

The 2009 R-ISEW (Regional Index of Sustainable Economic Well-Being) for all the English regions

A joint report for the East Midlands Development Agency, North West Development Agency, Yorkshire Futures, Advantage West Midlands, the South West Regional Development Agency and the South East of England Development Agency

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February 2010

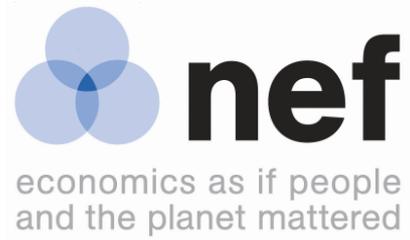
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Executive summary

English Regional Development Agencies are tasked with the challenge of encouraging sustainable development in their regions, with the ultimate aim of achieving high levels of social and economic well-being within environmental limits. Measuring progress towards that vision is no simple matter. Indicators exist for various aspects of this challenge, but without a cogent framework for bringing them together, assessing overall progress is difficult. A framework is also required to enable inevitable trade-offs to be assessed.

Two years ago, **nef** (the new economics foundation) produced the first complete set of Regional Indices of Sustainable Economic Well-Being (R-ISEWs) for the nine Government Office Regions of England. R-ISEW is a measure of how much a region's economic activity contributes to, and detracts from, well-being, and how sustainable this activity is. It is an adjusted economic indicator which attempts to incorporate costs and benefits not traditionally measured in monetary terms. By monetising social and environmental issues, it brings them into a single analytic framework with economic ones, allowing us to explore trade-offs, and to assess whether economic well-being is really increasing sustainably in a given region. As a monetary figure, the R-ISEW can be compared with Gross Value Added (GVA), and other economic indicators. At the same time, exploring the R-ISEW's 20 separate components helps us to understand a fuller story of how economic well-being varies over time.

This year's results broadly confirm last year's analysis. Whilst England's R-ISEW grew at a similar rate to its GVA between 1994 and 2003, that growth tailed off between 2003 and 2007, even dipping slightly in 2006. The R-ISEW per capita for England for 2007 was £11,318, some £9,145 below GVA per capita for that year, and only 2.4% higher than that in 2003. The principal reasons for R-ISEW growth tailing off despite GVA continuing to rise appear to be rising costs of long-term environmental damage, sharply decreasing investment in capital stocks, and a growing trade deficit.

Looking between regions, the South West remains the region with the highest R-ISEW per capita. Yorkshire and the Humber remains in last place, bearing the burden of the cumulative, long-term environmental damage of its power generation and heavy manufacturing industries. Last year's calculations suggested it had climbed to 7th place of the nine regions; however, the recalculation undertaken in this report reduces the 2006 R-ISEW substantially, and shows the region as consistently in 9th place since 1994. The recalculation also results in London's R-ISEW now coming a very close second place to the South West. Over the last three years, the East Midlands, London and the North East have all seen significant increases in the R-ISEW, whilst the South East has suffered the greatest drop.

We have made a clear attempt not to alter the methodology from last year's edition of the R-ISEW, yet visible changes in the final results appear to emerge from changes in the underlying datasets.

1. Introduction

Two years ago, **nef** produced the first complete set of R-ISEWs for the nine Government Office Regions (GORs) of England.¹ The results showed that, whilst the R-ISEWs for all GORs have been growing from 1994 to 2005, they remain substantially lower than GVA, the dominant measure of economic progress. Furthermore, there was a suggestion of a slowing of the growth in the R-ISEW in recent years, and a concomitant widening of the gap between the R-ISEW and GVA.

Last year, we produced an update of the R-ISEW up to the year 2006.² This latest report presents new data calculated in 2009 for the years 1994–2007. The data, which also includes the updating of several sets of figures that previously had to be estimated for 2006, show that a nine-year increase in the English R-ISEW since 1994, began to peter out in 2003, such that *total* per capita growth between 2003 and 2007 was only 2.4%. Indeed, between 2005 and 2006, per capita R-ISEW fell slightly.

As a result, the gap between GVA and the R-ISEW has been increasing from a low of £7,653 per capita in 2002, to £9,145 in 2007. In other words, whilst GVA continued to grow right up till the recession began in 2008, the faltering R-ISEW could have been indicating an early warning (of course, more data would be required before being able to conclude that the R-ISEW can be used as an early indicator before recessions).

As in our previous two reports, we here present the R-ISEW story in numbers. After looking at the overall picture, we explore patterns in the R-ISEW from component to component, looking at the pattern for England, as well as for a few GORs where interesting results can be found. Next, we look at each GOR in turn, noting how key components have determined their results. This section is concluded with a brief exploration of variation across GORs. Lastly, we consider how the results differ from last year's calculations – as a result of new data, and adjustments to the methodology. Numerical results are included in table form in Appendix 1.

This report is the second of three annual updates that we are carrying out using the current methodology. By 2010, we will have calculated a consistent time series of R-ISEWs for all GORs from 1994 to 2008 inclusive.

In parallel, we have also begun a strand of development work to explore how to improve and encourage use of the R-ISEW. The first output in this strand was a scoping report exploring areas for improvement completed earlier this year.³

1.1 Overall patterns

The total England R-ISEW in 2007 stood at £578 billion, which is 45% below the total GVA of £1,046 billion. Per capita, the figures are £11,318 per person and £20,463 per person (Figure 1). This represents a gap of £9,145. The total R-ISEW rose by 43% over the 13-year period from 1994, compared with a 46% growth in GVA. Perhaps more meaningful, however, are the increases in *per capita* R-ISEW and GVA – 35% and 38% respectively. These figures represent mean annual growth rates of 2.4% per year and 2.5% per year

respectively. Whilst GVA grew most rapidly between 1996 and 1998, the R-ISEW grew most rapidly between 2000 and 2002 (at about 5% per year – Figure 2). As noted earlier, the last four years have seen little change in the R-ISEW, with the latest per capita figure only 2.4% higher than that in 2003. The R-ISEW for 2006 was particularly low, dropping below 2004 levels.

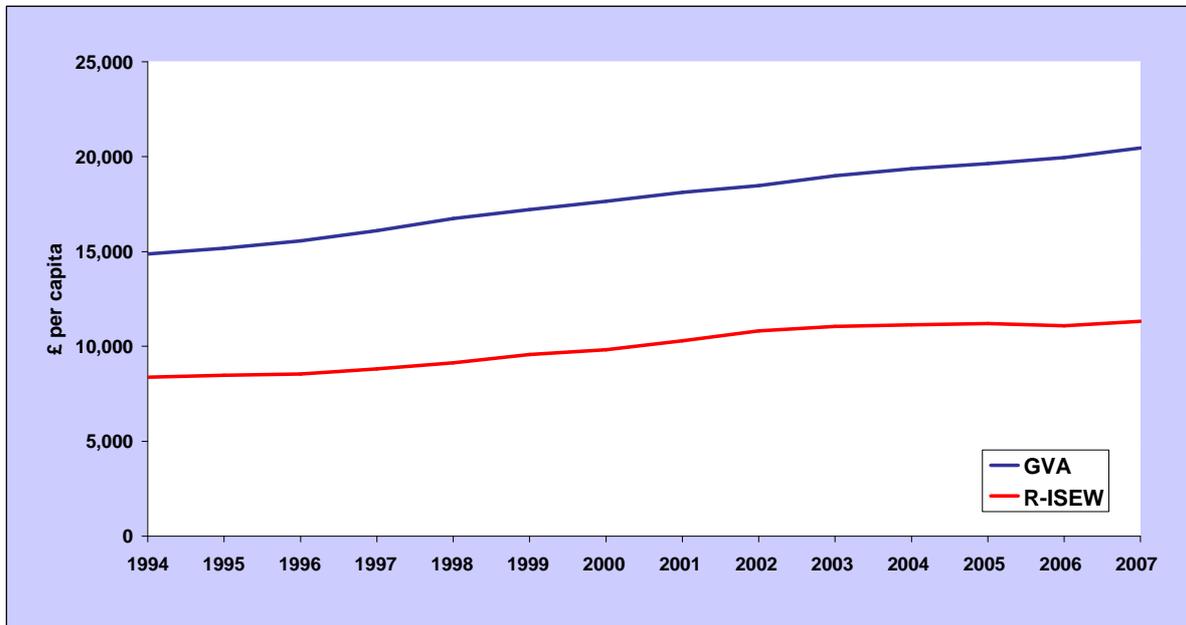


Figure 1: R-ISEW and GVA for England per capita.

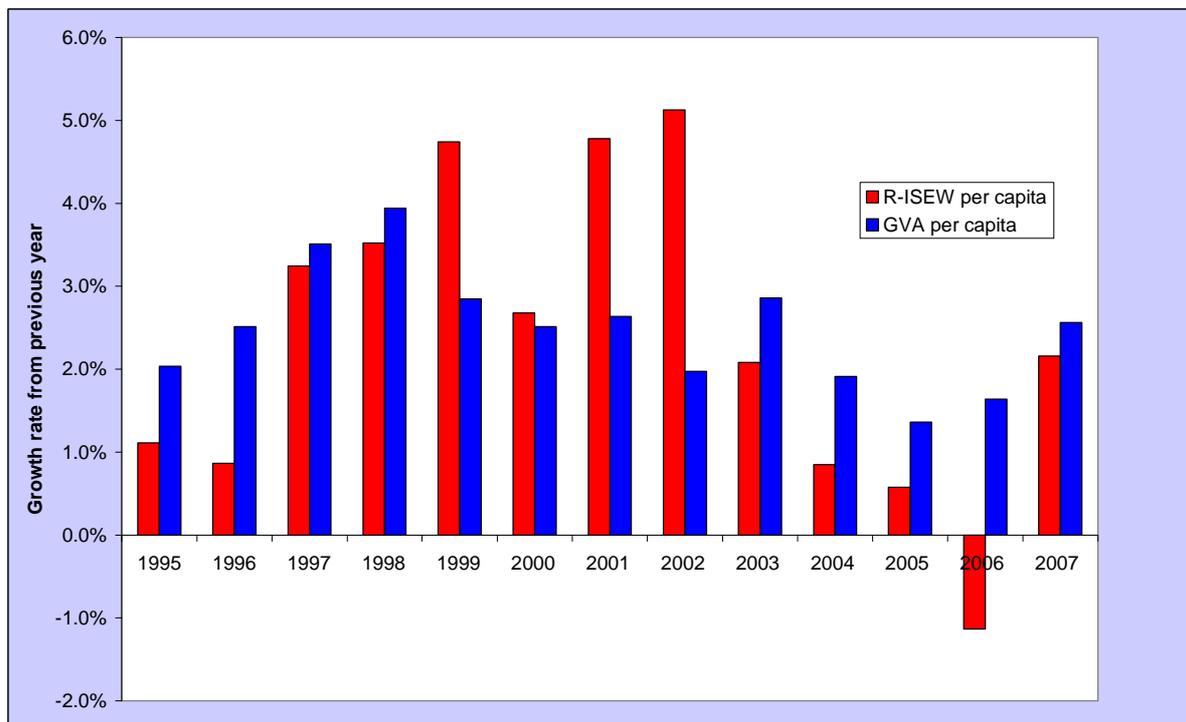


Figure 2: R-ISEW and GVA per capita year-on-year growth for England.

The gap between GVA and the R-ISEW has grown steadily in absolute terms (having started at £6,496 per capita). As a proportion of GVA, the picture is a little more complex –

with the gap rising between 1994 (when it was 44% of GVA) and 1998, before falling to a low point of 41% of GVA in 2002, only to rise again to 45% in 2007 (Figure 3).

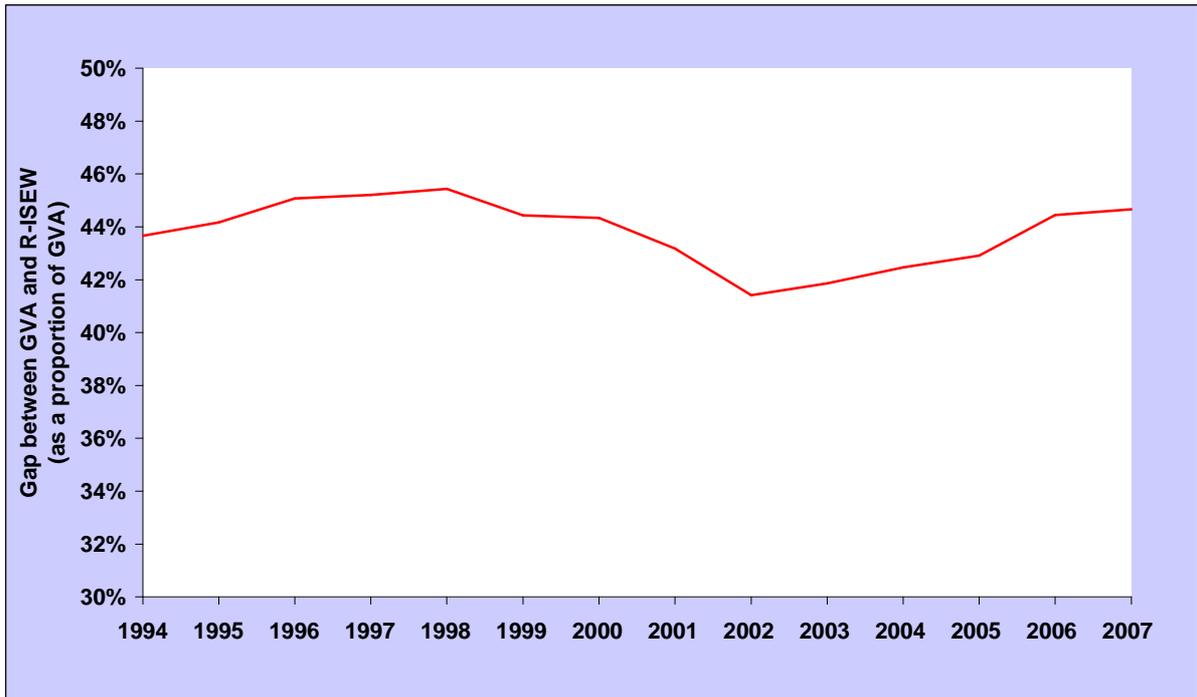


Figure 3: Gap between GVA and R-ISEW for England, as a proportion of GVA.

