.uk/urban-traffic-management-control/

air quality[389]. In addition, it is suggested that there is scope to follow the European model by extending the ports' hinterland though port-centric logistics (a distribution centre that is located at a port as opposed to inland) which would reduce costs and bring green benefits. This opportunity may not only reduce the potential air pollution in the New Anglia region but further afield as well. It has the potential to bring green benefits to many downstream sectors which use the port in their supply chain.

Advancements in the clean energy sector may positively impact air quality. In recent years emissions from industry have improved and become more stable. The clean energy sector has the potential to reduce air pollution in multiple sectors of the economy and on a broader scale than just the New Anglia region. Work is currently being carried out in this regard. The New Anglia LEP commits to working with relevant organisations to drive investment in, and national lobbying on, micro-generation and renewables. The aim is to help the New Anglia region become a net exporter of renewable energy.

Another factor which may be significant for the New Anglia LEP is the potential growth in the agricultural sector. Agriculture contributes significantly to emissions of greenhouse gases and other pollutants (particularly nitrous oxide and methane) as previously indicated. The Environment Agency provides a website showing air quality in the UK[390].

5.8.Noise

Sounds can be physically described in terms of their loudness, frequency and duration. Noise, or unwanted sound, can bring with it negative effects, but can also be regulated by ecosystems. Actual spatial measurements of noise are very limited, but national models consistently suggest that noise and visual intrusion have increased as urbanisation, including road traffic, has increased. Table 5.8.a shows how the areas disturbed by noise and visual intrusion have increased in the East of England since the 1960s. In addition, Figure 5.8.a provides a visual representation of the increasing areas disturbed by noise and visual intrusion.

Table 5.8.a: Disturbed and undisturbed areas by noise and visual intrusion in the East of England

Data for East of England (19,574.10 km²)	Early 1960s		Early 1990s		2007		% change 1960s - 1990s	% change 1990s - 2007
	Disturbed area (km²)	% of region	Disturbed area (km²)	% of region	Disturbed area (km²)	% of region		
Disturbed areas	4,275.67	21.84%	7,549.64	38.57%	9,714.99	49.63%	76.57%	28.68%
Undisturbed areas	14,791.58	75.57%	11,472.83	58.61%	9,859.11	50.37%	-22.44%	-14.07%

Source: Land Use Consultants (2007): Developing an Intrusion Map of England. Report for CPRE (Campaign to Protect Rural England), accessed at http://www.cpre.org.uk/resources/countryside/tranquil-places/item/1790-developing-an-intrusion-map-of-england

[389] Hutchison Ports (UK) (2011): Ship2Shore: Issue 11, accessed at http://www.portoffelixstowe.co.uk/common/publications/documents/ship2shore/issue11.pdf

[390] The Environment Agency: Air pollution, accessed at http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=airpollution

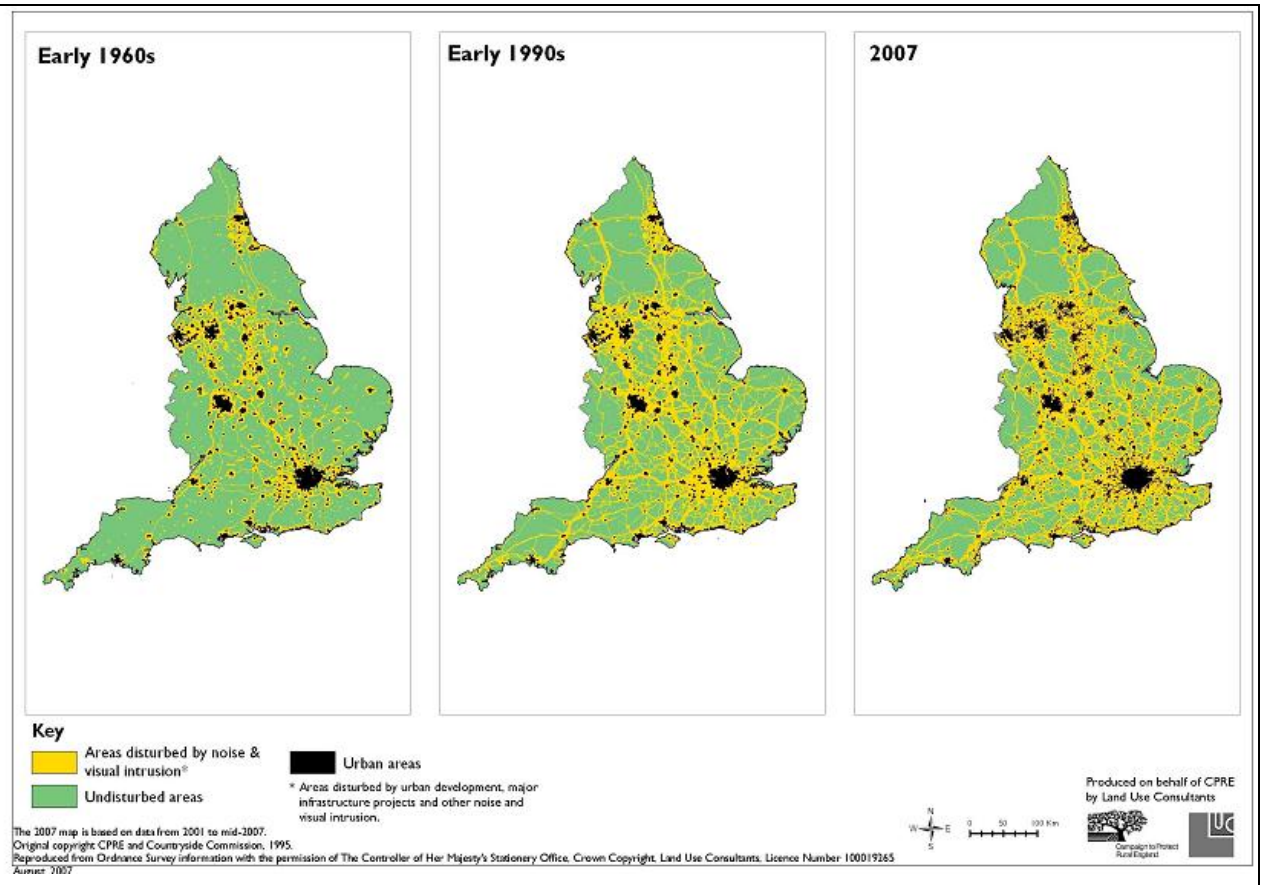


Figure 5.8.a: National Intrusion Maps
Source: Land Use Consultants (2007): Developing an Intrusion Map of England. Report for CPRE (Campaign to Protect Rural England), accessed at http://www.cpre.org.uk/resources/countryside/tranquil-places/item/1790-developing-an-intrusion-map-of-england

Road traffic is considered to be the main source of noise in the UK[391]. The main driver for the increase in disturbance has therefore been the increase in population, transport and urban development[392].

The growing UK population poses a threat to the environment with regards to levels of noise and visual intrusion. The Office for National Statistics (ONS) suggests that the UK population increased by 3.1 million between 2001 and 2010. In addition, the mean distance travelled per person per year increased and these trends are expected to continue. The Department of Transport (2004) predicts a 40% increase in road traffic in England by 2025 compared to 2000. The Department of Transport also predicts a two to three-fold increase in the demand for air flights over the same period[392].

[391] Grimwood, C (2002): Trends in environmental noise. Clean Air, 30 (1) pp15–20

[392] UK NEA (2011): Chapter 14 Regulating Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=XPPBQJuWlzk%3d&tabid=82

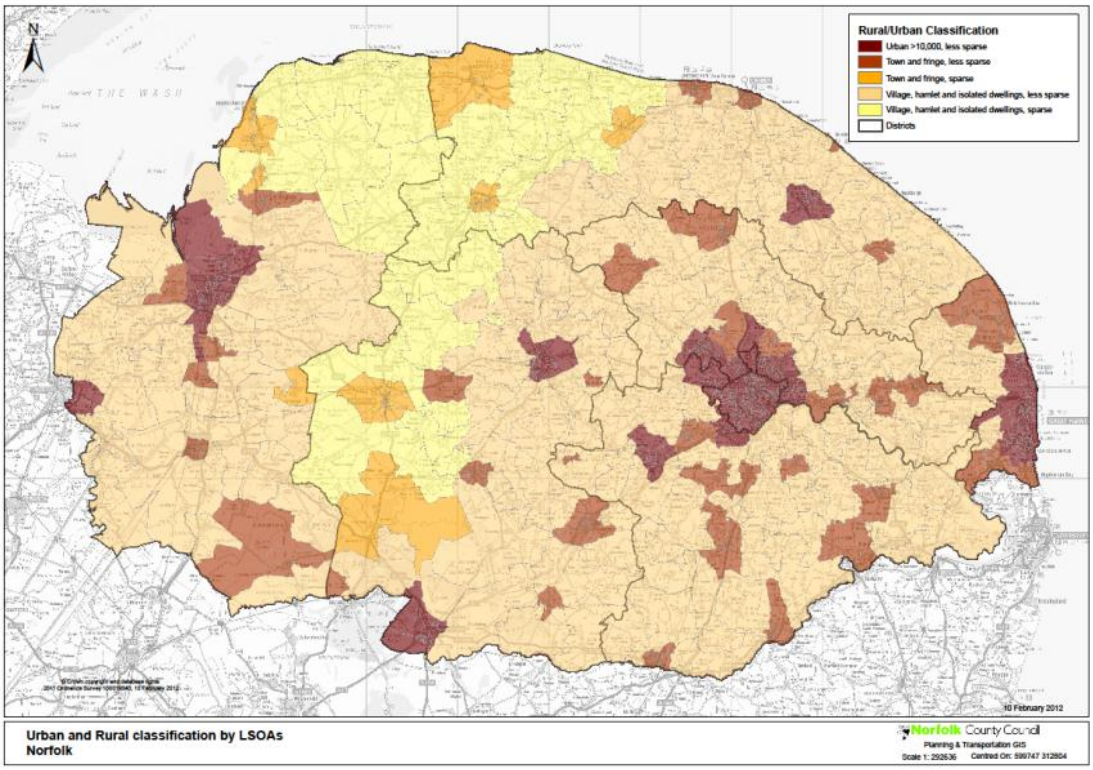
Population trends in the East of England are likely to have an impact on noise pollution in the New Anglia region. The ONS provides data on population trends, in mid-2011 the total population in the East of England was 5.9 million; 11% of the total population of England[393]. Within England, between 2001 and 2010, the East of England saw the highest percentage increase in population at 8%, compared to the English average of 5.6%[394]. A more recent study found that between 2001 and 2011, the region had the second highest percentage increase in population at 8.6%, compared with the English average for the same period at 7.4%[395]. The region has a high population growth rate and this trend is set to continue. According to the ONS 2008 based projections, by 2030 the population in the region may have increased by 19.5% to almost 7 million residents. However, more recent projections made in 2011 suggest that the region may have almost 6.5 million residents by 2021 (10.2% more than in 2011)[395, 393]. Figures 5.8.b and 5.8.c show the rural and urban areas of Norfolk and Suffolk.