1.2 Regional patterns

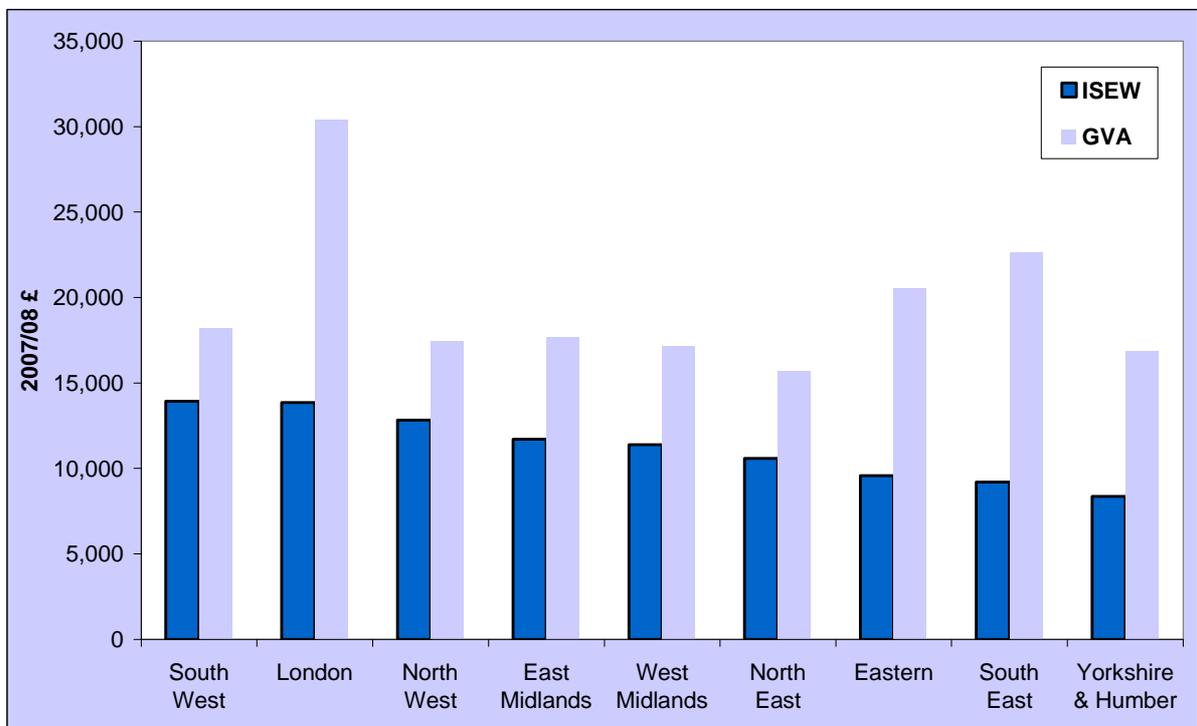


Figure 4: Per capita R-ISEWs and GVAs by GOR in 2007.

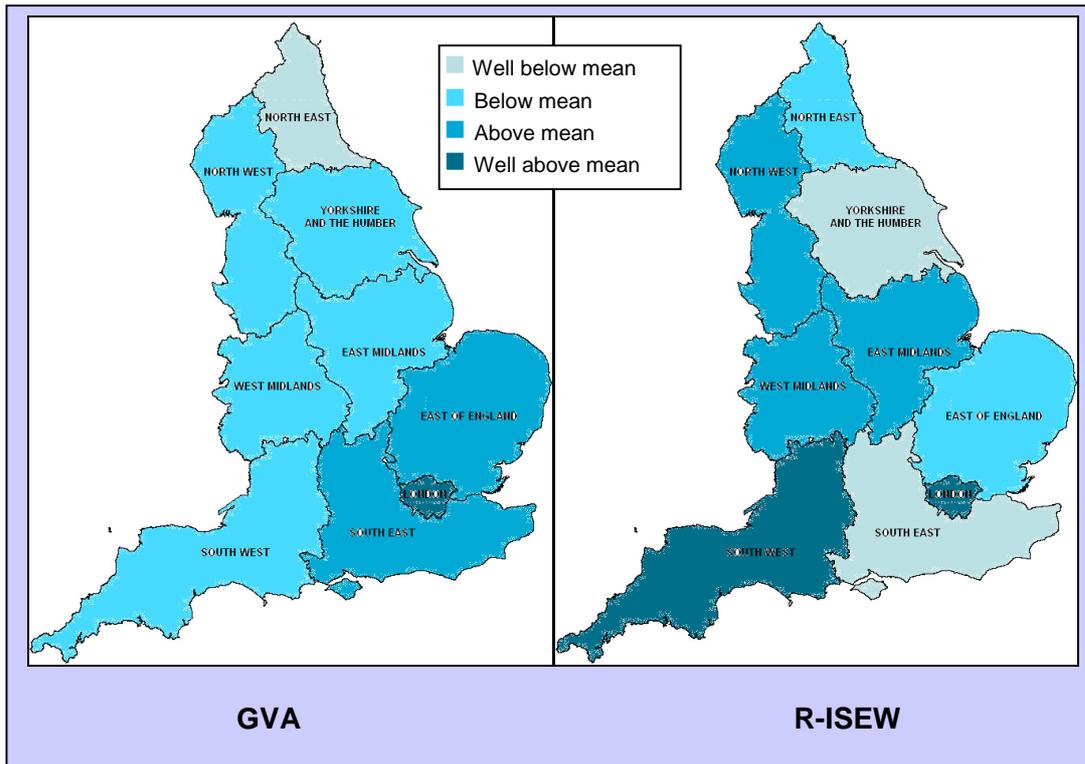


Figure 5: Per capita R-ISEWs and GVAs by GOR in 2007. ⁴

Looking across GORs, the R-ISEW tells a very different story to GVA. Whereas the top GORs in terms of GVA per capita are concentrated around London and the Home Counties (the South East and the East of England), the R-ISEW in 2007 was highest in the South West. Adjustments to the estimates of earlier CO₂ emissions, which affect the costs of long-term environmental damage, however, mean that London now has the second highest R-ISEW (Figures 4 and 5), whilst the North West is now only third highest. Nevertheless this still represents a significant deviation from the GVA rankings, which places the North West sixth out of nine regions.⁵ The most substantial drop in ranking is in the South East, which drops from second highest in terms of GVA to second *lowest* in terms of the R-ISEW.

The Midlands emerges in the middle of the rank order both in terms of GVA and R-ISEW, with the East Midlands outperforming the West Midlands on both counts in 2006. Meanwhile, on the north-east seaboard, the North East moves up three places from last in terms of GVA to sixth place in terms of the R-ISEW, whilst Yorkshire and the Humber drops to last place.

These patterns have not stood unchanged in the 13 years from 1994 to 2007. Of course R-ISEW increases have been seen across England, but these have not been equal (Figures 6 and 7). The most substantial increases were found in the East Midlands (more than doubling from £5,773 to £11,689 per capita), London (£8,215 to £13,818 – a 69% increase), and Yorkshire and the Humber (£5,535 to £8,365 – a 51% increase). Conversely, the smallest increases were found in the South East (8%), and the West Midlands (16%).

As a result of these changes, London has moved up the R-ISEW table from fifth place in 1994 to second place in 2007 (with the most rapid increase between 2000 and 2002); and the East Midlands has moved from eighth to fourth. The most substantial drop is seen for the South East (from fourth to eighth). Figure 8 and Table 1 shows these results in more detail.

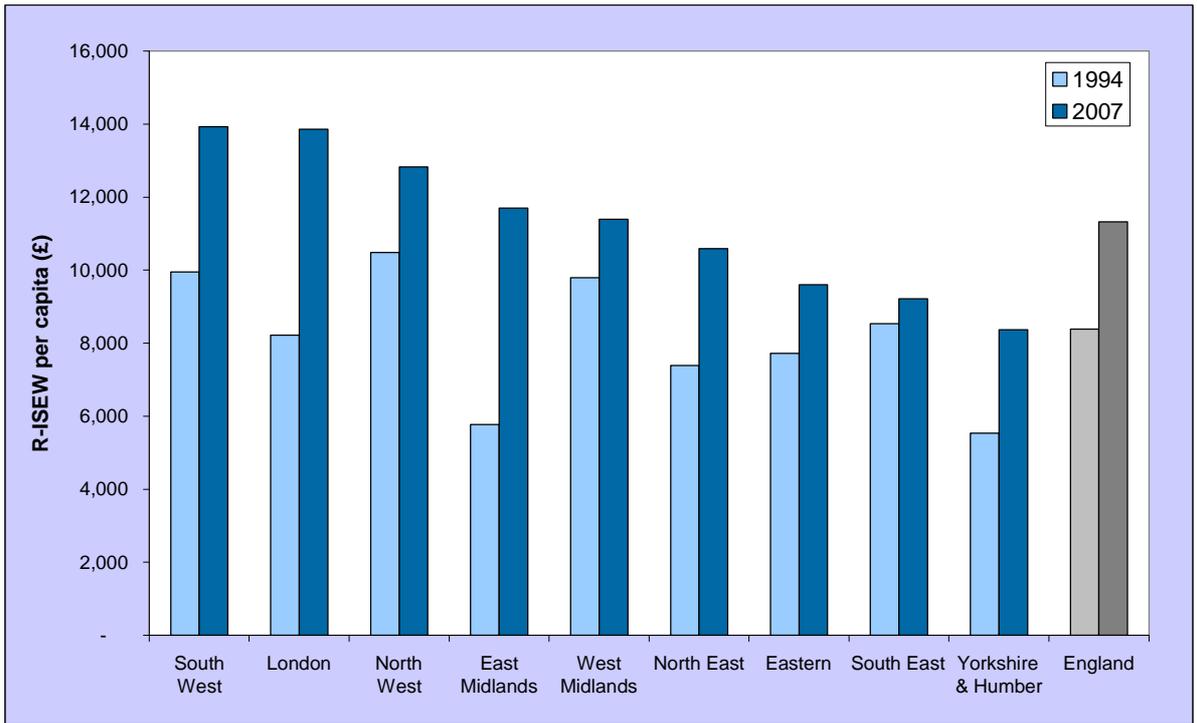


Figure 6: Increases in the R-ISEW from 1994 to 2007 across the GORs.

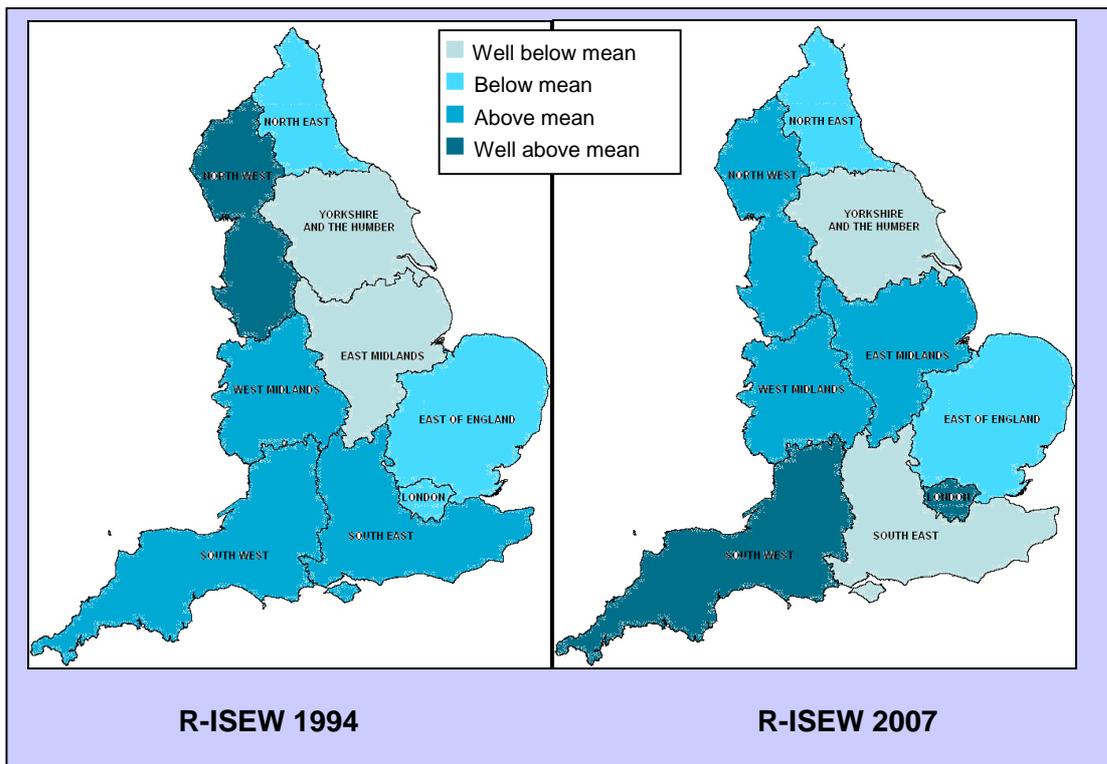


Figure 7: Per capita R-ISEWs for 1994 and 2007.⁴

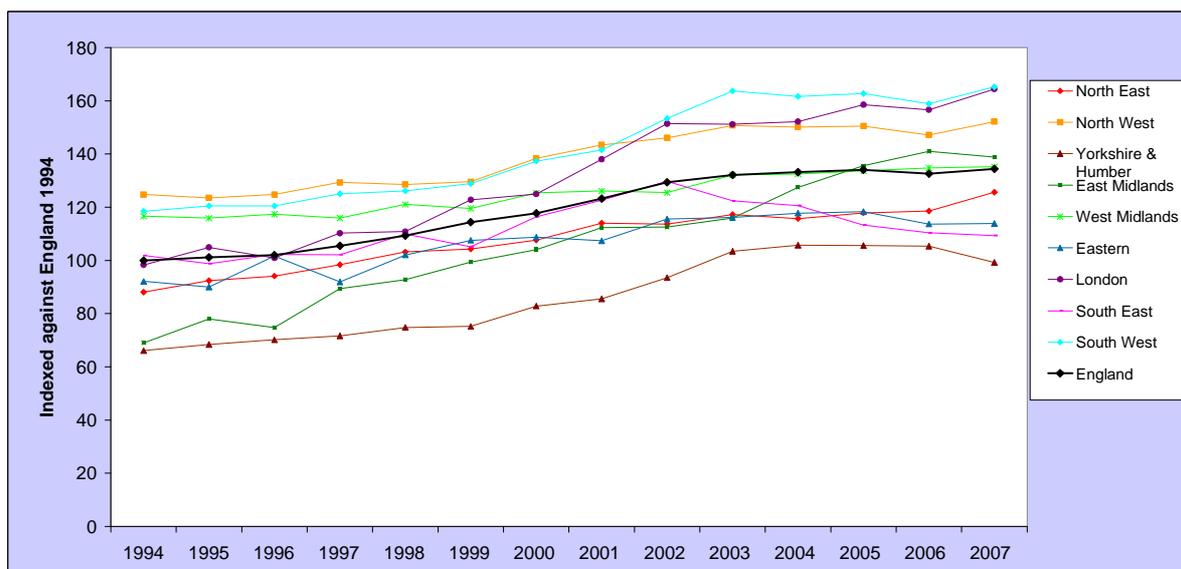


Figure 8: R-ISEWs per capita indexed against England’s R-ISEW for 1994, for all the English GORs.

Table 1: R-ISEW per capita rankings for each region from 1994 to 2007.⁶

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
North East	7	6	7	6	6	7	7	6	7	6	8	7	6	6
North West	1	1	1	1	1	1	1	1	3	3	3	3	3	3
Yorks	9	9	9	9	9	9	9	9	9	9	9	9	9	9
East Mid.	8	8	8	8	8	8	8	7	8	8	5	4	4	4
West Mid.	3	3	3	3	3	4	3	4	5	4	4	5	5	5
Eastern	6	7	5	7	7	5	6	8	6	7	7	6	7	7
London	5	4	6	4	4	3	4	3	2	2	2	2	2	2
South East	4	5	4	5	5	6	5	5	4	5	6	8	8	8
South West	2	2	2	2	2	2	2	2	1	1	1	1	1	1

1.3 Component patterns

The R-ISEW takes consumer expenditure as a starting point – which reached a total of £725 billion for England in 2007. The two other main positive components are services from household labour and volunteering, and public expenditure on health and education (Figure 9). Whilst services from household labour and volunteering have been steadily declining from 1994 to 2007 (starting at £215 billion but dropping to £183 billion), public expenditure on health and education has almost doubled – growing from £78 billion to £147 billion.

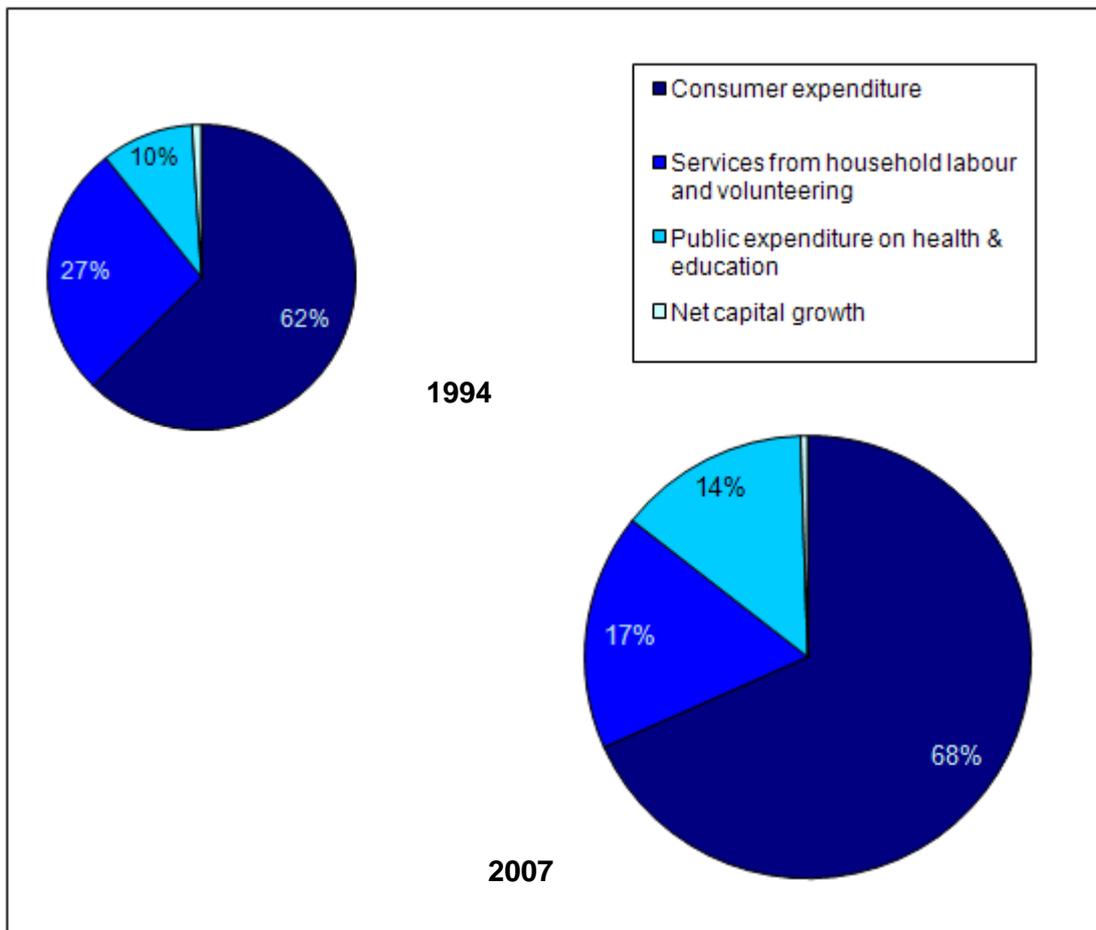


Figure 9: Positive components of England's R-ISEW in 1994 and 2007.

The picture for costs subtracted from the R-ISEW is rather more complex (Figure 10). Environmental costs represent the biggest two components here – long-term environmental damage (£122 billion in 2007) and depletion of non-renewable resources (£99 billion in 2007) – with the local costs of air pollution also representing a substantial cost (£19 billion in 2006). The two largest social costs are the adjustment for income inequality (which took £91 billion off England's R-ISEW in 2007) and the cost of commuting (£34 billion in 2007). Lastly, the main negative economic cost – net international position – represented a loss of £51 billion.

Over the 13 years for which data is available, the biggest changes have been the increase in the costs of long-term environmental damage and resource depletion (which represented 46% of the R-ISEW costs in 2007, compared with 39% in 1994), and the *decrease* in the costs of air pollution (only 4% of the R-ISEW costs in 2007, compared with 16% in 1994). The costs of income inequality and net international position have also increased over the 13 years since 1994.

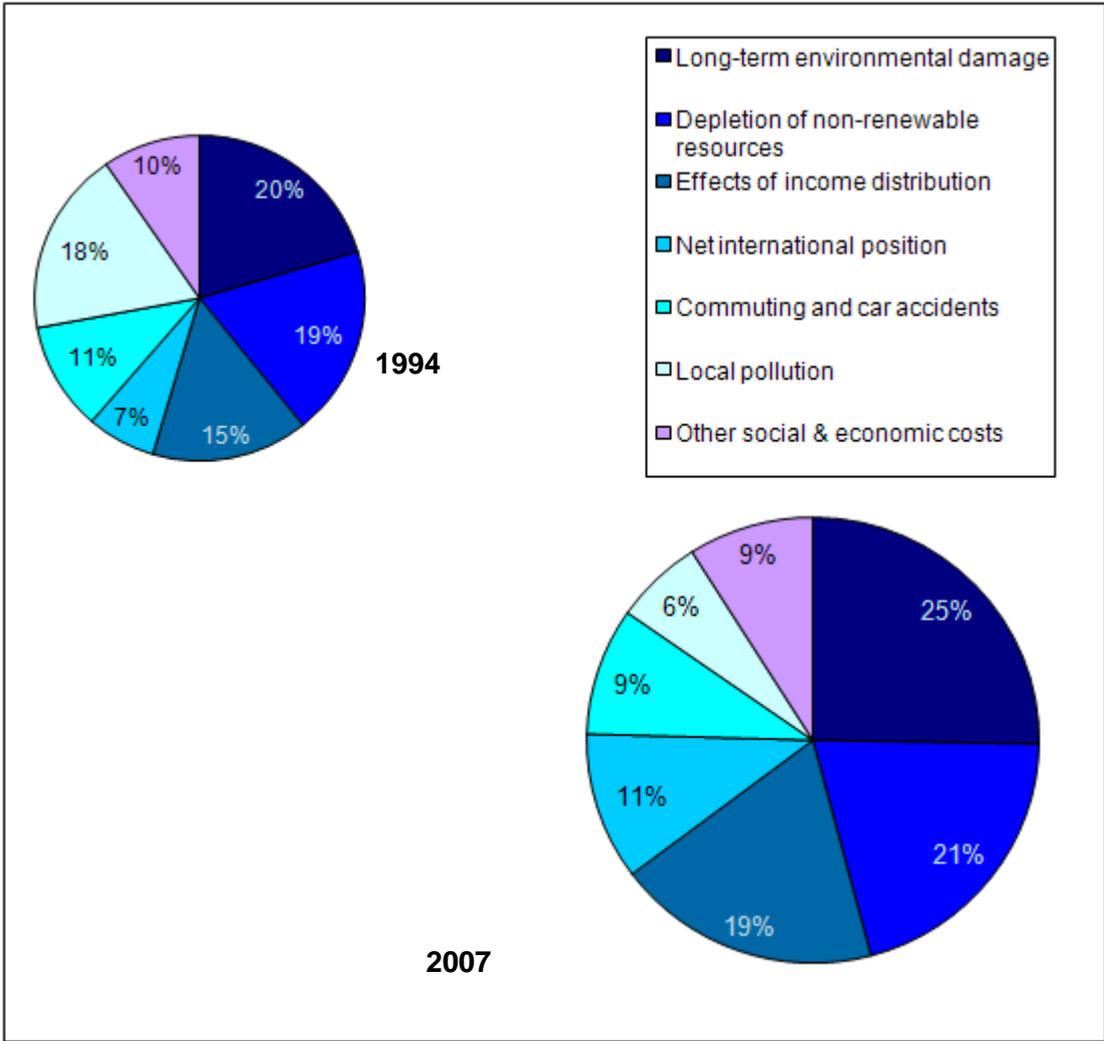


Figure 10: Negative components of England's R-ISEW in 1994 and 2007.

2. The R-ISEW – by component

Adjusted measures of economic well-being start from an account of economic consumption (as for GDP). This basis is then adjusted to incorporate various economic, social and environmental factors which are not included in the conventional measure. In the following section we discuss key findings and trends over time in each of the component factors of England's R-ISEW, as calculated for the period 1994–2007. Here, we provide short descriptions of each component – more detail on how each component is calculated, including references, can be found in Appendix 4 of an earlier report,⁷ and in the forthcoming technical report.⁸

A full discussion of all the results for all GORs is beyond the scope of this report; instead we focus on particularly interesting or outstanding patterns. For brief region-by-region analyses refer to Section 3 of this report.

Throughout this Section, we shall report per capita figures, rather than totals. Typically this has the tendency to reduce the apparent size of changes over time, as total figures do not control for the increase in population in England over the 13 years in this time series – from 48 million in 1994 to 51 million in 2007. For each component, the percentage in brackets in the title represents its value in 2007 for England, relative to the final R-ISEW score for that year, as well as the direction in which the component takes the R-ISEW (positive or negative). As we go through the Section, we shall provide a running update of the effect the incorporation of each set of components has.

2.1 Economic factors

The baseline for the R-ISEW is regional consumer expenditure. It is recognised that this is a contested proxy for well-being for a number of reasons, but it at least provides an indication of the value of goods and services consumed and is therefore a reasonable estimate of the 'standard of living' during the period. From this basis, the R-ISEW makes several economic adjustments to account for factors which are vital to the long-term sustainability of the regional and global economies.

Consumer expenditure (+125%)⁹

Household final consumption expenditure. National figures from the ONS Blue Book, which are based primarily on information from retailers. Estimated regional figures derived using data from the Expenditure and Food Survey.¹⁰

Per capita regional consumer expenditure for England grew by 36% in real terms over the period 1994–2007, from £10,398 in 1994 to £14,181 in 2007, which is a marginally smaller increase than that in GVA per capita (which tracked a 38% increase, from £14,878 to £20,463).¹¹ Unsurprisingly, there are quite large differences between GORs, with per capita expenditure in the South East (£15,765 in 2007) 26% higher than that in the North East (£12,543). This difference, however, is the lowest it has been throughout the time series, rising from 36% to 44% between 1994 and 2000, before falling again to its current level.

It should be noted that for some regions, there is a substantial discontinuity from earlier trends in the data on consumer expenditure. For example, consumer expenditure appears to have increased by 6% between 2006 and 2007 for the North East, which is roughly the same amount it had increased over the previous five years put together. Similar leaps were seen in the data for the South West and the East of England. Meanwhile consumer expenditure appeared to fall by 2% in the East Midlands and by 1% in Yorkshire. At this stage it is still not clear whether these differences represent a genuine phenomenon or are just an artefact of the small sample sizes involved in collecting regional consumer expenditure data.

Looking at how different GORs have fared over the 13 years, the East Midlands has fallen below the mean for England – whereas it used to be above the mean in 1994 and 1995; whilst the South West and the East of England have risen above the mean. Meanwhile, London and the South East have swapped places as the wealthiest GOR in England several times, with London recording large increases between 1996 and 2000, but then a sustained fall in consumer expenditure between 2000 and 2004.