[393] ONS (2013): Regional Profiles - Population and Migration - East of England, March 2013, Office for National Statistics, accessed at: http://www.ons.gov.uk/ons/dcp171780_301596.pdf

[394] ONS (2011): Regional Profiles - Population and Migration - East of England, October 2011, Office for National Statistics, accessed at: http://www.ons.gov.uk/ons/dcp171780_234372.pdf

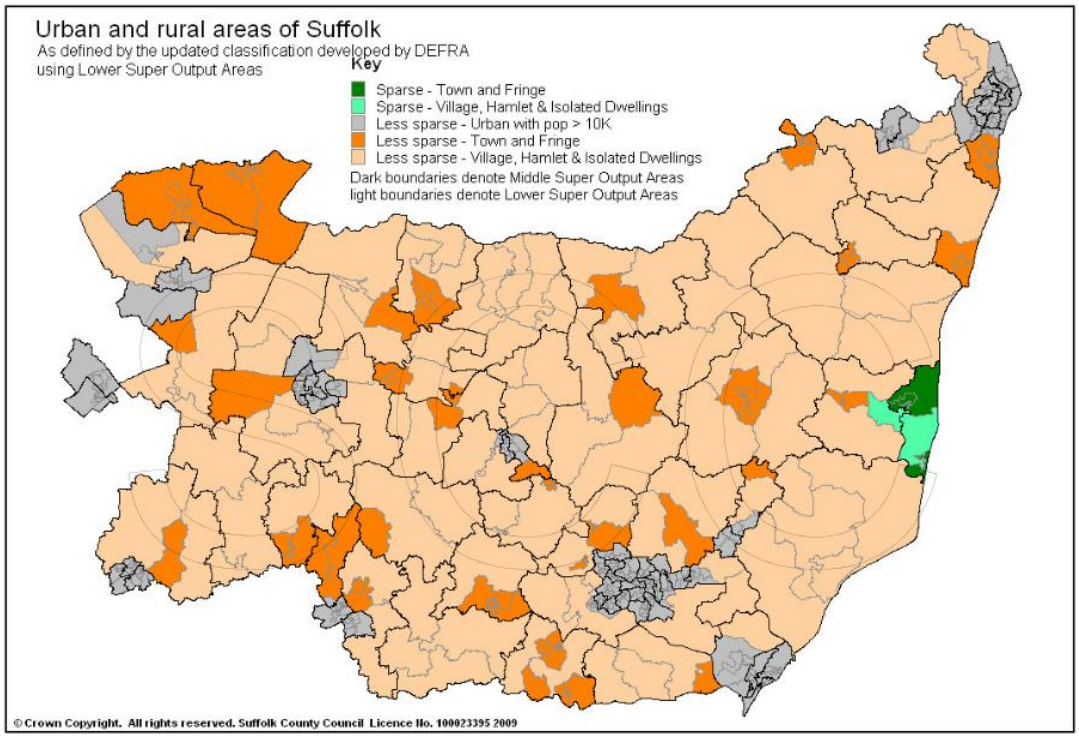
[395] UK NEA (2011): Chapter 14 Regulating Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=XPPBQJuWlzk%3d&tabid=82

Figure 5.8.b: Rural and Urban areas of Norfolk



Source: Norfolk County Council (2012): Norfolk - Place and People: an evidence base to support the County Council Plan, accessed at: http://www.norfolk.gov.uk/view/ncc090847

Figure 5.8.c: Rural and Urban areas of Suffolk



Source: Suffolk County Council (2012): Suffolk Diversity Profile 2012, accessed at: http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Your%20Council/Plans%20and%20Policies/Equality%20and%20Diversity/2013_01_03%20Suffolk%20Diversity%20Profile%20Final.pdf

Increased traffic may result not only from population growth but also through growth in industry. The tourist industry in the New Anglia region is set to expand which would add to the flow of transport across the region. In addition, the potential increase in port activity would also increase traffic flow which would result in increases in noise levels.

There is also the possibility of knock-on negative impacts for tourism as increased noise in certain areas may affect the areas image of tranquillity, such as eco-tourism or bird watching.

Increased knowledge and studies on noise and noise pollution as well as methods to mitigate it may reduce the impact of noise on surrounding areas. For example, the presence of vegetation reduces the extent to which sound carries around urban areas[396], when planted close to a road, a dense 10m deep row of trees reduces noise levels by 8 decibels compared to a hard surface[397]. Retaining areas undisturbed by noise may prove advantageous to the New Anglia region. People actively value natural sounds such as birdsong, and leaves rustling, and these are judged to contribute to tranquillity[398].

5.9.Pollination

A vast amount of the environment is reliant on biotic pollinators (bees and other insects such as butterflies and hoverflies), both in terms of commercially grown crops and the wildflowers which shape the natural landscape. The value of pollinators in the UK to commercial crops was estimated at around £430 million in 2007[397].

There are a number of commercial crops which are dependent on insect pollinators, such as apples, pears and oilseed rape, the latter is often used as a biofuel. Pollinator-dependent crops made up around 20% of the total UK cropped area in 2007[397]. In 2010 around 10% of the total crop cover in Norfolk and Suffolk was that which relies on pollinators (Table 5.9.a). This is below the UK average, but this estimate is likely to be an underestimate (as other vegetables were not included in the analysis). However, it is likely that the figure would be lower than the national average considering the fact that a large proportion of Norfolk and Suffolk crops are cereals[399].

[396] Bolund, P & Hunhammar, S (1999): Ecosystem services in urban areas. Ecological Economics, 29 pp293-301

[397] UK NEA (2011): Chapter 14 Regulating Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=XPPBQJuWlzk%3d&tabid=82

[398] Grimwood, C (2002): Trends in environmental noise. Clean Air, 30 (1) pp15–20

[399] Defra (2010): Local authority breakdown for key crop areas and livestock numbers on agricultural holdings, Department for Environment, Food & Rural Affairs, accessed at https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

Table 5.9.a: Pollinator–reliant crop cover in 2010 (ha)			
Crop	**Norfolk**	**Suffolk**	**Total**
Oilseed rape	26,954	27,389	54,343
Top Fruit	581	491	1,072
Small fruit	1,048	173	1,221
Hardy Nursery stock [a]	584	206	790
Crops grown under glass/plastic [b]	119	11	130
Total arable crops [c]	280,048	206,834	486,882
Total horticultural crops [d]	13,749	6,785	20,534
Total crops	459,436	344,630	804,066
Percentage of pollinator-reliant crops	10	13	11
Source: Defra (2010): Local authority breakdown for key crop areas and livestock numbers on agricultural holdings, Department for Environment, Food & Rural Affairs, accessed at https://www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june Notes: [a] includes bulbs and flowers grown in the open; [b] includes fresh vegetables, melons, strawberries, flowers and ornamental plants; [c] also includes cereals, potatoes, field beans, peas for harvesting dry, crops for stockfeed, maize, bare fallow land; [d] also includes peas and beans, all other vegetables and salad.			

The reliance on biotic pollinators varies by crop type. The percentage of pollinator-reliant crops is likely to be an underestimate, as some other vegetables are reliant on pollinators, together with some varieties of beans and also certain fodder crops such as clover.

Some commercial crop growers keep bee hives to pollinate their crops, however, considering that all registered bee hives in the UK would only be sufficient to pollinate up to one third of the pollination services required, wild bee populations and other invertebrate pollinators are essential. Overseas pollinators are also important to the UK economy, as a large proportion of our food stuffs reliant on pollinators are imported.

As well as commercial crops, pollinating insects also maintain a vast array of wildflowers, which in turn produce seeds and fruit which other wildlife relies upon. The benefits of pollinators to the environment therefore also maintain the aesthetic, cultural and recreational uses which we derive from it.

Declines in managed bee populations have been occurring in the UK and Europe. The reasons for this decline may be attributed to many factors, including the decline in the keeping of bees for 'own use' and higher proportions of the rural population working in urban areas[400]. The costs associated with treating bee diseases may also be a factor. The decline in bumblebee populations in the UK have largely been attributed to the changing use of the landscape, with

[400] Potts, et al (2010): Declines of managed honey bees and beekeepers in Europe. Journal of Apicultural Research, 49 (1) pp15-22

more intensive agricultural practices often causing a decline in wildflowers[401]. Another major threat has been an increase in ecto-parasites and diseases affecting honeybee populations, some of which are impossible to eradicate[402]. Increases in pesticides have also been attributed to declining bee populations[401], with increasing evidence that neonicotinoid based insecticides, some of the most widely used chemical pest control substances, are responsible for large declines in bee numbers. There is a growing lobby for the UK to support the proposed EU ban of neonicotinoids, which have already been banned in several European countries such as France and Italy[403]. The EU ban failed to pass on 15th March 2013, but the European Commission may still enforce the ban by taking it to an appeals committee[404].

Within Norfolk and Suffolk, there are a number of habitats which are important sources of nectar for pollinators (Table 5.9.b). Some of these habitats are particularly important early in the season as they support the insects that pollinate and fertilise commercial arable crops before the crops themselves are producing pollen and nectar[405]. The degree to which crops rely on insect pollinators depends on both species and cultivar. The interstitial habitats (e.g. the edges of farm tracks) become the key sources of both pollen and nectar where the landscape is dominated by arable crops.

Table 5.9.b: Habitats supporting important nectar sources for pollinating insects within National Character Areas

National Character Area (No.)	Habitat Type (area in ha where available)
North West Norfolk (76)	Heathland (700 ha) Lowland meadows (650 ha) Other semi-natural grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
North Norfolk Coast (77)	Heathland Acid grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
Central North Norfolk (78)	Heathland (765 ha) Forest-edge Acid grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
North East Norfolk and Flegg (79)	Heathland Forest-edge

[401] Bumblebee Conservation Trust: Why bees need our help, accessed at http://bumblebeeconservation.org/about-bees/why-bees-need-help/

[402] UK NEA (2011): Chapter 14 Regulating Services, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=XPPBQJuWlzk%3d&tabid=82

[403] The Soil Association: Help to keep Britain buzzing, accessed at http://www.soilassociation.org/supportus/keepbritainbuzzing

[404] Carrington, D (2013): Bee harming pesticides escape proposed European ban. The Guardian, accessed at http://www.guardian.co.uk/environment/2013/mar/15/bee-harming-pesticides-escape-european-ban

[405] Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished document

Table 5.9.b: Habitats supporting important nectar sources for pollinating insects within National Character Areas	
National Character Area (No.)	**Habitat Type (area in ha where available)**
	Acid grassland habitats Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
The Broads (80)	Meadow Marsh Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
Suffolk Coast and Heaths (82)	Heathland (1,837 ha) Marshland Lowland meadow Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
South Norfolk and High Suffolk Claylands (83)	Lowland meadows Lowland heathland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
Mid Norfolk (84)	Lowland meadows Lowland heathland Calcareous grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
The Brecks (85)	Semi-natural habitat mosaic of heathland Forest-edge Acid grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
South Suffolk and North Essex Claylands (86)	Species-rich grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
The Fens (46)	Lowland meadows Lowland heathland Lowland calcareous grassland Where arable cropping dominates, interstitial habitats e.g. the edges of farm tracks
Sources: Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished document Natural England (2012): National Character Area profile, 85. The Brecks, accessed at http://www.naturalengland.org.uk/publications/nca/the_brecks.aspx Note: see Figure 5.5.a for location of National Character Areas	

The projected growth in housing developments over the next 20 years could have a negative impact on the proportion of wildflower habitats available for pollinators. However, there are opportunities for these developments to play a key role in the sustainable management of hedgerows, riverbanks, gardens and urban spaces to provide habitats and food sources for pollinators.

Another key growth sector for the LEP is agriculture. Given the predictions in population increase and the need for more local resilience in terms of food provision, this could have a direct impact on pollinators. More intensive crops, could mean an increase in the use of insecticides, which may have negative impacts on bee health.

The Government has set out a bee health plan, which aims to sustain the health of honeybees and beekeeping in England and Wales, with five main aims[406]:

- To keep pests, diseases and other hazards to the lowest levels achievable;
- To promote good standards of husbandry to minimise pest and diseases risks and contribute to sustaining honey bee populations;
- To encourage effective biosecurity to minimise risks from pests, diseases and undesirable species;
- To ensure that sound science underpins bee health policy and its implementation; and
- To get everyone to work together on bee health.

Maintaining and increasing grass margins and nectar-strips in areas of intense agriculture could significantly benefit bee and invertebrate populations[407]. This could be achieved through encouraging the uptake of agri-environment schemes. Increasing semi-natural habitat mosaics that provide early and late sources of nectar for pollinators would also benefit pollinators.

There is also a project underway which aims to link up important nectar sources by establishing wide strips of wildflower rich habitat. The B-Line initiative is being coordinated by Buglife and The Invertebrate Conservation Trust, who are piloting the scheme in Yorkshire[408].

[406] Defra (2009): Bee health, Department for Environment, Food & Rural Affairs, accessed at https://www.gov.uk/bee-health

[407] Natural England (2012): National Character Area profile, 85. The Brecks, accessed at http://www.naturalengland.org.uk/publications/nca/the_brecks.aspx

[408] Buglife: The B-Lines Project, accessed at http://www.buglife.org.uk/conservation/currentprojects/Habitats+Action/B-Lines/The+B-Lines+Project

6. Cultural services

6.1.1. Landscape

In Norfolk, landscapes of interest include the Norfolk Coast Area of Outstanding Natural Beauty (AONB) and the Broads National Park[409]. King's Lynn and West Norfolk Borough has five historically designated landscapes included on English Heritage's non-statutory national register of Parks and Gardens of Special Historic Interest (Houghton Hall, Hunstanton Hall, Sandringham House, Stradset Hall and The Walks) and Norfolk as a whole has 51 such designations[410]. Around 12% of Suffolk's landscape is designated as an AONB (Suffolk Coast & Heaths and Dedham Vale)[411].

Landscape character is what makes an area unique and comprises a distinct, recognisable and consistent pattern of elements; natural or human[412]. The Government is keen to enhance landscape character and encourages developers and local authorities to complete Landscape Character Assessments (LCAs) to identify features which give a locality a 'sense of place' and individuality[411]. Table 6.1.1.a shows characteristics identified from LCAs carried out by authorities within Norfolk and Suffolk, which suggests that the LEP area is made up of a variety of landscape types but is mainly rural, with wetlands and arable land interspersed.

Table 6.1.1.a: Landscape Character Assessment features identified for areas within Norfolk and Suffolk

Area name	Identified landscape features
South Norfolk	Predominantly rural; ranges from large open plateau landscapes to the more enclosed low-lying river valleys[1]
West Norfolk and King's Lynn	Mainly rural with a diverse and varied landscape; rolling farmland and high plateau are fringed by Norfolk Coast AONB, which is contrasted by parkland, woodland, fens, mudflats and saltmarshes[2]
North Norfolk	A landscape of open character, with uninterrupted views, the land use is primarily arable, typically bordered by single species hedgerows, with some large areas of pasture and rough grassland, interspersed with villages and farmsteads[3]
Waveney	A very varied part of Suffolk encompassing The Broads and Suffolk Coast & Heaths AONB, including wet meadows, reedbeds, estuarine valleys and acid heathland[4]

[409] Environment Agency (2008): Environmental Report – Strategic Environmental Assessment of the draft River Basin Management Plan for the Anglian river basin district, accessed at http://www.environment-agency.gov.uk/static/documents/Research/Environmental_report.pdf

[410] Chris Blandford Associates (2007): King's Lynn and West Norfolk Borough Landscape Character Assessment, Final Report. Report for King's Lynn and West Norfolk Borough Council, accessed at http://www.west-norfolk.gov.uk/pdf/Final%20LCA.pdf.

[411] Suffolk County Council (2007): Final Sustainability Appraisal Report. Report for the Minerals Core Strategy of Suffolk County Council's Minerals & Waste Development Framework, accessed at http://www.suffolk.gov.uk/assets/suffolk.gov.uk/Environment%20and%20Transport/Planning%20and%20Building/Minerals%20and%20Waste%20Development%20Framework/Minerals%20Core%20Strategy%20DPD/Final%20Sustanbility%20Appraisal%20Report.pdf

[412] Natural England: Landscape Character Assessment, accessed at http://www.naturalengland.org.uk/ourwork/landscape/englands/character/assessment/default.aspx

Table 6.1.1.a: Landscape Character Assessment features identified for areas within Norfolk and Suffolk	
Area name	**Identified landscape features**
Suffolk Coast & Heaths AONB	The area is characterised by low-lying coast and coastal features such as shingle beaches, spits, estuaries, marshes and mudflats[5]

Sources: [1]Chris Blandford Associates (2012): South Norfolk Council, South Norfolk Local Landscape Designations Review. Report for South Norfolk Council, accessed at http://www.south-norfolk.gov.uk/planning/media/11115101R_Final_DW_06-12.pdf
[2]Chris Blandford Associates (2007): King's Lynn and West Norfolk Borough Landscape Character Assessment, Final Report. Report for King's Lynn and West Norfolk Borough Council, accessed at http://www.west-norfolk.gov.uk/pdf/Final%20LCA.pdf
[3]North Norfolk District Council (2009): Landscape Character Assessment of North Norfolk, accessed at http://consult.north-norfolk.gov.uk/portal/planning/lca/draft_landscape_character_assessment?pointId=273373
[4]Land Use Consultants (2008): Waveney District Landscape Character Assessment, Final Report. Report for Waveney District Council, accessed at http://www.waveney.gov.uk/site/scripts/download_info.php?fileID=742
[5]Alison Farmer Associates (2012): Touching the Tide, Landscape Character Assessment Final Report, accessed at http://www.suffolkcoastandheaths.org/assets/Projects--Partnerships/Touching-the-Tide/FinalReport.pdf

The LCA for King's Lynn and West Norfolk identified a range of drivers for change which will affect the landscape character of the study area however they are also relevant to Norfolk and Suffolk as a whole[413]. The key forces identified sit under the following main headings:

- Agriculture, land management and diversification;
- Socio-economic characteristics;
- Infrastructure, transport and traffic;
- Built development;
- Tourism and water-based recreation;
- Climate change; and
- Renewable energy.

Agriculture is a significant industry within the New Anglia area which shapes the character of the landscape. Historically farming practices have played a crucial role in shaping the landscape we know and value today, however changes in practices and fluctuations in the agricultural economy can have adverse effects. Intensification of farming practices requires the removal of hedgerows to create larger fields with the subsequent loss of the 'patch-work' countryside, whilst increased use of pesticides brings about losses of unique agricultural flora and fauna[414]. Policies such as the Common Agricultural Policy (CAP) and initiatives such as the Environmental Stewardship Scheme aim to enhance or maintain the landscape character. The

[413] Chris Blandford Associates (2007): King's Lynn and West Norfolk Borough Landscape Character Assessment, Final Report. Report for King's Lynn and West Norfolk Borough Council, accessed at http://www.west-norfolk.gov.uk/pdf/Final%20LCA.pdf

[414] Alison Farmer Associates (2012): Touching the Tide, Landscape Character Assessment Final Report, accessed at http://www.suffolkcoastandheaths.org/assets/Projects--Partnerships/Touching-the-Tide/FinalReport.pdf

CAP safeguards the scenic value of the landscape by providing income support payments to farmers, allowing them to adopt environmentally sustainable farming methods such as leaving field boundaries uncultivated, creating ponds and other landscape features and planting trees and hedges[415].

The social and economic characteristics of the area play an important role in the process of future change and regeneration. There have been changes in the structure and type of employment in recent years, with a move from traditional manufacturing and agriculture to service industries such as retail, tourism and office work. There has also been increased development of regional shopping centres, out-of-town retail parks and extended opening hours[416].

Infrastructure, transport and traffic are features of most British landscapes. Increased car usage has resulted in congestion, pollution and the need for new roads, all of which have the potential to adversely affect the landscape. Most notable is the construction of new roads and the ensuing infrastructure such as lighting and earthworks, improvements to existing roads such as widening and straightening and increased parking provision.

There is pressure to develop the region in order to meet housing, employment and transport needs[417]. This necessity has resulted in urban expansion, intensification of urban areas and the development of infrastructure such as sewage works and waste disposal facilities on the urban fringe. Many have the perception that development in general spoils the 'peace and tranquility' of a landscape[418].

Tourism plays an important role in the region's economy particularly in coastal areas, the Broads and the numerous 'traditional' villages. In recent years increasing numbers of people have been attracted to the region for tourism and recreational activities which can necessitate the expansion of accommodation facilities and results in habitat disturbance and truncation.

The inevitable but somewhat uncertain effects of climate change will have a major physical impact on the landscape character of the region. The East of England is particularly sensitive

[415] European Commission (2012): The Common Agricultural Policy: a partnership between Europe and farmers, accessed at http://ec.europa.eu/agriculture/cap-overview/2012_en.pdf

[416] Chris Blandford Associates (2007): King's Lynn and West Norfolk Borough Landscape Character Assessment, Final Report. Report for King's Lynn and West Norfolk Borough Council, accessed at http://www.west-norfolk.gov.uk/pdf/Final%20LCA.pdf

[417] Environment Agency (2008): Environmental Report – Strategic Environmental Assessment of the draft River Basin Management Plan for the Anglian river basin district, accessed at http://www.environment-agency.gov.uk/static/documents/Research/Environmental_report.pdf

[418] Eftec (2007): R105 – Valuing Transport's Impact on the Natural Landscape, Phase 1 – Draft Progress Report. Report submitted to the Department for Transport, Economics for the Environment Consultancy, accessed at http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CEQQFjAD&url=http%3A%2F%2Fwww.eftec.co.uk%2Fsearch-all-uknee-documents%2Feftec-projects%2Feftec-valuing-transports-impact-on-the-natural-landscape-143%2Fdownload&ei=XCVcUdm1Mum70QWc1oHIBA&usg=AFQjCNGeVdX43T6CynSRjG3-EX69gq7a_g

given the amount of low-lying land and sedimentary nature of the coastline. Increased sea levels may cause greater erosion of habitats and agricultural land which is located on reclaimed marshland, which may also suffer from saline intrusion. Other potential impacts are erosion of historic landscapes, increase of non-native species and loss of existing vegetation[419].