Interestingly, none of this movement can be seen when looking at regional GVAs, which have grown steadily in every GOR, with little change in position. For example, whilst consumer expenditure was relatively low in the East of England in 1994 (7% lower than the England mean), its GVA was, compared with rest of England, more or less the same as it is now (5% above the mean in 1994, at the mean in 2007). Meanwhile, London's GVA has remained consistently and considerably higher than that of the South East, and has not declined since 2000, as consumer expenditure has. Figure 11a maps consumer expenditure across the GORs for 2007.

2007 saw a bigger increase in consumer expenditure (a 1.7% year-on-year increase) than any year since 2001.

Net international position (-9%)

For the UK, this is the balance of payments, adding exports and income, subtracting imports, and adjusting for current account transfers. Regional estimates of each region's contribution to the UK's net international position are determined using a combination of regional trade data, consumer expenditure on services, and sectoral GVA.

England has suffered an increasing deficit across the time series, increasing its impact on the R-ISEW from £557 per capita in 1994, to £1,006 per capita in 2007. This is predominantly due to imports of material goods far exceeding exports, a deficit that is not compensated for by the surplus in trade in services. Three GORs have consistently bucked this trend – the East Midlands, North East and North West. The North East and North West both started the period with particularly high surpluses (£1,278 and £813 per capita respectively), peaking in 1997, but then declining slightly – particularly in the case of the North West. Meanwhile, the East Midlands started the period with only a marginal surplus (£64 per capita) which has risen steadily to £973 per capita in 2007. All these GORs have maintained a surplus in goods trade, with that for the East Midlands having increased dramatically since 1994.

Meanwhile, the biggest deficits were seen in the South East and the East of England. These have been consistently growing, reaching £3,797 per capita in the South East in 2007, and £3,329 in the East of England. Again, these deficits are driven by the balance of goods trade, with deficits for the South East and the East of England having shot up since 1994 (for example, that for the South East has increased from £1,376 per capita in 1994, to £4,960 in 2006 – in current prices). Whilst these GORs have also seen increases in their services surplus, this does not compensate for the goods deficit.

The region with the third highest deficit per capita is the West Midlands (£860 per capita in 2007). This represents a steady decline from a *surplus* of £903 per capita in 1994. The

region's balance of payments went into the red in the year 2000, again driven predominantly by a switch from having a goods surplus to a goods deficit.

By contrast, London has seen a substantial improvement in its net international position. Whilst it remains in deficit, it has reduced this deficit from £3,003 per capita in 1994, to £638 per capita in 2007. In 2003, the deficit was only £97 per capita. Whilst the region has, like most of England, seen a growing goods deficit, this has been more than matched by a growing services surplus.

Changes to the underlying regional GVA data have resulted in a slightly rosier picture across England than in last year's R-ISEW.

Figure 11b maps net international position across the GORs for 2007.

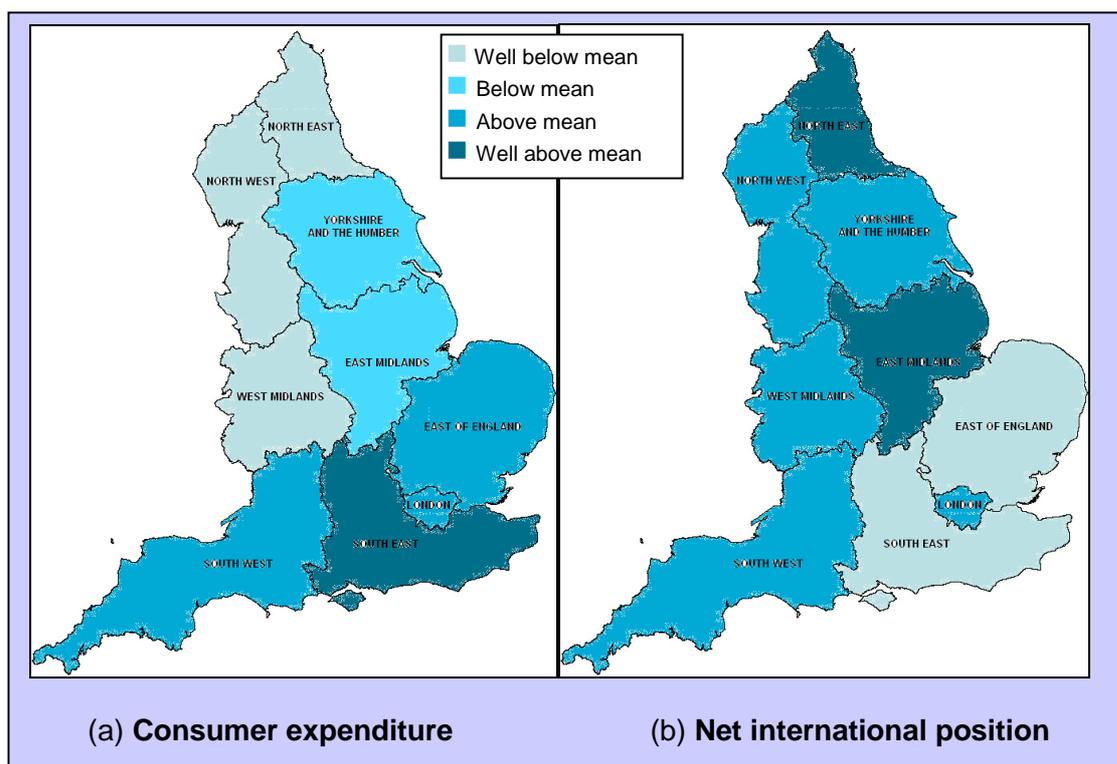


Figure 11: Per capita consumer expenditure and net international position in 2007.⁴

Net capital growth (+1%)

Growth in capital stocks net of labour force growth. Estimated, based on change in UK capital stocks from the ONS, and regional net capital expenditure figures from the Annual Business Inquiry.

The net effect of this adjustment can vary substantially, depending on the balance between capital investment and workforce growth in a given GOR. For England as a whole, this component has a relatively small, but positive impact on the R-ISEW. Its greatest annual contribution was of £389 per capita in 2002. Since then it has declined steadily, to £107 per capita in 2007, though this is still above the low point of only £62 per capita in 1997.

In contrast to its low temporal variability, however, this component has substantial spatial variability. The North East is the only GOR to have been consistently in deficit during the 13-month period, with this deficit taking off £275 from its per capita R-ISEW in 2007, and £485 per capita in 2004. Meanwhile, several GORs have consistently turned out a positive

figure for net capital growth – namely the East Midlands, the North West, and the West Midlands – areas traditionally recognised as the industrial hub of England.

Yorkshire and the Humber had also consistently seen positive net capital growth, recording the highest per capita figures between 2002 and 2004. Since then, however, net capital growth has dropped substantially in the region, becoming marginally negative in 2007. The South East and South West have also seen net capital growth dramatically decrease, such that these two regions had the lowest regional per capita figures in 2007 (-£334 per capita and -£486 per capita, respectively).

Meanwhile, the East Midlands continues to increase its capital stock, such that net capital growth contributed £716 per capita to its R-ISEW in 2007. London is the only other region to see substantial gains. Whilst net capital growth was negative for the region from 1995 to 2004, the last three years of the time period saw the region move into second place in terms of this component.

It should be noted that the key driver of variation between GORs for this component is net capital *expenditure*, as recorded by the Annual Business Inquiry. R-ISEW calculations implicitly assume an equal rate of capital depreciation across GORs. What this means is that the R-ISEW may be under-estimating the amount of capital stock in regions where depreciation has been slow, and over-estimating the amount in those where depreciation has been fast. Regional figures for stocks would be necessary to resolve this problem.

Adjustment for consumer durables (-3%)

The purchase of durable goods, such as washing machines, provides a household with a flow of valuable services for some years, and not just the year in which the goods are purchased. To adjust for this, the difference between expenditure on and service flow from consumer durables is estimated, accounting for depreciation and obsolescence.

This component has a modest impact on the R-ISEW, subtracting 2.4% of the value of England's consumer expenditure (£337 per capita) in 2007. This represents a decrease from the high point of £427 per capita in 2001. Generally, the pattern is for this component to be largest when consumer expenditure on consumer durables is high, and to be lowest when expenditure is relatively low, but follows a period of high expenditure from which service flows can be recouped.

Comparing across regions, this component has been consistently the largest in affluent southern GORs (particularly the South East). The exception is London, for which the cost of this component has tended to be below average

Step 1: Effect of economic adjustments

Applying these three economic adjustments to consumer expenditure is the first step to creating the R-ISEW. Doing so reveals stark differences with GVA (Figure 12). Until 2003, the adjusted expenditure indicator increased along with GVA – indeed, in percentage terms, the increase was marginally greater per capita (31% vs 28%). Even at this early stage in the calculations, however, the flattening out of growth in the final R-ISEW, beginning in 2003, is identifiable. Even before social and environmental factors are taken into consideration, calculations reveal that the economic health of the nation hardly improved between 2003 and 2007. Whilst GVA increased by 8% over this period, the adjusted indicator only increased by 1%, or £140 per capita. Indeed even this rise is only attributable to the final year of the time period – 2007 – when consumer expenditure increased at a faster rate than usual. The figure for 2006 is identical to that of 2003.

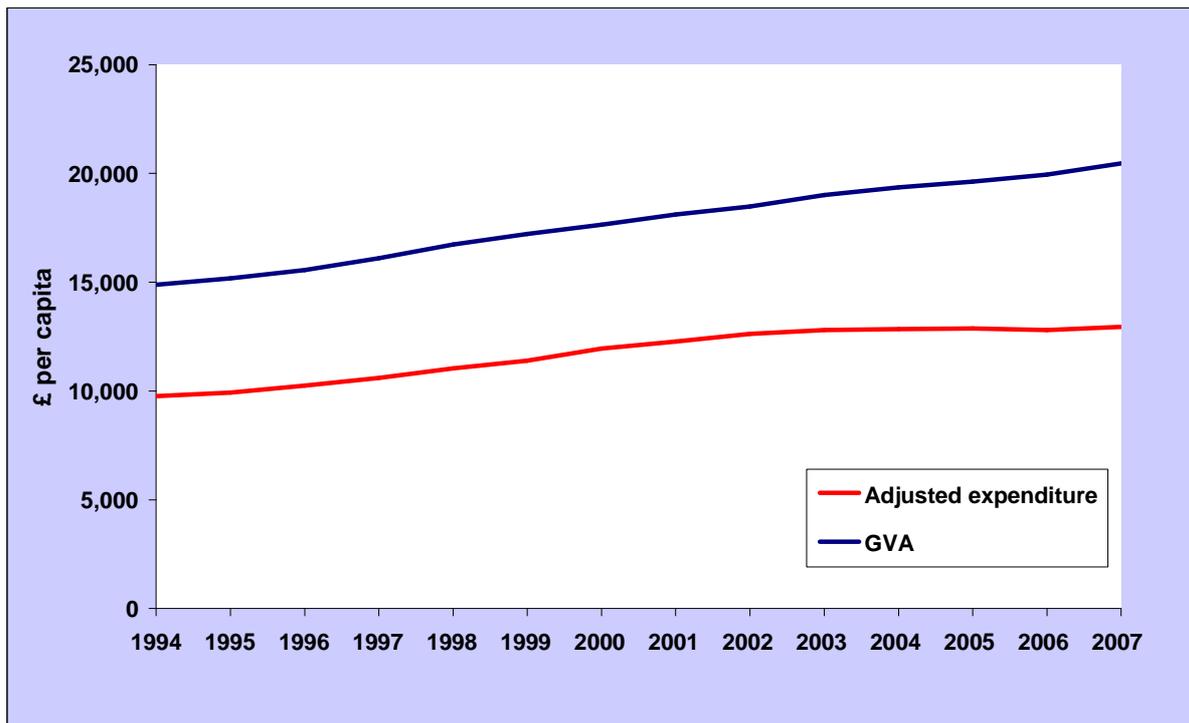


Figure 12: Adjusted consumer expenditure (after Step 1) vs GVA for England.

Comparing GORs also reveals important differences (Figures 13 and 14 for selected GORs). London's significant lead in terms of GVA disappears, though it still maintains second place. The figures for the East of England and the South East, meanwhile, are the lowest for any region at £11,541 and £11,209 per capita in 2007 (11% and 13% below the England average, respectively). Meanwhile, the East Midlands, South West, and the North West reveal economically adjusted figures that are higher than one would expect based on GVA. The adjusted figure for the East Midlands is the highest at £14,800 per capita.

The lead that the East Midlands has over other regions is somewhat diminished compared to last year's report. This is due to two factors. The first one can be observed in the current data: the East Midlands adjusted consumer expenditure decreased slightly from 2006 to 2007 (by £89 per capita), whilst those of London and South West leapt up (by £441 and £597 per capita respectively). These differences are entirely due to the data on regional consumer expenditure, which, as we have already noted, present a discontinuity between 2006 and 2007. As a result, it may be unwise to interpret these changes too strongly.

The second factor is the inclusion of new data on capital growth and net international position. As the calculation of both these components involves considerable smoothing, figures for 2007 have an impact on the estimates for earlier years. In particular, London's figures on these two components in 2006 and 2005 have benefited dramatically from this smoothing. For example, net capital growth per capita in London were estimated to be -£81 and -£76 per capita in 2005 and 2006 respectively in last year's R-ISEW report. Our new figures, incorporating data for 2007, have been adjusted up to £140 and £192 per capita. Similarly the balance of payments deficit for London in 2006 was estimated to be £963 per capita last year. This time around the figure was only £499 per capita. Note that these changes in estimates only affect more recent years – the calculations for these components for earlier years are more stable.