The East of England is set to significantly contribute to the national target for renewable energy generation. A study by LUC for the Broads Association concluded that The Broads are highly sensitive to large or very large scale wind turbines given its landscape character and other special qualities[420]. The landscape will also be marred should the growth of bio-fuels increase significantly[421].

Habitat creation also acts as a driver of landscape change. Lowland heathland is one of the most valuable habitats in Europe, however in recent years much has been lost to other land uses or neglect and is now recognised as a priority habitat within the UK Biodiversity Action Plan process[422]. Other habitat creation includes turf ponds at Oulton Marshes and the Fen Restoration project in Norfolk. Restoration or re-creation of habitats which provide a visually attractive landscape and are rich in cultural history will invariably enhance the landscape character of the area[423].

6.1.2. Recreation

Tourism within Norfolk and Suffolk is vital for the local economy. Between 2009 and 2011an average of around 3 million overnight trips were made to Norfolk each year, corresponding to approximately £435,000 spent. Around 1.6 million trips were made to Suffolk each year in that time which equated to around £143,000 spent. This includes all domestic overnight tourism

[419] Chris Blandford Associates (2007): King's Lynn and West Norfolk Borough Landscape Character Assessment, Final Report. Report for King's Lynn and West Norfolk Borough Council, accessed at http://www.west-norfolk.gov.uk/pdf/Final%20LCA.pdf

[420] LUC (2012): Broads Landscape Sensitivity Study for Renewables & Infrastructure: Broads Landscape Sensitivity Study for Renewables and Infrastructure. Report for Broads Authority, accessed at http://www.broads-authority.gov.uk/planning/landscape-character-assessment/landscape-studies/landscape-sensitivity-study-for-renewables-infrastructure.html

[421] Environment Agency (2008): Environmental Report – Strategic Environmental Assessment of the draft River Basin Management Plan for the Anglian river basin district, accessed at http://www.environment-agency.gov.uk/static/documents/Research/Environmental_report.pdf

[422] Norfolk Wildlfe Trust: Heathland, accessed at http://www.norfolkwildlifetrust.org.uk/Wildlife-in-Norfolk/Habitat-explorer/Heathland.aspx

[423] Eglington, S & Horlock, M (2004): East of England Heathland Opportunity Mapping Project, Final Report, accessed at http://www.forestry.gov.uk/pdf/eng-ee-heathland-mapping-report.pdf/$file/eng-ee-heathland-mapping-report.pdf

from business and holiday trips to visits to friends and relatives.[424] Tourism is worth £2.5 billion within Norfolk and Suffolk[425], with a Gross Value Added (GVA) of £1.3 billion (GVA per employee in 2010 was £19,013) and a business turnover of £5.4 billion in 2010[426]. The New Anglia Green Economy Pathfinder Manifesto indicates that tourism within Norfolk and Suffolk generates approximately £4 billion a year and is worth £3.4 billion. The Broads alone brought in £437 million in 2010 from 7 million people and angling generates around £20 million for the local economy[427].

Tourism accounts for around 10.5% of total employment in Norfolk and Suffolk, employing 67,697 people in total in 2010 in 5,445 businesses. This figure is an increase of 807 from 2008[428]. Within Norfolk tourism supports more than 47,114 jobs, accounting for 13.3% of all employment in Norfolk[424]. Tourism accounts for 17.3% of businesses in the Norfolk Coast AONB and 16.3% of the Suffolk Coast and Heaths AONB, supporting around 3,400 jobs in these areas[425]. Within Norfolk 9% of the main and second job employment was within tourism characteristic activities in 2010/11. 5.4% was within accommodation and food/beverage serving activities and 3.6% within passenger transport, vehicle hire, travel agency, cultural, recreational and sporting and conference activities. In Suffolk 8.3% of main and second job employment was within tourism characteristic activities in 2010/11, 4.3% in accommodation and food/beverage serving activities and 4% within passenger transport, vehicle hire, travel agency, cultural, recreational and sporting and conference activities[429].

Recreational activities within the New Anglia area also contribute indirectly to the local and national economy as when people have good access to green space they are 24% more likely to be physically active which saves approximately £2.1 billion for the UK's annual health budget[430].

The most popular areas for tourists to visit within the East of England were Norwich, Great Yarmouth and North Norfolk in 2010, of these the visitors to North Norfolk are most likely to be

[424] VisitEngland: England Local Authority, County and Towns 2006-2011., accessed at www.visitengland.org/insight-statistics/major-tourism-surveys/overnightvisitors/Index/Regional_Results_2011

[425] Visit Norfolk: Tourism in Norfolk Strategy 2009-2012, accessed at http://mediafiles.thedms.co.uk/Publication/ee-nor/cms/pdf/TIN%20Strategy.pdf

[426] NewAnglia LEP for Norfolk and Suffolk (2013): Sector Growth Strategy, accessed at http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[427] Natural England (2012): Valuing Ecosystem Services: Case studies from lowland England, Annex 2: Reconnecting the Broads and fens: Norfolk, accessed at http://publications.naturalengland.org.uk/publication/2319433.

[428] Visit Norfolk: Tourism in Norfolk Strategy 2009-2012, accessed at http://mediafiles.thedms.co.uk/Publication/ee-nor/cms/pdf/TIN%20Strategy.pdf

[429] ONS (2012): The Geography of Tourism Employment, Office for National Statistics, accessed at http://www.ons.gov.uk/ons/rel/tourism/the-supply-side-of-tourism/the-geography-of-tourism-employment/rpt-tourgeog.html

[430] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

those attracted by the natural environment as this area is mostly rural. In 2011 Norwich was the 18th most visited town in England, with approximately 934,000 trips and £128 million spent by visitors[431]. More day trips were made to urban areas (15 million trips spending £697 million) than the countryside (7 million trips spending £265 million) or coast (4 million trips spending £136 million) in 2010 in Norfolk[432]. Despite this the natural environment is a major attraction for visitors to Norfolk and Suffolk, particularly the Broads, Brecks, Fens and AONBs[433]. The Broads had 7 million visits in 2009 (both day and overnight visits)[434]. Values for visits to the countryside may be underestimates as it is more difficult to record the numbers of visitors to the natural environment, and they often spend less. Tourism South East listed the strengths of Norfolk regarding tourism and many of those were related to the natural environment. These include[435]:

- The Broads, the coast (AONB) and the countryside;
- Coastline, AONB beaches and water sports;
- Biodiversity;
- Environmental diversity including special areas of conservation and wildlife assets;
- National park;
- Heritage features including maritime heritage, historic buildings, churches;
- Attractive towns and villages with their countryside hinterland; and
- Established boating destination.

Tourism South East also indicated that Norfolk is one of the most important bird watching destinations in the UK, and is popular with walkers and cyclists. Norfolk has more than 1,200 miles of lanes which count as green infrastructure and encourage tourists to use the countryside on foot which releases less greenhouse gases[436]. The countryside has been shown to be important nationally for tourism as, in 2005, 19% of people surveyed visited the countryside

[431] VisitEngland (2011): Most Visited English Towns 2011, Great Britain Tourism Survey, accessed at http://www.visitengland.org/Images/Top%20Towns%20-%20By%20Trip%20Purpose_v2_tcm30-33063.pdf

[432] Tourism South East (2010): Economic Impact of Tourism: Norfolk County 2010 Results. Report for VisitNorfolk, accessed at http://mediafiles.thedms.co.uk/Publication/ee-nor/cms/pdf/2010%20VolumeValue.pdf

[433] NewAnglia LEP for Norfolk and Suffolk (2013): Sector Growth Strategy, accessed at http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[434] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

[435] Tourism South East (2010): Economic Impact of Tourism: Norfolk County 2010 Results. Report for VisitNorfolk, accessed at http://mediafiles.thedms.co.uk/Publication/ee-nor/cms/pdf/2010%20VolumeValue.pdf

[436] Tim Lidstone-Scott (2013) Senior Trails Officer for Norfolk County Council, personal communications

and people were more likely to go walking than leisure shopping. Walking was the joint first most popular activity, along with eating/drinking out[437].

The LEP area features numerous water and land-based recreational resources which are a fundamental factor in enhancing the quality of life of those people visiting and living in the area. Examples include the Peddars Way, Viking Way and Norfolk Coast Path, various bathing waters, many waters offering good angling opportunities, the Norfolk Broads, etc[438]. The coastline around Norfolk and Suffolk attracts many tourists with around 37 designated bathing water beaches in the area. In 2007, 73.7% met the UK bathing water guideline standard and 76.3% met the EU bathing water guideline standard. No beaches failed the mandatory standard. There were also 14 beaches with Blue Flag status. Norfolk's coast also has a very popular coastal path and coast hopper bus service which are used by around 80% of walkers[439]. The Natural England initiative for coastal access aims to improve access to the English coast, and has plans to create paths along the Suffolk coast which will increase tourism in these areas[440]. The link between footpaths and tourism is well recognised, for example by the creation of a 12-mile footpath heralding a boost in tourism on the Wensum Way[441].

Table 6.1.2.a shows the visitor attractions listed by VisitEngland within Norfolk and Suffolk and the number of visitors to each in 2010. Of the top 20 tourist attractions by number of visitors, eight include aspects of the natural environment and many of the others are enhanced by aspects of the natural environment.