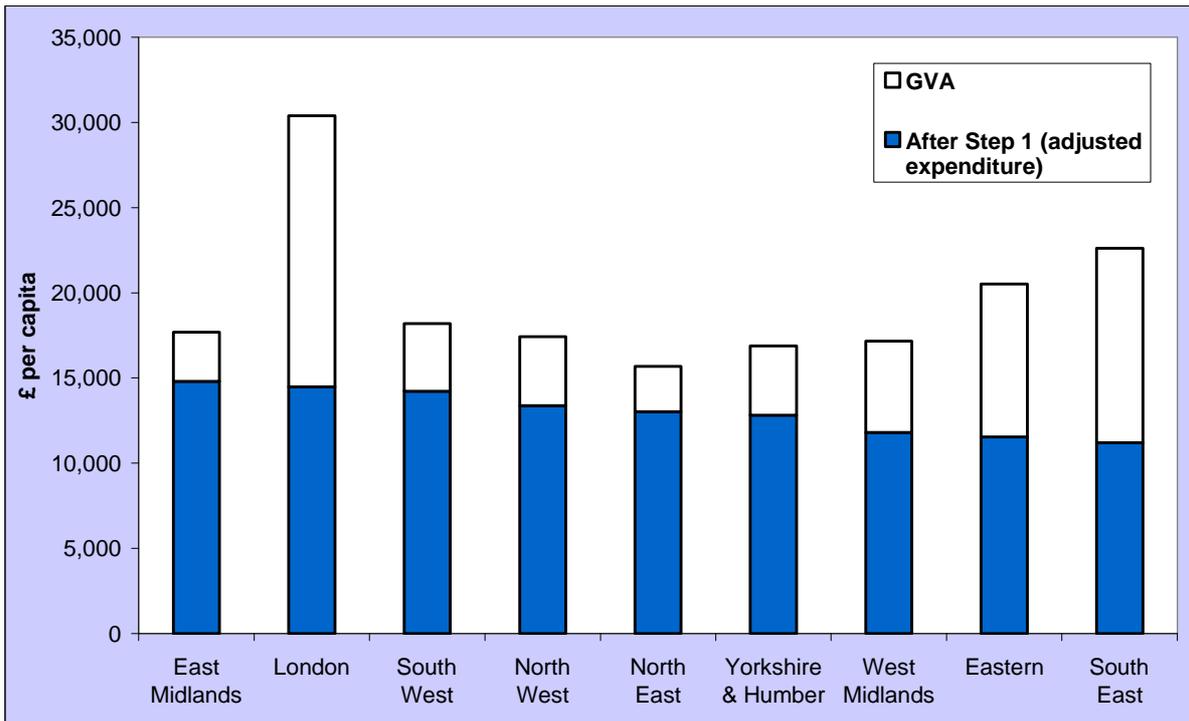


Figure 13: Adjusted per capita consumer expenditure vs total GVA for each GOR in 2007.

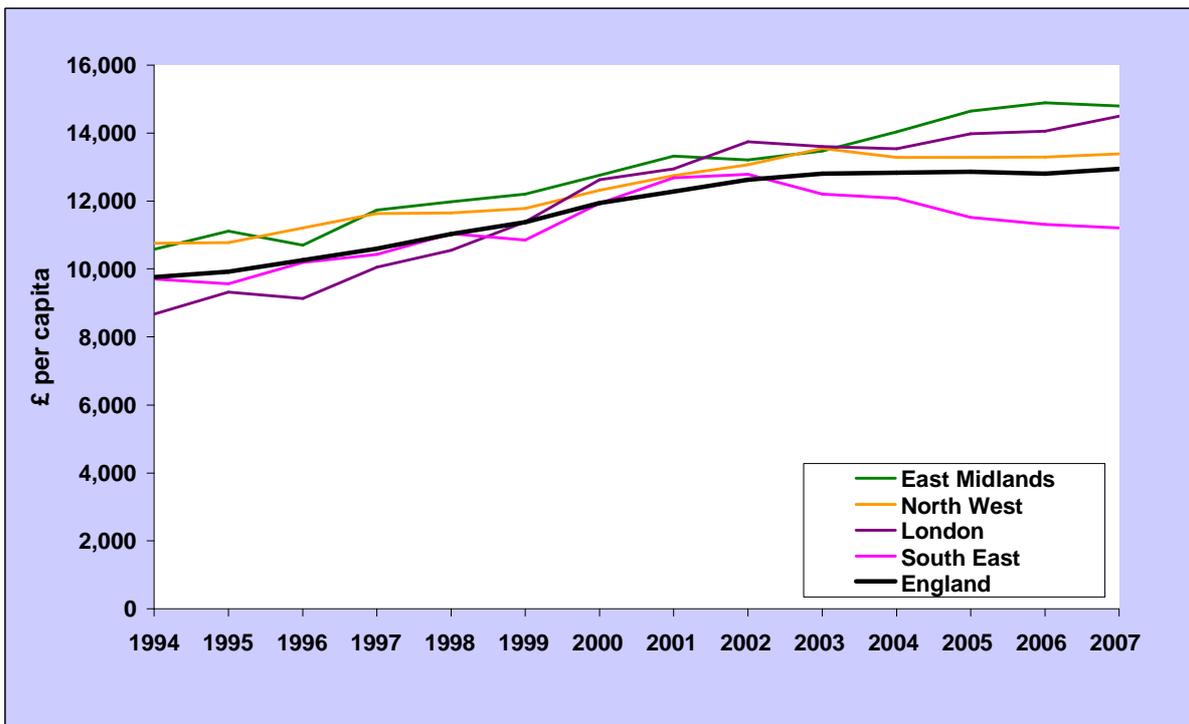


Figure 14: Adjusted consumer expenditure per capita for selected GORs.

It is worth noting that, relative to GVA, adjusted consumer expenditure serves to reduce inequalities between GORs. Whilst London's per capita GVA was almost double that of the North East by 2007, the highest adjusted consumer expenditure figure (for the East Midlands) was only 32% higher than the lowest (for the South East).

2.2 Social factors

The R-ISEW incorporates several adjustments to account for social aspects of the economy which are vital to sustainability, but which would normally be excluded from conventional economic accounts. Two of these adjustments are positive ones: services to the economy provided by unpaid labour from households and volunteers; and public expenditures on health and education. Social costs – crime, divorce, commuting and accidents on the road and in the workplace – are then accounted for.

Services from domestic labour and volunteering (+32%)

Productive contribution of total time spent on domestic labour and volunteering, based on Time Use Survey data, and valuing a unit of time equally across GORs and over time.

Time use trend data reveal that people in England are spending less and less time on domestic labour and only marginally more on volunteering. On average, people spent approximately 18.2 hours per week on domestic labour, and 73 minutes per week on volunteering in 1995. In 2005, the figures were 14.7 hours per week for domestic labour and 100 minutes per week for volunteering. Based on this trend, the total *value* of this time use for England, using appropriate national wage rates, declines from £4,465 per capita in 1994, to £3,587 in 2007 (as noted in Section 1.3) – a drop of 20%.

Comparing across GORs, the South East and South West enjoy the highest per capita figures, whilst London and Yorkshire and the Humber have the lowest – the gap between these two pairs of GORs was around £400 per capita in 2007. Changes in the regional pattern over time are unlikely to be detected as the time use trend data does not have such sensitivity.

Public expenditure on health and education (+25%)

All public expenditure on health and education is included (defensive health spending due to crime, car accidents and pollution is subtracted elsewhere)

Public expenditure on health and education has increased across England by 78% from 1994 to 2007 – from £1,617 per capita to £2,885 per capita. The increase applies to both health and education spending, though it has been more significant for the former. This pattern of increase has been roughly the same across the country. As such, differences between the GORs have been more or less preserved. Throughout the time period, London has had the highest per capita public expenditure – 18% above the English average in 2007. Meanwhile, the East of England, South East, South West and East Midlands have had the lowest spending per capita – between 6 and 11% below the English average.

Whilst the increase in public expenditure appeared to be tailing off up to 2006 (only increasing 1% from 2005 figures), 2007 saw another substantial increase – of 4%. Regions were affected to different degrees, with the increase in London being the fastest at 6%.

Step 2: The impact of incorporating social benefits

The overall impact of incorporating positive social benefits (the value of domestic labour and the value of public expenditures on health and education) to economically adjusted expenditure measure is shown in Figure 15.

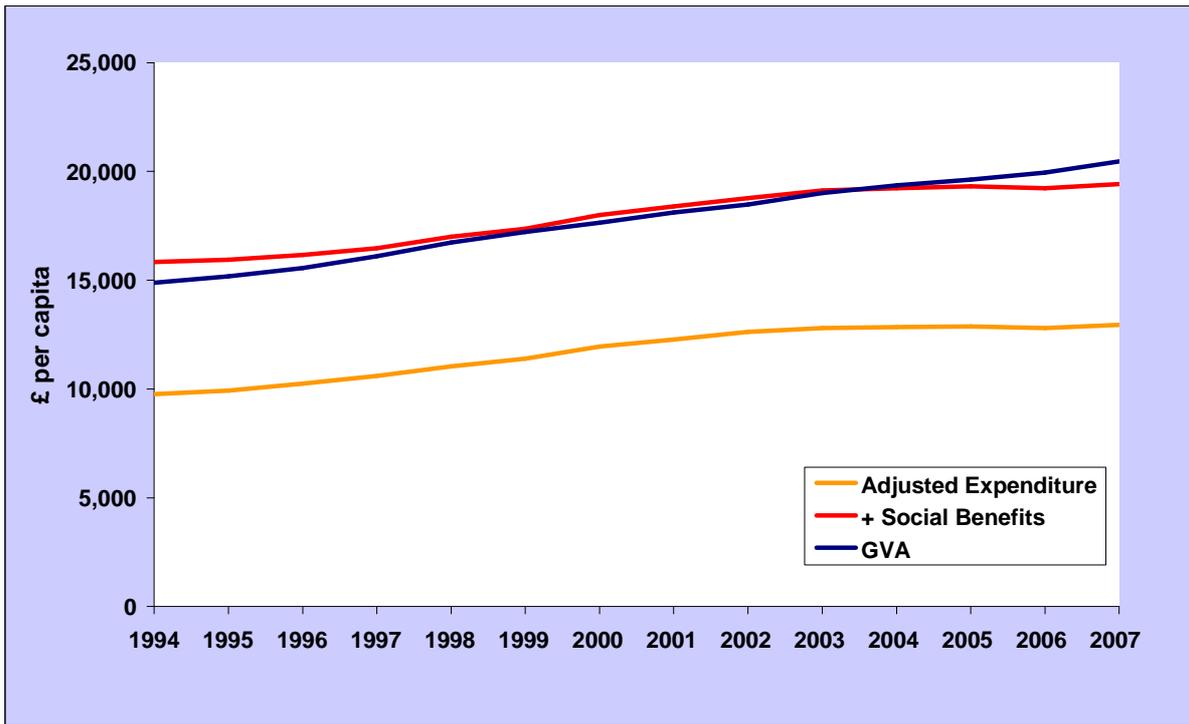


Figure 15: Adjusted consumer expenditure (after Step 1) combined with social benefits (Step 2) vs GVA.

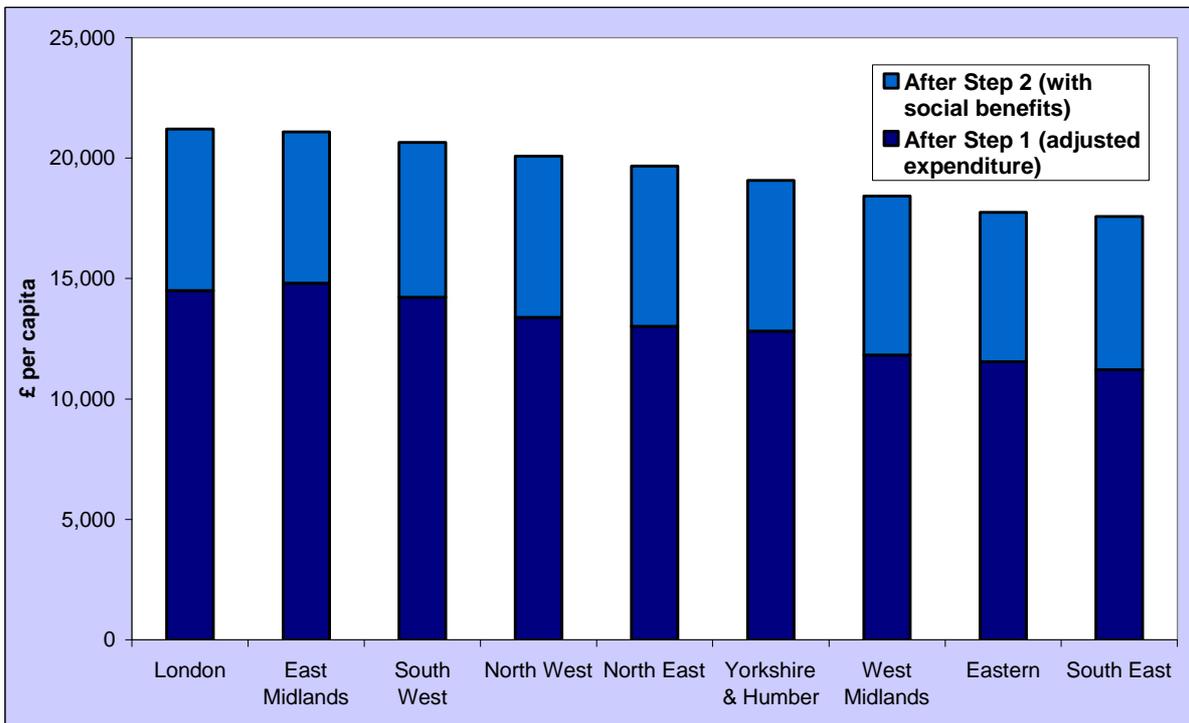


Figure 16: Adjusted consumer expenditure (after Step 1) combined with social benefits (Step 2) for each GOR in 2007.

As in Figure 12, Figure 15 shows the adjusted index for England on a per capita basis. Adding public expenditure on health and education and services from household labour returns the adjusted index to a level similar to that of GVA. The flattening out, however,

seen from 2003 onwards in Figure 12, is only marginally compensated for by the addition of these two social benefits. Total growth between 2003 and 2007 stands at 1.5% per capita, compared to 1.1% without social benefits, and 7.7% for GVA.

Including social benefits serves to lift London from second place to first, overtaking the East Midlands. This appears to be because of the higher and increasing per capita levels of public expenditure in London. Between 2004 and 2006, the East Midlands has the highest per capita value, even once social benefits have been included.

Costs of income inequality (-16%)

This attempts to adjust unequal consumer expenditure to reveal the total associated utility, recognising that increased expenditure has different marginal utility at different expenditure levels. Atkinson Indices are calculated for each GOR, from household income data from the Family Resources Survey, in order to determine the appropriate amount to be subtracted from total consumer expenditure for that region.

Using an ϵ parameter value of 0.8,¹² the costs of income inequality in England come to £91 billion or £1,787 per capita in 2007. This represents 13% of the value of consumer expenditure, making this one of the largest costs factored into the R-ISEW. As a proportion of consumer expenditure, the value of this component has remained relatively stable since 1994. This stable proportion equates to a steadily increasing absolute value as consumer expenditure grows. The data reveal a sharp peak in 2000, however, when this cost reached 15% of consumer expenditure.

Looking across the GORs, differences are large (Figure 17a). London has by far the largest cost of inequality at £2,488 per capita in 2007. It is interesting to note that the aforementioned peak in the cost of inequality across England in 2000 seems to have been driven predominantly by high inequality in London in that year (indeed the figure reached £3,595 per capita for London in 2000). After London, the two GORs with above-average costs of inequality are its neighbours: the South East and the East of England – the costs in both regions peaking in 2001 at £2,467 and £2,305 per capita respectively.

Meanwhile, the GORs with the lowest costs of inequality are generally those with lower consumer expenditure – the North East, the North West and West Midlands. These GORs are also joined by Yorkshire and the Humber, however, where consumer expenditure is only marginally below the average for England. This can be attributed to the fact that the GOR has seen a fall in its levels of inequality, as measured by the Atkinson Index, since the year 2000. Indeed, in 2007, its Atkinson Index was the lowest of any GOR. The other GOR which has seen a steady fall in its Atkinson Index is the North East.

Costs of crime (-2%)

These are based on Home Office estimates of the social costs (including health costs) of individual crimes in different categories, and incidence rates mostly from the British Crime Survey, with additional data on vehicle crime and homicides from other Government sources. Some defensive expenditure by business is also included.

The costs of crime represent a modest fraction of the R-ISEW (£202 per capita). The costs were relatively low until the year 2000, when they began increasing steadily, peaking in 2004 at £237 per capita. Since then, however, they have declined again such that costs in 2007 were 5% below those at the beginning of the time series.

As might be expected, the costs of crime are higher in GORs with large metropolitan areas – particularly London, but also Yorkshire and the Humber. The quite high levels of crime seen in the North West at the beginning of the millennium have dropped considerably. Meanwhile, costs are lower in predominantly rural GORs, particularly the East of England.

Over time, different GORs have seen very different patterns. For example, whilst London has always had the highest costs, these dropped quite significantly in the last two years of

the time series, from £315 per capita in 2005 to £257 per capita in 2007. London also failed to register the surge in the costs of crime which many GORs saw at the turn of the millennium, particularly Yorkshire and the Humber (where costs rose from a low point of £169 per capita in 2000, to £272 per capita in 2003), the South East, the South West and the East of England. The high cost recorded in the North West in 2002 is attributable to a single incident.¹³ The biggest improver is the North East. The region had a fairly high cost of crime in the first three years of this time period (17% above the English average in 1994), but this dropped dramatically in 1997, and has remained below the English average since. The East Midlands has also improved relative to the rest of England, staying at or below the English average since 1998.

Costs of divorce (-1%)

Costs of divorce include defensive costs (identified in surveys commissioned by an insurance company) and the costs of increased risk of mortality for divorcees.

The costs of divorce represent a 1.3% reduction in the overall R-ISEW (some £149 per capita in 2007). This amount has remained relatively stable over the 13-year period, rising slightly in the early years of the new millennium (2001–2004) parallel with the costs of crime. The cost has come down in the last three years, however, to reach its lowest point yet. In 2007, there were 135,588 divorces in England, compared to 160,631 in 2002.

The distribution of the costs of divorce across regions does not match the distribution of other social costs. The highest per capita costs have tended to be in the South West. Indeed, in many years, the costs of divorce have been higher in this region than the costs of crime. Divorce rates peaked at 3.7 per 1000 inhabitants in 2002, compared to, for example, 3.0 per 1000 inhabitants in the West Midlands. The figure for the South West was particularly poor in 2007 – 17% above the English average.

Meanwhile, the GOR with the lowest costs of divorce has been the East Midlands, where the divorce rate in 1998 was as low as 2.1 per 1000 inhabitants. Whilst all regions have seen substantial fluctuations in divorce costs over the 13-year period, London and Yorkshire and the Humber have both seen declines overall.

Costs of commuting and car accidents (-8%)

The costs of commuting include the loss of leisure time through time spent commuting, and the direct spending costs of motoring and use of public transport. The costs of car accidents include the costs of damage to vehicles and property and the costs of ill-health and fatality. All data, including unit costs for commuting time, come from the Department for Transport.

Our continued dependence on a 'car culture' is not without its price. As people drive longer distances, the associated social costs from commuting and car accidents have, until recently, tended to rise nationally. Together, the two components take 7.7% off the overall R-ISEW (5.8% attributable to the costs of commuting, and 1.9% attributable to the costs of car accidents).

Looking first at the costs of commuting, these have increased from £563 per capita in 1994 to £661 per capita in 2007, having peaked in 2000 at £687 per capita. The rank order of the GORs has remained fairly stable (Figure 17b), with London having by far the highest costs (34% above the English average), whilst the North East has the lowest costs. London is also the region where the most notable change in this component can be seen – the cost shot up from £744 per capita in 2003 to £882 per capita in 2005. This is largely due to the increased amount of time Londoners appear to have spent commuting in the last four years of the time series. This is not because individual commutes are taking much longer, however, but that the number of commuting trips reported to be made per person jumped up significantly. Further analysis is necessary to determine whether this is a genuine effect, as it is unclear why London residents would have suddenly increased their amount of commuting in 2004. This is a particularly sensitive issue as this change coincides with the

introduction of the congestion charge in London. It is worth highlighting that the newest data we have on this particular variable are only for 2005. Surveys have not been carried out to estimate numbers of commuting trips per person in 2006 and 2007.

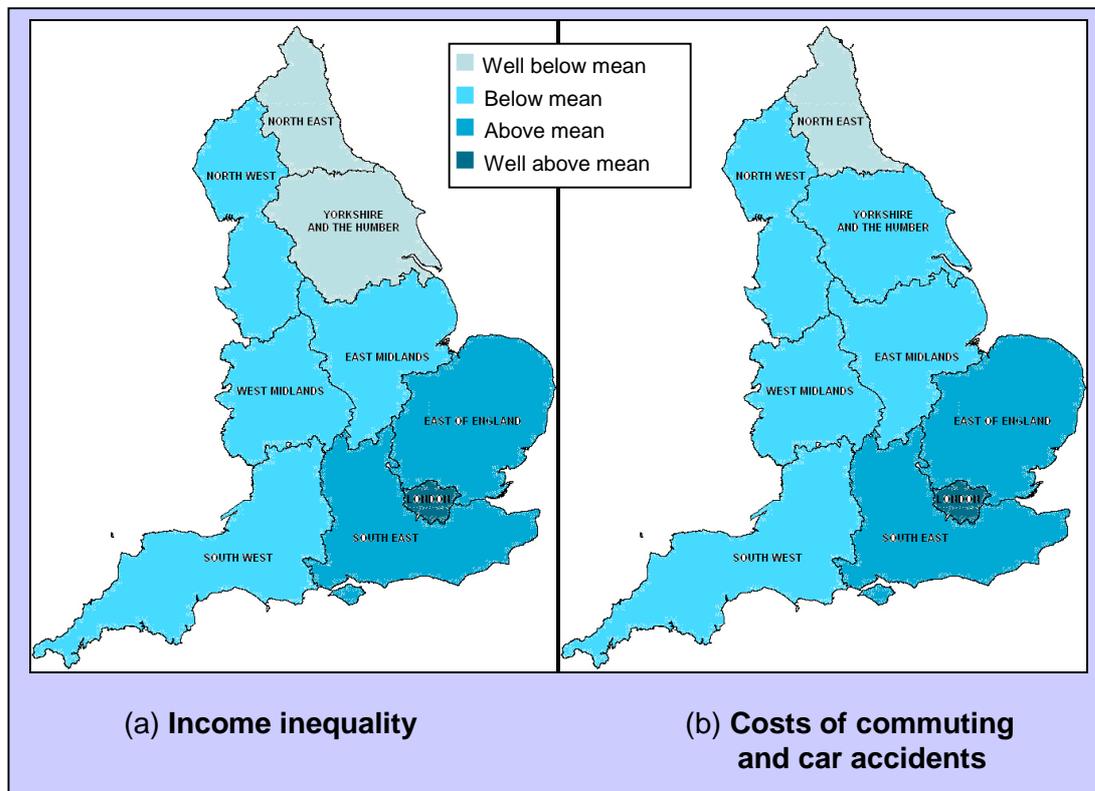


Figure 17: Costs of income inequality, and commuting and car accidents in 2007.⁴

The pattern for car accidents is very different. Here, a steady decrease has been recorded, from a starting cost of £318 per capita in 1994, to one of £216 per capita in 2007. This trend has been true for all GORs, but those starting the time series with the largest costs have enjoyed the greatest gains. As a result, the difference between the best-performing and worst-performing GORs has decreased from £157 per capita in 1994, to £62 per capita in 2006. At the beginning of this period, London had the highest costs (£379 per capita) followed by the East Midlands and the East of England, whilst the lowest costs were in the North East (£217 per capita) and the South West. The most dramatic change again can be observed in London, which now has the second lowest per capita costs. The biggest gains were seen here between 2003 and 2004, coinciding with the introduction of the London congestion charge. Overall the cost in London has fallen by 47%. As the costs in London fell, Yorkshire and the Humber, having started with below-average costs, has become the GOR with the highest per capita cost, particularly in the last two years of the time series. Though the costs of car accidents have fallen over the time series, they are still higher than those of crime.

Costs of industrial accidents (-1%)

These are based on estimates of the costs of industrial accidents to UK society, and regional incidence rates from the Health and Safety Executive.

The costs of industrial accidents represent around 1.4% of the R-ISEW (£162 per capita in 2007). Data has only been available for this component since 2001 – the lack of variation in previous years is only an artefact of the estimation methodology. In the time period for which actual data are available, costs have fallen marginally, by 6%, since a high point in 2003. Variation between GORs is fairly large, with the East Midlands and the South West

suffering the highest per capita costs (24% and 22% above the English average respectively); whilst the North West has the lowest costs (33% below the average). These patterns have remained relatively static with costs decreasing across the country in tandem. The only exceptions are London and the South West, where costs have increased marginally since 2001. The sharp jump seen in the West Midlands in 2006 appears to have been an aberration, and the region is now again at the English average.

There are no apparent structural reasons for differences, such as the proportion of regional population employed in particular sectors. For example, why does a relatively industrial region such as the North West have the lowest per capita costs? This may be an area which merits more detailed investigation of the underlying data.

Step 3: The combined impact of social and economic factors

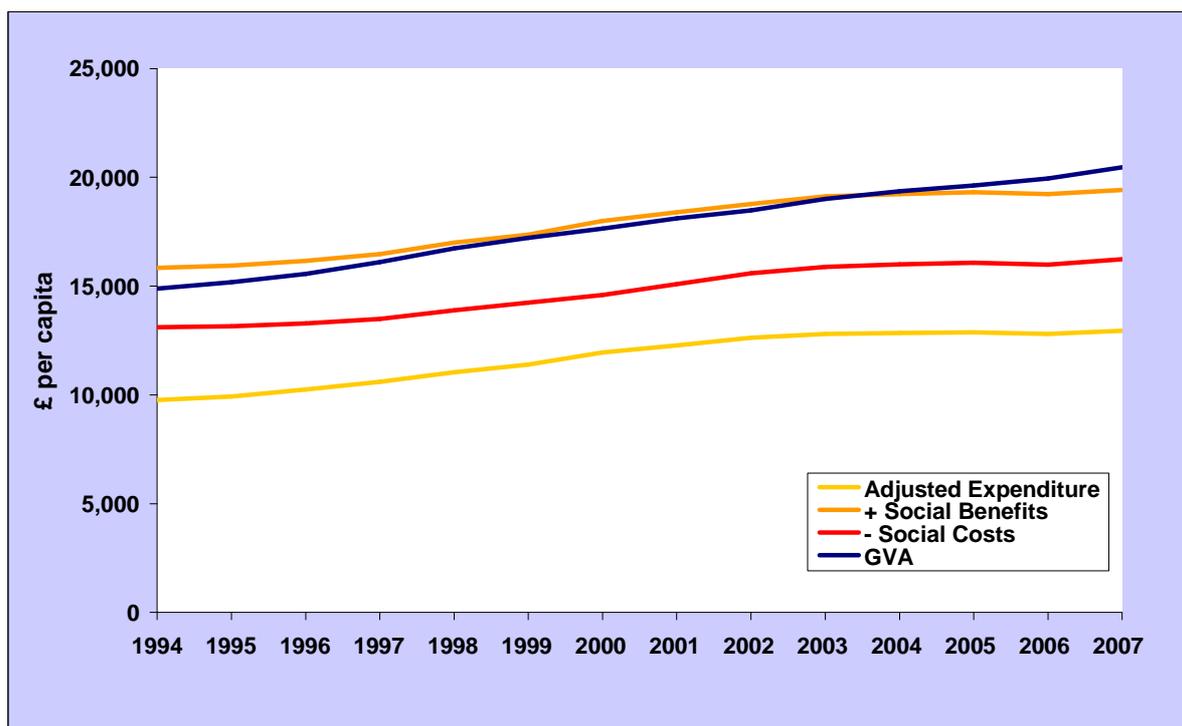


Figure 18: Steps 1 to 3 vs GVA.