Table 6.1.2.a: Top 50 tourist attractions in Norfolk and Suffolk by number of visitors in 2010 (attractions dependent upon the quality of the natural environment are highlighted in green)

Attraction	Number of visitors
Holkham Hall	800,000
Needham Lake and Nature Reserve	310,000
Dunwich Heath Coastal Centre and Beach	200,000
Norwich Castle Museum and Art Gallery	176,446
BeWILDerwood	160,198
The Poppy Line (North Norfolk Railway)	143,761
Blickling Hall, Gardens and Park	135,000
Felbrigg Hall, Garden and Park	94,364
St Edmundsbury Cathedral	86,279
RSPB Minsmere Nature Reserve	85,415
Oxburgh Hall	71,288

[437] Research International (2006): England Leisure Visits: Summary of the 2005 Leisure Visits Survey. Report for the ELVS Consortium

[438] Environment Agency (2008): Anglian River Basin District Environmental Report: Appendices, accessed http://www.environment-agency.gov.uk/static/documents/Research/Environmental_report_appendices.pdf

[439] Tim Lidstone-Scott (2013) Senior Trails Officer for Norfolk County Council, personal communications

[440] Natural England: Improving coastal access report, accessed at http://www.naturalengland.org.uk/ourwork/access/coastalaccess/improvingcoastalaccessreport.aspx

[441] EDP24 (2013): New Wensum Way footpath will fill in 'missing link' in Norfolk Trails network, accessed at http://www.edp24.co.uk/news/environment/new_wensum_way_footpath_will_fill_missing_link_in_norfolk_trails_network_1_1830795

Table 6.1.2.a: Top 50 tourist attractions in Norfolk and Suffolk by number of visitors in 2010 (attractions dependent upon the quality of the natural environment are highlighted in green)	
Attraction	**Number of visitors**
RSPB Titchwell Marsh Nature Reserve	68,000
Gressenhall Farm and Workhouse	67,082
Framlingham Castle	66,531
Christchurch Mansion	60,515
Thrigby Hall Wildlife Gardens	59,815
The Amber Museum	50,000
Merrivale Model Village	47,778
Amazona Zoo	41,065
Walsingham Abbey Grounds	40,000
Norfolk and Suffolk Aviation Museum	39,347
Orford Castle	35,620
Lavenham Guildhall	34,394
Fairhaven Woodland and Water Garden	32,312
West Stow – The First English Village	31,954
Time and Tide Museum	31,675
The Muckleburgh Collection	30,586
RSPB Lakenheath Fen Nature Reserve	28,000
Mississippi Boat Trip	27,827
Alby Crafts and Gardens	27,000
Moyse's Hall Museum	26,708
Cromer Museum	25,200
Wells and Walsingham Light Railway	20,000
Dunwich Museum	19,813
Castle Acre Priory	18,332
Houghton Hall	18,227
East Anglia Transport Museum	17,801
St Peter's Brewery and Visitors Centre	15,000
Grimes Graves	13,826
Lynn Museum	10,329
Church of St Peter and St Paul	10,000
Hoveton Hall Gardens	8,917
Ancient House Museum of Thetford Life	8,896
Lowestoft Museum in Broad House	8,558
Orford Ness National Nature Reserve	8500
Orwell River Cruises Limited	7,745
Nelson Museum	6,132
Stow Windmill	6000
Martlesham Heath Control Tower Museum	5,600
Walpole St Peter's Church	5,000
Source: VisitEngland (2010): Visitor Attractions Trends in England 2010: Annual Report, accessed at http://www.visitengland.org/Images/Final%20report_tcm30-27368.pdf	

Of the residents within Norfolk 14% of them had visited the natural environment within the last seven days for health and exercise when surveyed in 2010. This value is slightly higher in Suffolk at around 15% (weighted estimate of the proportion of residents in each area taking a

visit to the natural environment for health and exercise reasons). This places Norfolk and Suffolk within the third quartile in the country for people using outdoor places[442].

Tourism within the LEP area can be affected by both internal and external factors. Threats to tourism in Norfolk and Suffolk include; changes to the water quality at beaches, flood risk, climate change and lack of accommodation. Water quality can be decreased by the presence of faecal contaminants, the presence of faecal indicator organisms in the water can be caused by storm evens releasing these organisms from soils. Water quality could also be affected by contamination from farmland and urban runoff which may increase due to climate change because of compacted soils and less frequent but more intense summer rainfall events[443]. The coastline around Norfolk is eroding at a rate of between 1 and 3 m per year[444]. Erosion coupled with rising sea levels and storm events may lead to a significant risk of flooding, which will reduce the appeal of the area to visitors. The changing climate and rising sea levels may cause salt water to enter the rivers and change the ecology of the habitats within the Broads[445], as these areas are a major attraction for tourists this could lead to a decrease in tourism. Deterioration of the natural environment through pests or diseases such as ash die back may reduce the number of tourists as the area is no longer perceived as being as pleasant. Lack of accommodation in some areas, such as Southwold and Aldeburgh will limit visitor numbers, and the quality of the accommodation within this area is in need of improvement[446].

The main threats to the environment from tourism are the increased pressure on resources, and habitat disturbance. As the number of tourists visiting Norfolk and Suffolk increases (Norfolk County Council anticipates a growth of around 38% between 2010 and 2011), the pressure on resources such as water and infrastructure will increase. This will affect both the environment and people as the facilities may deteriorate. This threat is being addressed by the Environment Agency which has already produced Catchment Abstraction Management Strategies. Increased numbers of tourists within the area may increase the damage caused to the natural environment via disturbance and trampling, this may reduce the appeal of the area.

[442] Natural England (2012): MENE PHOF 1.16 map of results, accessed at http://www.naturalengland.org.uk/Images/MENE-PHOF-results-map_tcm6-33881.pdf

[443] Environment Agency (2009): River Basin Management Plan Anglian River Basin District, Annex H: Adapting to climate change, accessed at http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/gean0910bspu-e-e.pdf

[444] Environment Agency (2013): Long term planning: North Norfolk Coast, accessed at http://www.environment-agency.gov.uk/research/planning/108980.aspx

[445] Broads Authority: Climate Change, accessed at http://www.broads-authority.gov.uk/managing/climate-change.html

[446] NewAnglia LEP for Norfolk and Suffolk (2013): Sector Growth Strategy, accessed at http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

Tourism South East listed factors currently considered to be limiting tourism within Norfolk, including[447]:

- Poor transport links & perceived inaccessibility;
- Tourism product is not of consistent quality;
- Seasonality. There is a relatively short main season;
- Poor interpretation at attractions/trails etc.;
- Signage;
- Fragmented marketing approach;
- Declining boating holiday market;
- Low international awareness;
- Lack of market intelligence e.g. visitor survey, trends in holiday taking;
- Lack of understanding of coast and countryside as a product resource; and
- Perception of Norfolk as flat, cold, wet and windy (anecdotal).

Both external and internal factors provide opportunities to tourism. An increase in the area of semi-natural environment, which is one of the aspirations of the Green Economy Pathfinder, may increase tourism as the area will be considered more pleasant to visit[448]. The current economic climate may increase tourists to Norfolk and Suffolk as people consider cheaper holiday options and remain in the country rather than travelling abroad. Research by the Tourism Company for the Broads Authority determined that tourists' holiday choices and behaviour may be influenced by; the quality and nature of the environment in the destination and their concern for their own impact and those of others on the local and global environment[449]. This may lead to an increase in tourism within Norfolk and Suffolk as people avoid the impacts on the environment caused by travel overseas. Climate change may increase the holiday season due to a slight increase in temperature thereby increasing the tourism within the Norfolk and Suffolk area[450]. There is potential to link the Norwich Northern Distributor Road to the north coast road which would improve the accessibility to the area for tourists.

[447] Tourism South East (2010): Economic Impact of Tourism: Norfolk County 2010 Results. Report for VisitNorfolk, accessed at http://mediafiles.thedms.co.uk/Publication/ee- nor/cms/pdf/2010%20Volume Value.pdf

[448] NewAnglia LEP for Norfolk and Suffolk (2012): The Green Economy Pathfinder Manifesto, accessed at http://www.newanglia.co.uk/Assets/Files/Content/2012-06-08%20New_Anglia_Manifesto_art_lo-res.pdf

[449] The Tourism Company Ledbury (2006): The Broads: Market Opportunities From The Environment. Report for the Broads Authority, accessed at http://www.broads-authority.gov.uk/broads/live/managing/sustainable-tourism/FINAL_Market_ops_from_environment_report.pdf

[450] Broads Authority: Climate Change, accessed at http://www.broads-authority.gov.uk/managing/climate-change.html

Tourism provides opportunities for the natural environment as increased tourism will increase the money coming into Norfolk and Suffolk, some of which may be spent on protection and management of areas of the natural environment.

6.1.3. Aesthetics

When people undertake physical activities and interact with nature in environmental settings such as parks, rivers and the wider countryside there are many cultural benefits including aesthetic satisfaction, health improvements and an enhanced sense of spiritual well-being[451]. 'Green spaces' in urban areas have been associated with improved cognitive functioning and reduced levels of crime and aggression as well as providing an outdoor classroom. When valuing ecosystem services these benefits tend to be under-estimated, with the focus being on economic value, despite growing evidence that ecosystems can affect people's physical and mental health and quality of life. To the vast majority, loss of aesthetic services generates the perception of ecosystem degradation to a greater degree than more subtle changes such as increased flooding and pollution[452].

There is a deep sense of place within the counties of Norfolk and Suffolk as a result of the open, arable landscape, extensive coastline and remnants of wilderness in the form of heaths, salt marsh and woodland[453]. The landscape is interspersed with villages, farmhouses, large estates and historic buildings made from locally sourced material, such as flint and clunch. The landscape of The Broads is valued for its beauty and has an inherent social and community value, playing an important role in people's lives[454].

The Norfolk Coast and Suffolk Coast & Heaths are designated as Areas of Outstanding Natural Beauty (AONBS); key to this designation are the scenic qualities of the landscape, including the combination of landscape elements, aesthetic qualities, local distinctiveness and 'sense of place'[455]. The high quality natural environment, not only attracts visitors to the area, but is particularly important for artisans who use the area's environment and heritage as inspiration

[451] UK NEA (2011): Synthesis of Key Findings, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

[452] UK NEA (2011): Synthesis of Key Findings, UK National Ecosystem Assessment, accessed at http://uknea.unep-wcmc.org/Resources/tabid/82/Default.aspx

[453] Natural England (2013): Draft National Character Areas ecosystem services, Norfolk and Suffolk area, Natural England unpublished document

[454] Broads Authority (2006): The Norfolk and Suffolk Broads Local Development Framework: Core Strategy Development Plan Document: Preferred Options Report, accessed at http://www.broads-authority.gov.uk/authority/consultations/core-strategy/submission-core-strategy-dpd-consultation.html

[455] Norfolk Coast Partnership (2009): Norfolk Coast AONB Management Plan 2009-14, accessed at http://www.norfolkcoastaonb.org.uk/mediaps/pdfuploads/pd001158.pdf

for their work[456]. Maintaining the high quality environment will ensure that the area remains attractive to visitors and businesses.

The design of new buildings has a significant effect on the character and quality of an area[457]. The sense of place within Norfolk and Suffolk is threatened by poorly managed and designed developments which are a consequence of increasing economic activity in the region. There is a concern that the character of Norfolk has already been adversely affected by poorly designed modern developments. However there is the opportunity to conserve and enhance the unique landscape character and quality when renovating existing buildings and developing new infrastructure by promoting the use of traditional building materials and using local design guidance[458]. In the past planning authorities had limited influence over design matters but guidance for residential design has now been devised. The guide promotes an integrated approach to design with the end result being a pleasant and safe place to live in, which fits comfortably within the existing settings[459]. As well as the design of developments it is important to consider their impact on the landscape in terms of locality. Where possible developments should avoid replacing large swaths of countryside or areas where there has been little settlement historically.