Throughout the time period, subtracting social costs takes between 16% and 19% off the total after Step 2. This impact peaked marginally in the year 2000 driven by the increased costs of inequality, and has been at its lowest over the last six years. Indeed, the lowest cost, proportionally, was in the last year of the time period – 2007. Almost all costs decreased marginally between 2006 and 2007: income inequality, crime, family breakdown, car accidents and industrial accidents. The only cost to increase marginally was that of commuting. As a result, the slight upturn seen in the adjusted indicators after steps 1 and 2 begins to look more pronounced after incorporating social costs (Figure 18). This contrasts with the change from 2004 to 2006, where the costs of income inequality had increased by £88 per capita, cancelling out the gains seen in other social costs.

Looking across the GORs, the largest social costs fall to London, followed by the South East. Meanwhile, the lowest costs are in the northern GORs, and the West Midlands (Figure 19). Despite these differences, the only change in ranking from Step 2 is that London drops from top place to fourth. As after Step 1, the East Midland again emerges as the highest ranking GOR.

Looking back over time, we can see that London's social costs were even greater in 2000, when they shaved £5,259 per capita off the R-ISEW.

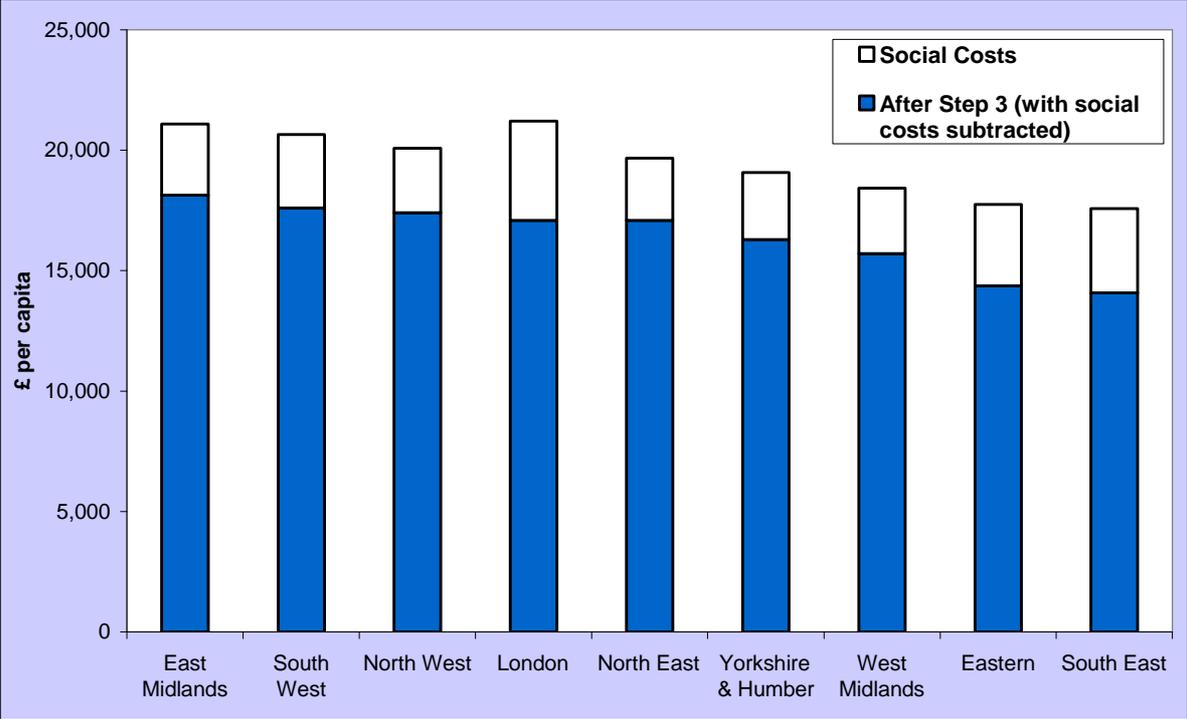


Figure 19: Subtraction of social costs per capita for each GOR in 2007 (Step 3)

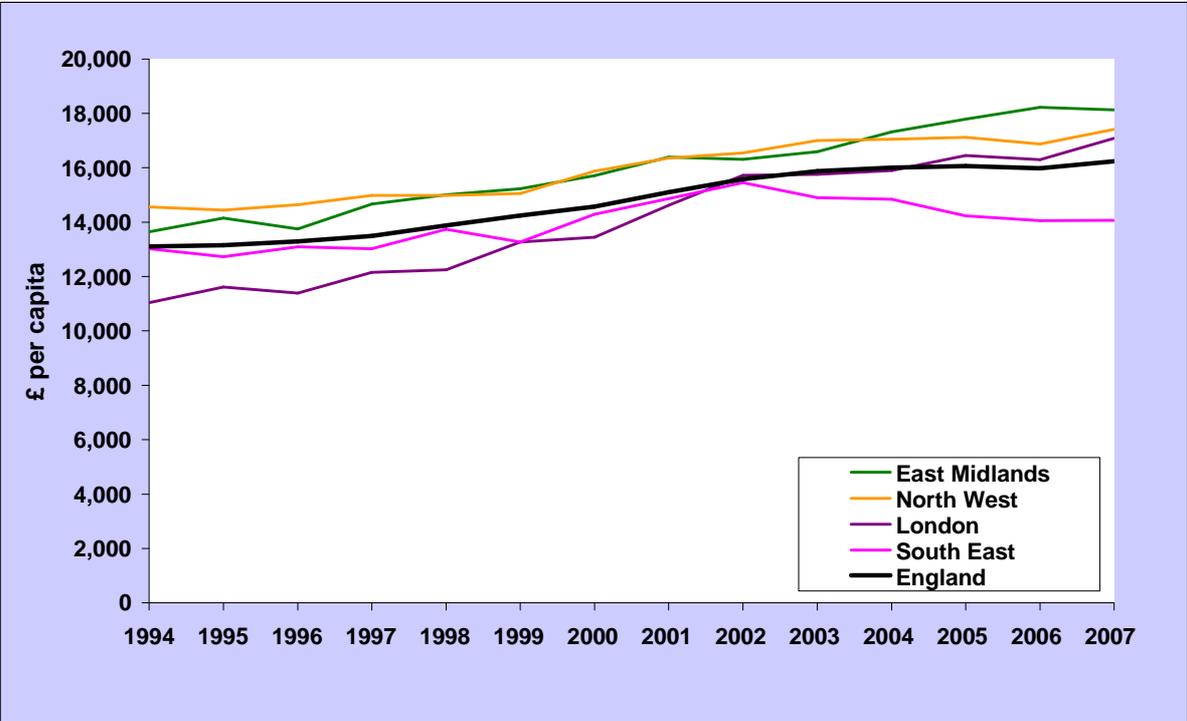


Figure 20: Results of Step 3, per capita for selected GORs.

2.3 Environmental factors

Several different kinds of environmental costs are considered, even though some of these may be in the process of becoming less important to the economy. These costs include the costs associated with 'local' environmental pollutants (air pollution, water pollution, etc.); the implicit costs in losses of agricultural land and natural habitats; the accumulated long-term costs associated with climate change; and the depletion of finite (non-renewable) resources, in particular of fossil energy resources. We discuss each of these adjustments in the following sections.

'Local' environmental pollution

Conventional 'local' air and water pollutants such as sulphur dioxide, nitrogen oxides, chemical oxygen demand, and so on have been the focus of environmental policy initiatives for several decades now. In the R-ISEW, four specific kinds of pollution costs are accounted for under this category:

1. Local and regional air pollution (including sulphur oxides, nitrogen oxides, carbon monoxide, particulates and volatile organic compounds).¹⁴
2. Water pollution (based on chemical and biological quality of waterways).
3. Pollution abatement.
4. Noise pollution (based on estimates of road and air traffic noise).

The first two categories measure the environmental impact of local water and air pollution – that is, the costs associated with levels of pollution actually recorded in the environment. The third category accounts for abatement costs to industry – expenditure at and before the point where emissions reach the smokestack or waste pipe. These costs are included because they are passed on to the consumer in higher prices, and are thus cashed out as a 'benefit' in the consumer expenditure data used as the R-ISEW baseline. They are, however, clearly *defensive* costs which cannot be said to contribute positively to welfare, and should therefore be deducted.

Taken together, the overall trend over time in the category of local pollution is a declining one. Although noise pollution costs are on the rise, the others are falling, and this category is dominated by the trends in air pollution, as we will see in more detail below.

Again, by following trends in air pollution costs, it can be seen that power-producing GORs, such as the East Midlands and Yorkshire and the Humber, have the highest overall costs in this category – and the highest reductions over the period of the study, in both absolute and proportional terms. GORs such as London and the South West, with little energy generation or heavy manufacturing see lower costs and lower reductions.

It is important to remember, however, that the R-ISEW does not attempt to capture the impact of our economy and consumption habits on local environments outside the nine regions of England. For example, air pollution may have declined greatly in England, and indeed in most of Western Europe. This may, however, be due to some extent to our increasing reliance on non-Western countries for manufactured goods. For example, the fact that England manufactures fewer cars than in the past may have led to decreases in *local* air pollution. But if this decrease in manufacturing has only been achieved through an increase in the import of cars manufactured in other countries, with similar or possibly even greater concomitant air pollution, then we might question whether the change really represents a move towards increased sustainability. Rather, the environmental costs have merely been exported.¹⁵ Of course, this effect can also function in the opposite direction. A region that is a net exporter to other regions may be incurring environmental costs associated with production that other regions are partly responsible for. This issue is discussed in depth in the recent scoping report that we have produced for the RDAs.¹⁶

Water pollution (-0%)

The cost associated with rivers of low chemical and biological quality, as estimated by Defra. Levels of water quality for each GOR as reported by the Environment Agency.

Water pollution has a minimal impact on the overall R-ISEW, deducting a mere £6 per capita across England in 2007. This low figure represents a fall of 26% from 1994 levels. Comparing GORs is a little tricky here as, of course, some have greater lengths of waterway per capita than others (the South West has almost a fifth of all the English waterways, whilst London has only 1%). This can potentially result in regions being penalised simply for having more water.

Looking at the percentages of river length that have fair, poor or bad quality, it is London that performs worst, both in terms of biological and chemical quality. Chemically, the rural East of England also performs badly, whilst the sparsely populated South West and North East perform well. Biologically, the East of England and South East actually do relatively well (as of course does the South West); it is the North West and West Midlands that perform poorly.

Good quality water ensures that, even when the lengths of waterways are taken into account, the South West performs relatively well. But ironically it is London which has the lowest cost per capita of water pollution of any GOR. Meanwhile, relatively poor quality in the West Midlands, combined with extensive waterways, mean it has the highest cost per capita in 2007. Whilst all regions except London have seen some improvement, the greatest gains have been seen in the East Midlands, where total costs have fallen by a third since 1994, mainly because of improvements in chemical quality.

Air pollution (-3%)

The costs of damage to health and property of local air pollution, estimated from two recent meta-studies. Levels of air pollution for the UK as a whole, and for each GOR gathered from the National Air Emissions Inventory.

The biggest single component contributing to local pollution is air pollution, although this cost has come down a great deal over the time period. In 1994, air pollution took 15% off England's R-ISEW total – £1,280 per capita. By 2007, the figure had dropped to just over 3% – only £377 per capita: a substantial 71% fall. Falls were most dramatic for sulphur dioxide (SO₂) emissions (a 78% drop for the UK as a whole) and carbon monoxide emissions (a 70% drop), with smaller declines in particulate emissions and nitrous oxide (NO_x) emissions. As a result, NO_x now represent the biggest total cost of any pollutant or pollutant group (£7.0 billion in 2007 for England), whereas, until 2004, it was SO₂ that was the biggest problem (costing England's R-ISEW £30.7 billion in 1994).

Looking across England, these decreases have, of course, had the greatest impact on GORs with extensive heavy industry and power-production facilities: Yorkshire and the Humber, the North East and the East Midlands. These GORs, however, still remain the biggest polluters. The only change in order is that, for the last four years, the East Midlands has no longer been the GOR with the highest per capita cost. This has been the result of a dramatic decrease in SO₂ emissions. Emissions in 2007 are estimated to be *one-seventh* those only four years earlier, in 2003. Such a steep fall has not been matched in neighbouring Yorkshire and the Humber, which now has the highest per capita costs.

At the other end of the scale, it is unsurprising that the rural South West has one of the lowest per capita costs. It is worth noting, however, that London, despite what its residents may suspect, actually enjoys the lowest per capita cost of any GOR (one-third the English average). This is due to the lack of both energy generation and heavy manufacturing in the region.

Pollution abatement (-1%)

This represents current expenditure and annuitised capital expenditure per employee on pollution abatement by sector from Defra. The Labour Force Survey was used to determine the number of employees in each sector for each GOR.

Pollution abatement cost England's R-ISEW £75 per capita in 2007. These costs are closely related to the prevalence of power generation and heavy industry. The distribution of costs is therefore not very surprising: low in London (only £38 per capita) and more southern GORs, and highest in the North East (£108 per capita) and other northern GORs. Over the eight years for which actual data are available, there has been no clear trend. Whilst costs appeared to be going down between 2000 and 2005, they have risen again over the last two years such that the per capita figure for 2007 is higher than that for 2000. This rise appears to be largely a result of increasing spending on pollution control in the electricity, gas, steam and hot water sector. Spending (including capital and operating expenditure) in this sector alone in 2007 was £1.8 billion, compared to £0.3 billion only two years earlier in 2005.

Prior to 2000, data has been estimated and therefore the apparent declining trend should be treated with caution.

Noise pollution (-1%)

This is based on three estimates of the cost of road traffic noise pollution in the UK, and regional data from the Department for Transport. Aviation noise is also costed based on a government-endorsed study, with the regional distribution of flights sourced from the Civil Aviation Authority.