The East Anglian region is set to play a significant part in the energy sector in the future, with plans to erect 1,200-1,800 wind turbines in the East Anglia Array wind farm, located 25km offshore. Although this brings opportunities for job creation, manufacturing and green energy generation to the area, the wind turbines and the pylons linking the farm to the mainland could be considered detrimental to the aesthetics of the area[460]. Similarly there are plans to decommission and build a nuclear power station at Sizewell in Suffolk. However this threat could be minimal given this structure is already in existence and is designed sensitively.

The region is also important agriculturally, with a growing population and pressure to increase outputs; agricultural practices need to be sensitive to the geometric field pattern established in the 18th century which is important to the overall 'sense of place'. This is also applicable to any increase in the growth of bio-fuel crops which provides opportunities for other key growth sectors.

[456] NewAnglia (2013): New Anglia local enterprise partnership for Norfolk and Suffolk: sector growth strategy, accessed at: http://www.newanglia.co.uk/Assets/Files/Content/New%20Anglia%20Sector%20Growth%20Report.pdf

[457] Norfolk County Council: Environment, accessed at http://www.norfolk.gov.uk/view/NCC030262

[458] Natural England (2012): National Character Area profile, 85. The Brecks, accessed at http://www.naturalengland.org.uk/publications/nca/the_brecks.aspx

[459] Norfolk County Council: Environment, accessed at http://www.norfolk.gov.uk/view/NCC030262

[460] Clarke, I (2011): Fears new pylons will scar Norfolk and Suffolk landscapes, EDP24, accessed at http://www.edp24.co.uk/news/politics/fears_new_pylons_will_scar_norfolk_and_suffolk_landscapes_1_787860

6.2.Health

In the case of Norfolk and Suffolk, the population of most communities is healthier and lives longer than the national average. This is expected to continue over the next 20 years. However, there are widening health inequalities in some communities[461].

Health is an important factor in any community. Poor mental and physical health can act as an obstacle for economic growth. Green infrastructure has been noted as one aspect, within a holistic approach, with which to tackle such issues[462]. There are a number of studies which show a statistically significant correlation between the quantity of greenspace within proximity of a population and positive health outcomes, both physical and psychological. As set out in the UK National Ecosystem Assessment (NEA)[463]: "Observing nature and participating in physical activity in greenspaces plays an important role in positively influencing human health and well-being and lowers the incidence of stress."

Those who live closer to greenspaces tend to use them more, benefitting from increased levels of open-air exercise and are healthier both physically and mentally in general. Findings from the UK NEA state that:

"Access to nature and greenspaces can encourage participation in physical activity (green exercise); individuals with easy access to nature are three times as likely to participate in physical activity and are 40% less likely to become overweight or obese[464]."

In addition to this, although there is still limited evidence, it is suggested that greenspaces with higher levels of biodiversity provide even higher levels of psychological benefits[465]. Furthermore, there is some evidence which suggests that investment in green infrastructure can have a positive impact on community cohesion, which in turn is thought to improve crime rates and health and educational outcomes. However, on the contrary, low quality greenspaces, such as badly maintained parks, can have the opposite effect[466].

[461]Environment Agency (2008): Environmental report: strategic environmental assessment of the draft river basin management plan for the Anglian river basin district: appendices, accessed at http://www.environment-agency.gov.uk/static/documents/Research/Environmental_report_appendices.pdf

[462] Natural England (2012): Microeconomic Evidence for the Benefits of Investment in the Environment – review, accessed at http://publications.naturalengland.org.uk/publication/32031

[463] UK NEA (2011) Chapter 23 Health Values from Ecosystems, UK National Ecosystem Assessment , accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=S901pJcQm%2fQ%3d&tabid=82

[464] UK NEA (2011) Chapter 23 Health Values from Ecosystems, UK National Ecosystem Assessment , accessed at http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=S901pJcQm%2fQ%3d&tabid=82

[465] Fuller, RA et al (2007): Psychological benefits of greenspace increase with biodiversity. Biology Letters, 3 (4) pp390-394

[466] Natural England (2012): Microeconomic Evidence for the Benefits of Investment in the Environment – review, accessed at http://publications.naturalengland.org.uk/publication/32031.

Greenspace Scotland has undertaken a comprehensive literature review, carried out by Croucher et al. (2008)[467], and advises that physical activity (which can sometimes be an incidental benefit from other priorities, such as relief from stress) is influenced by:

- Distance of residents from greenspace;
- Ease of access in terms of routes and entry points;
- Size of greenspace in relation to levels of population use;
- Connectivity to residential and commercial areas (allowing through routes);
- The range of amenities for formal and informal activities;
- Perceived safety of the greenspace; and
- The quality of maintenance.

The New Anglia LEP is largely a rural region. Norfolk and Suffolk are among the most rural counties in southern England. However, in both rural and urban areas Green Infrastructure Planning can ensure that developments leave room for green and blue space, or make the most of what is currently available.

Well planned urban areas affect quality of life, health and well-being[468]. Barton identifies aspects of residential areas which impact on human health and well-being. These include, for example, opportunities for active travel, the existence of good pedestrian networks and accessible local facilities and recreational facilities which encourage increased physical activity, especially amongst older people. Norwich city is surrounded by countryside and has over 150 green spaces within the city itself, including 23 parks, 59 natural areas and nature reserves and 10 kilometres of riverside walks[469]. There are also various pathways connecting different villages with the coast.

CBA[470] explain how the green infrastructure network in Norfolk connects Norwich, other settlements and the countryside via green corridors, particularly along the river valleys, providing sustainable opportunities for communities in towns and villages to access, enjoy and appreciate a variety of greenspaces on their doorstep and in the wider countryside. CBA advise that the green infrastructure approach should be regarded as a long-term framework for sustainable development, protecting the natural and historic environment. Green infrastructure should be delivered, protected and managed through the commitment and involvement of the public, private and voluntary sectors.

[467] Croucher K et al (2008): The links between green space and health: A critical literature review, Stirling: Greenspace Scotland.

[468] Barton, H (2009): Land use planning and health and well-being. Land Use Policy, 26 (1) pp115–123

[469] Visit Norwich: Norwich gardens & green spaces, accessed at: http://www.visitnorwich.co.uk/parks.aspx

[470] Chris Blandford Associates (2007): Greater Norwich Development Partnership: Green infrastructure strategy- A proposed vision for connecting people, places and nature, accessed at http://www.gndp.org.uk/content/wp-content/uploads/downloads/2010/03/1.Executive%20Summary(1).pdf

Increased links and access to the countryside by improving non-motorised routes and public transport links can improve community connectivity to green and blue spaces. Improved connectivity has been shown to increase tourism and benefit the health and wellbeing of communities which can access the environment easily in a sustainable way by reducing energy consumption. In terms of public transport, the coast hopper bus links inland villages and Norwich with the north Norfolk coast. In Suffolk there are several operators, such as Anglian Bus and First Group, which link inland villages with the coast and with other Norfolk towns.

There is a threat that with increased pressure for growth and economic development, adequate planning for the future of green infrastructure may be overlooked. However, well developed county plans, which are largely based around the environment, create positive opportunities to incorporate and improve green infrastructure within the LEP. For example the Thetford Green Infrastructure Strategy provides an integrated Green Infrastructure Strategy which ensures that properly planned greenspace is set sensitively within its landscape and ecological context.

Through the Countryside and Rights of Way Act the government recognises the value of public rights of way and required the development of a plan to identify changes that will provide "better provision for walkers, cyclists, equestrians and people with mobility problems"[471]. Both the Norfolk and Suffolk Rights of Way Improvement Plans (ROWIP) aim to provide this and to improve recreational and health benefits for the local population. In addition, the Broads Authority is responsible for the management and promotion of a range of recreational facilities within the Broads Executive area. The Broads Plan 2004, a 20 year aim for access to land and water is as follows: "The Broads will be easily accessible for all to enjoy recreational activity on land and water. Access will be sensitively managed, and of a kind and intensity that respects and preserves the special qualities and ambience of the Broads, its landscape and delicate ecosystems. Opportunities will be provided for land access, via a linked and extensive network of footpaths, cycle ways and bridleways that take advantage of the natural valley contours. More limited opportunities will be available for visitors to experience the fens and appreciate their fragility without degrading this habitat"[472].

[471] Defra (2000): Rights of way improvement plans; Statutory guidance to local highway authorities in England, accessed at: http://archive.defra.gov.uk/rural/documents/countryside/prow/rowip.pdf

[472] Broads Authority: Broads Plan, accessed at http://www.broads-authority.gov.uk/authority/strategy/broads-plan.html

7. Exploring possibilities

7.1. Assessing the operational importance of opportunities and threats

Table 7.1: The top 20 opportunities and threats.

	Opportunities					Threats				
Rank	Combined Score	Importance Rating	Urgency Rating	Code	Name	Combined Score	Importance Rating	Urgency Rating	Code	Name
1	16	4	4	WS4	Technology will play an important role in diminishing water loss in leaks and pipe bursts, together with improving water efficiency technologies	16	4	4	Hea3	The need for increased development to accommodate growth and economic development could lead to planning applications not being reviewed by councils in enough time to ensure that adequate green infrastructure is in place
2	16	4	4	WS6	Increasing water efficiency, recycling, management and awareness so as to cope with future increasing demand	16	4	4	MI4	High speed broadband infrastructure is increasingly becoming a major concern for businesses with new technology and communication requirements
3	16	4	4	Foo5	Opportunity to increase local resilience in terms of food security and reduce our reliance on the global market for food production	16	4	4	WS1	Population is expected to increase by 17% in the next 20 years and climate change is increasing rainfall seasonality patterns (wet winter- dry summer). It is predicted a water deficit in most water sources in some parts of the year
4	16	4	4	GR1	Increase strategic design of biodiversity for new developments. For example, where there are several different developers in one area, plans could be considered in conjunction, which would aid in the preservation and enhancement of ecological networks	16	4	4	LCR6	Decreasing rainfall and increasing temperatures will put pressure on water resources leading to droughts

5	16	4	4	LCR8	Increasing broadband speed has the potential to reduce local carbon emissions by enabling more people to work from home	16	4	4	FNC3	Increasing pressure of new developments, Climate Change and ageing infrastructure are likely to increasing severity of floods and the unpredictability of weather events
6	16	4	4	GCC M2	Create new technologies that enhance the sustainable use of the environment increasing resilient growth, and making the environment more important	16	4	4	WP2	Growing population size and demands for resources could result in declining water quality
7	16	4	4	FNC4	Introducing strict planning regulations, promoting green infrastructure such as SUDS will help at improving the capability of the environment to withstand possible flooding events	16	4	4	DaP2	Increasing the capacity and transfer of goods at ports could be a major source of pest and disease transfer as well as unchartered boats and recreational equipment/gear
8	16	4	4	WP1	Growing population size and external pressures present the opportunity to improve water quality alongside growth	16	4	4	Rec1	Strong growth in the tourism sector (Norfolk County Council anticipates growth of 38% between 2010 and 2020) could increase pressure on already stressed resources such as water, infrastructure, etc.
9	16	4	4	DaP4	An LEP wide approach to establishing a biosecurity defence system. This will ensure that detection and response is quick enough to prevent negative impacts to the economy, especially as there is no current specific body allocated to invasive non-native species in Suffolk as there is for Norfolk	16	4	4	Foo6	Climate change and other changes encourage pests and diseases. This has been seen in previous years with threats such as Spanish slugs, Schmallenburgh and Bluetongue coming over from the continent
10	16	4	4	Hea1	Increase connectivity and access by improving non-motorised routes and public transport links. Awareness raising of these services should also be carried out	12	3	4	LU1	Coastal areas are not well connected to the rest of the UK through the transport infrastructure. In addition, some port infrastructure may need upgrading
11	12	3	4	FR1	Potential total capital value to Norfolk and Suffolk for offshore wind of £23 billion and onshore wind of £74 billion. Also power transmission (£585 million and transport infrastructure £1.2 billion)	12	3	4	FR3	Lack of necessary infrastructure is likely to deter investors. This includes grid capacity for large scale renewable development, transport connections and coastal infrastructure

12	12	3	4	FR7	The awarding of Enterprise Zones to six areas within Norfolk and Suffolk and CORE status to Great Yarmouth and Lowestoft will encourage investors in renewable energy through financial and planning incentives	12	3	4	FR8	Frequently changing Feed-in Tariff scheme for renewables and government policy reduces popularity of renewable energy
13	12	3	4	WS12	Address water efficiency together with flood risk management so that flows are evened out	12	4	3	WS10	Higher demand from the energy sector (electricity supply) for water supply
14	12	3	4	FFA1	Possible designation of Marine Protected Areas may impact sectors such as fisheries, tourism, etc.	12	3	4	FCr8	Reducing water availability in the summer for irrigation could lead to building of storage reservoirs. These are likely to be built on poorer quality land in terms of crop yields so could be built over areas that are providing the greatest biodiversity value
15	12	3	4	GCC M6	Increase in Green Infrastructure	12	3	4	GR12	The increasing need for water abstraction may reduce the availability of water for sensitive habitats
16	12	3	4	ER2	Encourage sustainable crop production by minimising bare ground, planting green cover crops, and using low pressure ground vehicles to reduce erosion	12	3	4	LCR1	Expected economic and population growth as a detriment for green infrastructure
17	12	3	4	LSQ3	Promote agri-env schemes and broader scale sustainable farm management which deliver resource protection, such as buffer strips etc. which have benefits for biodiversity and soil quality	12	3	4	FCoa 2	Reduction in availability of Government funding for flood defences could result in increased flood risk for coastal communities, especially those where the community is less likely to be able to afford to contribute towards the cost. This could reduce inward investment into these areas
18	12	3	4	Rec1 1	Increasing non-motorised infrastructure such as coastal paths has the potential to increase access to the countryside more sustainably and increase tourism	12	3	4	LSQ1	A move to more intensive high value crops may result in the need for increased chemical fertilisers and herbicide/pesticide and water
19	12	3	4	FCr9	Winter storage reservoirs could be an opportunity if they are designed with biodiversity benefits in mind. These could also benefit water abstraction and designed for harsh drawdown.	12	4	3	Noi2	The mean distance travelled per person per year has increased annually and these trends are expected to continue. The Department of Transport (2004) predicts a 40% increase in road traffic in England by 2025
20						12	3	4	Pol3	More intensive farming with non-flowering crops could cause declines in pollinators

7.2. Tactical

7.2.1. Opportunity:

Table A6-1: Top opportunities with actions to avoid or mitigate them

Name of opportunity	Description of the opportunity	Actions to seize the opportunity	Benefits with other ecosystem services	Indirect positive economic and social effects	Cost to pursue the opportunity			Negative economic and social effects or risks
					Financial cost	Opportunity cost	Negative impacts on ecosystem services	
FR1, FR7, GCCM2 Enabling investment in renewable energy and new technologies	Identifying and promoting the benefits of the area (financial and planning incentives assisted by award of Enterprise Zones, activities that are taking place, technologies being developed, infrastructure in place and planned, how the area is investing in itself to improve attractiveness to incentives)	Identification of existing infrastructure and planned development, supply chain, skills, etc.		Crossover benefits for other sectors	Medium	Utilises resources that could be targeted to other actions	Development needs to take account of impact on ecosystem services	
		Promotion of what the area offers (from above), e.g. trade fairs		Crossover benefits for other sectors	Medium	Utilises resources that could be targeted to other actions	Risk of over-subscription potentially affecting environment (drive to develop becomes stronger)	
		Sell area as a 'package' (covering assets and quality of life), backing up specific promotion	Link to quality of environment (aesthetics, landscape, recreation)	Potential to attract higher skills that could be transferred to local population	Medium	Benefit as could capture lots of sectors at once	Risk of over-subscription or conflicts between sectors for land/water, etc.	Risk that just import people with high skills, with no benefit for local population
GCCM6 Improving and developing existing Green Infrastructure and increasing its consideration in development	Supporting and spearheading the importance of high quality Green Infrastructure for improving quality of life and the	Ensure that high quality Green Infrastructure is included in development planning	Link to quality of environment (aesthetics, landscape, recreation)	Benefits for all sectors by improving quality of life and environment	Low-Medium	Utilises resources that could be targeted to other actions	A balance is needed between community GI and GI with environmental benefits	Possibility that GI inclusion will have high short term costs for the developers, reducing uptake of above average requirements

Table A6-1: Top opportunities with actions to avoid or mitigate them

Name of opportunity	Description of the opportunity	Actions to seize the opportunity	Benefits with other ecosystem services	Indirect positive economic and social effects	Cost to pursue the opportunity			Negative economic and social effects or risks
					Financial cost	Opportunity cost	Negative impacts on ecosystem services	
planning	environment. Ensuring its inclusion in development planning, with the region acting as a leader with above average uptake and quality	Support for an LEP wide coordinator of GI to ensure a joined-up approach to the design and inclusion of GI in new developments which aims at a more strategic approach (working with local Councils and Wild Anglia LNP)	Link to quality of environment (aesthetics, landscape, recreation, biodiversity)	Benefits for all sectors by a more joined up approach	Medium	Benefit as could benefit other projects at the same time		
LSQ3, ER2, FCr9 Promote agri-environment schemes and broader scale sustainable farm management which deliver resource protection, benefiting	Promotion of sustainable farm management which may include diversification into other practices such as farm tourism and other environmentally	Support for farmers wishing to embark on business ventures which improve environmental quality and biodiversity, such as farm tourism, or wetland agriculture	Possible benefits to erosion regulation, land and soil quality, biodiversity, recreation, aesthetics, pollination, water quality	Possible benefits to tourism, and the agricultural sector through increasing yields/quality	Med-high	Benefit as could benefit other projects/sectors at the same time	Diversification into other areas must be sustainable	May not be as profitable as intensive farming practices, but has longer-term benefits

Table A6-1: Top opportunities with actions to avoid or mitigate them								
Name of opportunity	**Description of the opportunity**	**Actions to seize the opportunity**	**Benefits with other ecosystem services**	**Indirect positive economic and social effects**	**Cost to pursue the opportunity**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
biodiversity and other environmental processes	friendly practices. Promotion of uptake of agri-environment schemes	Promotion of agri-environment schemes and other management such as the use of natural systems for water storage	Water supply, water quality, biodiversity, soil quality, soil erosion, aesthetics, recreation, pollination, landscape	Benefits to public water supply and quality by improving water capacity. This will also increase yields	Med	Utilises resources that could be targeted to other actions	Must be considered with biodiversity in mind, so that inclusion has multiple benefits for the environment and the aesthetics of the area	Reduces intensification which may affect profits in the short -term
WS6, WS4, WS12, WP1 Increase water efficiency, recycling, management and awareness by supporting water efficiency technologies and flood risk management	Support the uptake of water saving measures into new developments (including the use of natural systems). Increase the uptake of SUDs and support the development of water efficiency technologies	Increase support for the uptake of water saving devices in new developments (natural reed beds as water filtering devices, SUDS etc.)			Med	Benefit as could benefit other projects/sectors at the same time	Where possible this should be developed in line with the delivery of multiple benefits for the environment	May have higher short-term costs
		Increase awareness of the sustainable use of water by working with water companies and others to increase awareness raising	Water supply, quality with knock-on benefits to others	Reduces demand and lowers the costs of alternative option such as water imports	Med	Benefit as could benefit other projects/sectors at the same time		
		Support the development of water efficiency technologies	Water quality, food production, energy, biodiversity, land and soil quality	Potential to benefit the economy by leading technological	Med	Utilises resources that could be targeted to other actions	The water saving technologies may have knock-on detrimental effects to the	

Table A6-1: Top opportunities with actions to avoid or mitigate them								
Name of opportunity	**Description of the opportunity**	**Actions to seize the opportunity**	**Benefits with other ecosystem services**	**Indirect positive economic and social effects**	**Cost to pursue the opportunity**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
				advancement in the area and encouraging further investment			environment (such as desalination), and sustainability should be stated as a pre-requisite	
Foo5 Increase food security and reduce reliance on the global food market	Promotion of locally grown produce to increase local food security and reduce reliance on the global market. This will also provide security in terms of global climate change impacts, and lowering food miles, thus reducing emissions	Support suppliers and producers of local produce by facilitating links with supermarkets and other retailers	Global and local climate change mitigation	Potential to benefit the economy by increasing the value and ease of selling local produce	Med	Utilises resources that could be targeted to other actions		
		Support sustainable food producers wishing to start up new businesses with a view to supplying the local market	Global and local climate change mitigation	Potential to make farming/food production more attractive and profitable to those wishing to start up new businesses	Med-high	Utilises resources that could be targeted to other actions	May increase intensive production at a detriment to the environment. Demand may outstrip available land for growing food, and put pressure on land for biodiversity	
		Promotion of food festivals which offer opportunities to sell out of season produce	Health and wellbeing, recreation and tourism, food supply	Potential to increase tourism and recreation and develop a sense of place and community	Med			
LCR8 Improving	Increasing broadband speed	Support the roll out of improved	Local climate change mitigation	Potential to have large benefits to	Med			

Table A6-1: Top opportunities with actions to avoid or mitigate them								
Name of opportunity	**Description of the opportunity**	**Actions to seize the opportunity**	**Benefits with other ecosystem services**	**Indirect positive economic and social effects**	**Cost to pursue the opportunity**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
broadband speed has the potential to reduce carbon emissions	has the potential to reduce local carbon emissions by enabling more people to work from home and encouraging new businesses to the area	broadband speed		the economy and if				
		Promote the area as a quality place to live with improving broadband speed	Link to quality of environment (aesthetics, landscape, recreation, biodiversity)	May increase investment in the region through business start-ups	Med	Utilises resources that could be targeted to other actions	Encouraging more people to relocate to the countryside may put added pressure on the environment	
DaP4 An LEP wide approach to establishing a biosecurity defence system	An LEP wide approach to establishing a biosecurity defence system. This will ensure that detection and response is quick enough to prevent negative impacts to the economy, especially as there is no current specific body allocated to invasive non-native species in Suffolk as there is for Norfolk	Support for a joint Norfolk and Suffolk Non-Native Species Initiative programme	All	Prevention of larger costs to the economy should an invasive species not be detected early enough	Med-high	Benefit as could benefit other projects/sectors at the same time		
Hea1, Rec11 Increase non-motorised infrastructure and public transport	Increase connectivity and access by improving non-motorised routes	Improve connectivity linkages which enable environmentally	Likely to have knock-on impacts to all services	Improvements to the tourism industry together with quality of life for residents, may	Med-high	Benefit as could benefit other projects/sectors at the same time		

Table A6-1: Top opportunities with actions to avoid or mitigate them

Name of opportunity	Description of the opportunity	Actions to seize the opportunity	Benefits with other ecosystem services	Indirect positive economic and social effects	Cost to pursue the opportunity			Negative economic and social effects or risks
					Financial cost	Opportunity cost	Negative impacts on ecosystem services	
links	and public transport links. Awareness raising of these services should also be carried out	friendly access to the environment		also encourage inward investment				
		Ensure that all new developments incorporate the inclusion of improved connectivity links, by both non-motorised routes and public transport connections, as standard practice	Link to quality of environment (aesthetics, landscape, recreation, biodiversity) Local climate change mitigation	Improved quality of life and may encourage inward investment	Med	Utilises resources that could be targeted to other actions		May increase short-term costs for developers, but should be a standard practice
		Promotion of non-motorised and public transport services	Link to quality of environment (aesthetics, landscape, recreation, biodiversity) Local climate change mitigation	Increase access to areas will benefit local economies	Low-med	Utilises resources that could be targeted to other actions		Demand may outstrip the current capacity of public transport, but this open opportunities to improve services

Key:
Low: £1,000 to £10,000
Medium: £10,000 to £100,000
High: >£100,000

7.2.2. Threat:

Table 6-3: Top 10 threats with actions to avoid or mitigate them

Name of threat	Description of the threat	Actions to avoid or mitigate the threat	Negative interactions with other ecosystem services	Indirect negative economic and social effects	Cost to remove or mitigate the threat			Negative economic and social effects or risks
					Financial cost	Opportunity cost	Negative impacts on ecosystem services	
WS1, LCR6, WS10, FCR8 (water resources deficits)	Increased demand for freshwater resources, which are already stressed, and impacts of climate change potentially leading to a deficit at some times of the year (potential loss of biodiversity if deficit is dealt with purely by building storage reservoirs, since these may be targeted towards least productive areas)	Promote more integrated approach to managing water through planning			Medium	Utilises resources that could be targeted to other actions		
		Promote best practice in member organisations			Low-Medium (could be done alongside other activities)	Time needed for organisations to implement		Short-term costs might affect uptake (even if longer-term they would save)
		Targeting funds (e.g. CIL) towards activities that help to retain water (e.g. wetlands, lakes)		Could redirect funds from other activities (e.g. communities)	Low-Medium (depending on level of LEP involvement)	Funds would not be available for other uses		

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
FR10, FR3, LU1, FR8 (Failure to meet Government targets for energy supply from renewable sources by 2020)	Investors are likely to be deterred by the lack of infrastructure. This includes transport connections (particularly in relation to coastal areas), grid capacity for large scale renewable development. A linked issue is changes to the feed-in-tariff for renewables which create uncertainty and could limit investment in infrastructure. The skills deficit also limits new technologies and workforce	Promote a more integrated approach to infrastructure development when looking at plans for individual roads and energy related developments, etc.			Medium	Utilises resources that could be targeted to other actions		
		Support investment into new technologies			Med	Utilises resources that could be targeted to other actions		Increasing renewable energy generation should be sustainable, and not impact on biodiversity, such as land take or nutrient loading from biofuel generation
		Facilitate apprentice			Med	Benefits as increases the		Risk that other industries/sectors

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
		schemes and promote the renewables industry in education centres to increase the skill base				skills base with higher earning potential		may suffer from a skill deficit
LCR1, HEA3 (green infrastructure)	Increases in the population along with economic growth could negatively affect green infrastructure, e.g. the need for rapid development may mean that insufficient time is given to consideration of green infrastructure when assessing planning	Help ensure that people making decisions about planning have a clear understanding of what green infrastructure is and why it is needed			Medium	Utilises resources that could be targeted to other actions		
		Promote the need for green infrastructure to property developers and planners			Medium	Utilises resources that could be targeted to other actions		

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
	applications							
FCOA2 (flood defence funding in coastal areas)	Changes in availability of funding for flood defences for coastal areas could increase the severity of the impacts of flooding as well as decrease inwards investment in high risk areas	Promote flood resilience measures amongst businesses and households at risk		Could lead to those outside the area seeing it as a high risk place to be; thus there could be knock-on impacts in terms of further decreases in inwards investment as firms look to move to areas with lower risk	Medium	Utilises resources that could be targeted to other actions		
		Encourage discussions in at risk areas about the way in which flood risk can be managed (such discussions may involve talking about contributions and awareness raising about the benefits of soft			Medium	Utilises resources that could be targeted to other actions		

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
		defences)						
		Promote the uptake of flood resilience measures by member organisations where appropriate			Low	Time spent promoting such measures		
FNC3 (increased severity of flood events)	Climate change, ageing infrastructure and greater pressure from development are likely to increase the severity of flood events	Promote flood resilience measures amongst businesses and households at risk		Could lead to those outside the area seeing it as a high risk place to be; this could limit inwards investment	Medium	Utilises resources that could be targeted to other actions		
LSQ1, POL3 (impacts from intensive farming)	Movement towards more intensive high value crops could lead to greater use of chemical fertilisers, herbicides, pesticides and	Promote agricultural research into ways of farming without the use of large quantities of chemicals			Medium	Utilises resources that could be targeted to other actions		
		Encourage the uptake of agri-			Medium	Utilises resources that		Potential for decrease in food

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
	water with knock on impacts for pollinators (through both use of chemicals and growth of different crops)	environment schemes where appropriate to minimise the impacts on water (e.g. through using buffer strips) and pollinators (through provision of field margins)				could be targeted to other actions		production and loss of competitiveness in the short term relative to other areas of the country if the focus is on the environment alone (but bearing in mind the potential long term negative impacts of intensive farming)
MI4 (high speed broadband)	High speed broadband infrastructure is increasingly becoming a concern for businesses with new technology and communication requirements	Promote local schemes providing better broadband for villages			Low (if LEP members undertake this where they are based)	Time spent promoting these schemes		
		Encourage consideration of communications infrastructure during the planning process for new developments			Medium	Utilises resources that could be targeted to other actions		

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
WP2 (water quality)	Growing population and size could increase demand for resources resulting in declining water quality	Promote water efficiency to limit the increased increase in demand for water, thus helping to retain quality of resources			Medium	Utilises resources that could be targeted to other actions		
		Support the inclusion of natural systems in new developments which increase water quality			Medium			
REC1, GR12,NOI1 (tourism and resource use)	Growth in tourism could put pressure on already stressed resources (e.g. water) and transport infrastructure	Encourage tourism businesses to promote wise use of resources (e.g. in accommodation) and use of public transport (e.g. Coasthopper)			Medium	Utilises resources that could be targeted to other actions		Risk that the area may be portrayed as somewhere that restricts tourists

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
		when visiting the area						
		Promote cooperation between tourism businesses to minimise impacts without limiting tourism (e.g. a coach firm could have an arrangement with a rural tourism attraction to take visitors from a set point (in a town) to the attraction to avoid large numbers of cars)		Negative impacts through having more large vehicles on small lanes (potential for increased disruption for locals)	Medium	Utilises resources that could be targeted to other actions		

Table 6-3: Top 10 threats with actions to avoid or mitigate them								
Name of threat	**Description of the threat**	**Actions to avoid or mitigate the threat**	**Negative interactions with other ecosystem services**	**Indirect negative economic and social effects**	**Cost to remove or mitigate the threat**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
FOO6, DAP2 (threat of introduced pests and diseases)	Climate change in combination with greater capacity at ports in the LEP could increase the risk that pests and diseases are brought into and/or transferred within the LEP	Raise awareness of pest and disease transfer routes at appropriate forums, for example, during discussions about port expansion and maintenance, etc.			Medium	Utilises resources that could be targeted to other actions		
		Promote the uptake of measures to combat the spread of pests and diseases throughout the LEP (i.e. in agricultural businesses as well as at ports)			Medium	Utilises resources that could be targeted to other actions		Some may see measures to combat transfer of pests and diseases as restricting economic growth and development
Key Low: £1,000 to £10,000 Medium: £10,000 to £100,000 High: >£100,000								

7.3.Strategic

7.3.1. Opportunities and Threats requiring a strategic response

7.3.1.1. Opportunity

Table A6-2: Top opportunity with actions to avoid or mitigate

Name of opportunity	Description of the opportunity	Actions to seize the opportunity	Benefits with other ecosystem services	Indirect positive economic and social effects	Cost to pursue the opportunity			Negative economic and social effects or risks
					Financial cost	Opportunity cost	Negative impacts on ecosystem services	
GR1 Increase strategic design of biodiversity for new developments and infrastructure	Increase strategic design of biodiversity for new developments and infrastructure. For example, where there are several different developers in one area, plans could be considered in conjunction, which would aid in the preservation and enhancement of ecological networks. New infrastructure	Support a coordinator to act as an interface between developers working alongside Wild Anglia to ensure that a wider more joined-up landscape approach is taken in development planning	Benefits to all services by reconnecting our landscape through sustainable development	Benefits to all sectors through improving quality of life and encouraging inward investment	Med-high	Benefit as could benefit other projects/sectors at the same time		May increase short-term costs for developers, but these should be offset by increased benefits and sales
		Promote the region as leading the way in sustainable development and design with biodiversity at	Knock-on benefits to all services	May encourage inward investment to the area, improving quality of the environment	Med	Utilises resources that could be targeted to other actions	Promotion should not supersede the action of strategic design of biodiversity in development	

Table A6-2: Top opportunity with actions to avoid or mitigate								
Name of opportunity	**Description of the opportunity**	**Actions to seize the opportunity**	**Benefits with other ecosystem services**	**Indirect positive economic and social effects**	**Cost to pursue the opportunity**			**Negative economic and social effects or risks**
					Financial cost	**Opportunity cost**	**Negative impacts on ecosystem services**	
	such as roads and cycle ways, should incorporate biodiversity, such as the insertion of hedgerows	its core		and uptake of sustainable design			planning	
		Ensure the incorporation of biodiversity alongside infrastructure at the outset of planning design	Link to quality of environment (aesthetics, landscape, recreation, biodiversity) Local climate change mitigation	May encourage inward investment through improvements to environment quality	Low-med	Utilises resources that could be targeted to other actions		
Key: Low: £1,000 to £10,000 Medium: £10,000 to £100,000 High: >£100,000								

7.3.1.2. Threat

None identified

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