Noise pollution has a similarly low impact on the overall R-ISEW, costing only £80 per capita in 2007, of which by far the biggest factor is road traffic. Unlike the other costs of local pollution, however, the cost of noise pollution has risen slightly since 1994 – by 15%. By far the most important single driver of this increase has been the increase in the number of vehicle kilometres over time. Variation between GORs is also determined by this factor. The regions with the highest per capita costs are those that include swathes of the commuter belt – the South East and the East of England – with costs decreasing as one moves away from the capital. London itself, however, being an urban conurbation with relatively good public transport links, has by far the lowest cost – 38% below the English average. Interestingly, London is also the only GOR where traffic levels have not risen since 1994; consequently costs have remained static.

Of course, looking at noise from air traffic, the picture is very different. London's bears almost half the cost – £85 million out of a total for England of £185 million.

Loss of farmlands and natural habitats (-1%)

The value of natural habitats is estimated based on a willingness-to-pay model using data from the RSPB. The value of farmland and costs of soil erosion are sourced from earlier studies. Rates of farmland and natural habitat loss (or gain) come from the Countryside Survey and Defra's June Agricultural Census.

In the R-ISEW, these factors – particularly the loss of farmland – represent a modest adjustment to the overall index. Furthermore, estimates for the loss of natural habitat are based on only two data points; one should be very cautious about their interpretation.

Looking then at natural habitats, the slight decrease in wetland area in England between 1990 and 1998 has been taken to imply a general slow loss across the country. This loss however, has been so slow as to not even keep pace with population growth. As such, per capita figures for this component have remained steady at around £46 per capita.

The costs of loss of farmland and soil erosion are even slighter – £13 per capita. They tend to affect GORs that have historically been more agricultural, such as the East Midlands and

the South West. It is interesting to note, however, that the South West has seen a sharp decrease in the cost of this component, owing to over 100,000 hectares having been brought into cultivation in the region since 1994.

Step 4: The combined impact of local pollution and loss of farmland and habitat

As a result of the falling costs of air and water pollution and pollution control expenditure within England, the combined impact of local pollution components has fallen from £1,501 per capita in 1994 to £597 per capita in 2007 (Figure 21). These amounts subtract from 11% to 4% from the total calculated at Step 3. The result is to push up the R-ISEW, in relative terms, in recent years. At Step 4, having included everything except the costs of resource depletion and long-term environmental damage, the adjusted indicator plots a 34% increase from 1994 to 2007 (as opposed to the 24% increase in Figure 18, which did not include the costs of local pollution). A slight drop, however, can still be observed in 2006.

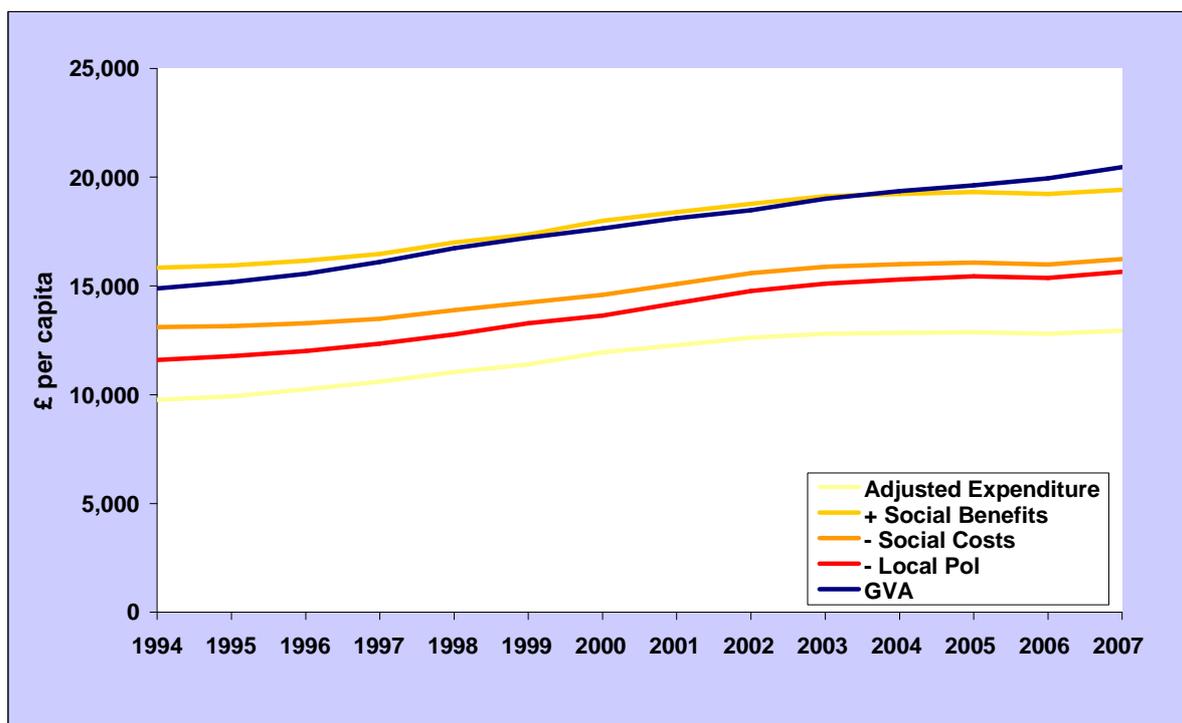


Figure 21: Steps 1 to 4 vs GVA.

Looking across GORs (Figure 22), the East Midlands suffers somewhat from the inclusion of the local pollution components; however it still remains at the top of the table in 2007. By comparison, in 1994, the East Midlands was the bottom region after local pollution components had been included – highlighting the great amelioration of pollution levels in the region – their cost falling from £3,540 per capita in 1994 to £740 per capita in 2007. Meanwhile, London’s low local pollution means that it edges back up the ranking, moving from fourth place after Step 3 to third place. It, too, has enjoyed great improvements over the 13-year time period.

Long-term costs of climate change (-21%)

*This component is based on an estimate of the total (increasing) cost of dealing with future problems caused by climate change. It then treats this as an accumulated debt; as though it could be paid off over time through an annuitised endowment fund which matures when required in the future. Costs are distributed to the point of emission (using data from the National Air Emissions Inventory), rather than the point of consumption.*¹⁷

As we have already seen in Section 1.3, this is the largest negative component of the R-ISEW, representing just over a quarter of all the costs included in 2007, or £2,384 per capita. Furthermore, as carbon dioxide emissions continue to accumulate in the atmosphere without any serious attempts to ameliorate the damage they will potentially cause, it is a growing component, at an average rate of 3.2% per year since 1994 – based on total emissions.

Given that the impacts of greenhouse gases are costed at the point of their emission rather than the point at which their benefits (e.g., electricity) are consumed, this component sharply distinguishes between energy-producing GORs and energy-consuming GORs (Figure 22a). So Yorkshire and the Humber suffers particularly (£5,079 per capita is more than half its total R-ISEW for 2007), as does the East Midlands and the North East. On the other hand, London and the South West have particularly low costs (London’s per capita cost being less than half the English average).

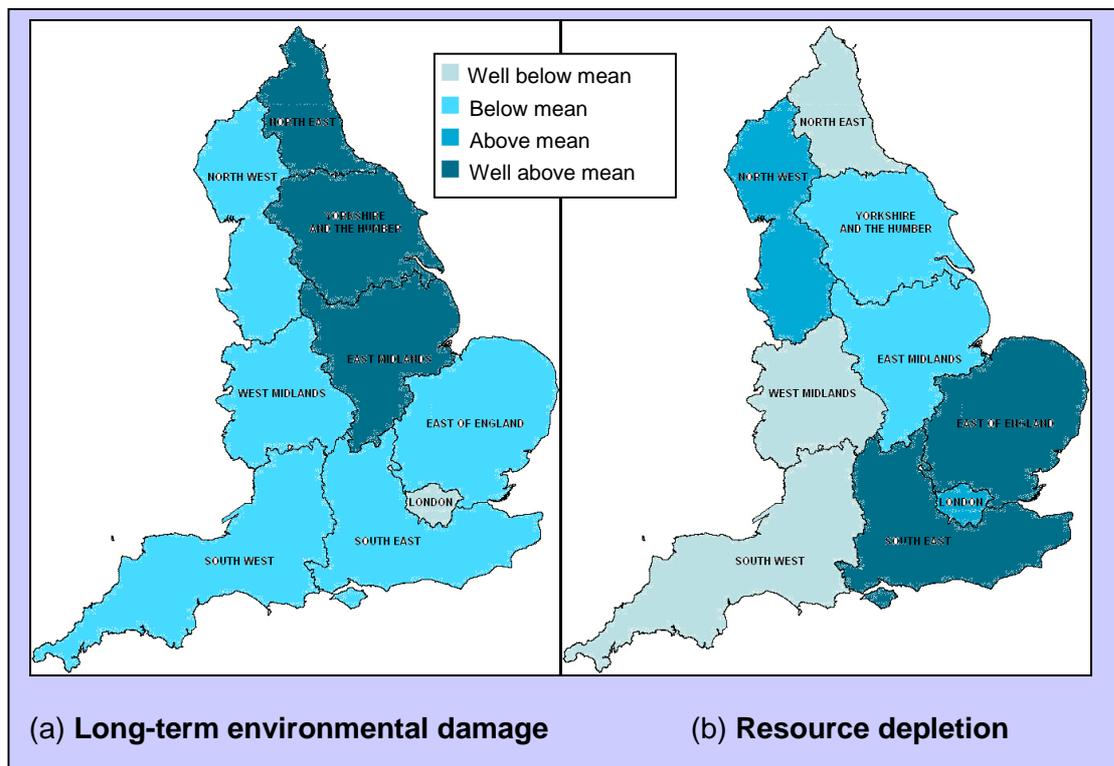


Figure 22: Per capita costs of long-term environmental damage and resource depletion in 2007.⁴

The discrepancy between regions has been somewhat accentuated in this year’s calculations. For example, whilst Yorkshire and the Humber’s per capita cost is now 4.8 times higher than that in London, it was only 3.4 times higher in last year’s calculations. This is down to differences in the way the regional distribution of emissions for earlier years was estimated. Having secured two more years of real data for most emissions, and one more year for CO₂ emissions, we were able to use a linear trend to estimate earlier emissions rather than a weighted average of available data (this difference applies to the air pollution component as well). So, for example, whereas Yorkshire and the Humber was estimated to account for 16.5% of UK CO₂ emissions in earlier years in last year’s R-ISEW calculations, this year it was estimated to account for 19.2% of them. This has a particularly important impact on this component as the costs in any given year are a function of emissions in all previous years. Whilst we have not changed our estimates for how much each region emits in the last few years of our time series, we have changed our estimates of how much they

have emitted in the past – and these changes effect present values. For more discussion of this change see Section 4.

The scoping report produced this summer included several recommendations related to this component.¹⁸ For example, we recommend considering the impact of only including current emissions in this component, rather than cumulative emissions. We also consider the impact of incorporating lessons learnt from the *Stern Review*. Lastly, we consider the implications of adopting a point-of-consumption approach to long-term environmental damage, rather than a point-of-production approach.

Resource depletion (-17%)

This is estimated as the cost of replacing fossil energy use with renewable energy, in line with the replacement cost methodology of Cobb and Cobb.¹⁹ National energy use data were available from the Department for Business, Innovation and Skills.²⁰ Regional distribution is estimated using data on sectoral GVAs, population and travel.

Resource depletion is the second biggest negative component in the R-ISEW, representing over one-fifth of all costs in 2007 (£1,942). Like long-term environmental damage, this is a growing component – in total over England it has grown 33% since 1994 (an average of 2.3% per year). Unlike the costs of long-term environmental damage, however, this growth has tailed off in recent years, to the extent that it actually began decreasing in 2007 (as we indeed predicted in last year's R-ISEW). Indeed energy consumption began decreasing in 2006 (from a high of 235 million tonnes of oil equivalent in 2005). This did not achieve a decrease in total cost, however, as our model for estimating unit costs for resource depletion incorporates an annual escalation factor of 2% per year.

Energy consumption between 2005 and 2007 has fallen across all energy sectors (industry, transport, domestic and services) and can be seen even before the increase in renewable energy use is factored in (subtracting energy produced from non-renewable resources reveals that actual resource depletion began declining slightly in 2005). Based on our proxies, the decline in fossil fuel depletion can be seen in all English regions.

It is important to recognise the differences behind the underlying calculations for this component and the long-term environmental damage component. Whilst long-term environmental damage costs are based on a complex annuity fund methodology that means that the costs of previous years continue to be borne in future years, the resource depletion component simply measures resource consumption in the year in question. If we cut our resource consumption by 50%, the component's impact would drop by roughly 50%, whereas the long-term environmental damage cost will continue to increase unless money is set aside in the hypothesised annuity fund.

Looking across GORs (Figure 22b), more affluent GORs such as the South East and the East of England suffer the highest per capita costs – 5% and 4% above the English average in 2007. Meanwhile, the North East, having borne some of the highest costs of long-term environmental damage, actually has the lowest per capita costs of resource depletion (6% below the English average in 2007).

Over time, the GORs have more or less grown their consumption in step, though increases have been slower in the West and East Midlands. Looking at the differences in growth patterns between different sectors is more revealing. Here we see that increases in energy consumption by transport have been most dramatic – an increase of 15% from 56 million tonnes of oil equivalent in 1994 to 65 million tonnes per year over the last three years. This equates to 29% of overall consumption in 2007. Meanwhile, energy consumption by industry has remained more or less static over the time period at between 57 and 60 million tonnes of oil equivalent, indeed dropping below this range in 2007.

Whilst this component attributes the costs of energy consumption at the point of the energy *consumption* (unlike the previous component, which penalises at the point of energy *production*), it should be remembered that the consumption of energy does not necessarily coincide with the consumption of a service or good. A car manufactured in the West Midlands, but purchased by an individual living in the South West will contribute positively to the South West's R-ISEW in terms of consumer expenditure, but negatively to the West Midlands' R-ISEW in terms of resource depletion (of course, if the energy used to manufacture the car was generated in the East Midlands, then it is this region that will see its long-term environmental damage component affected by the car's manufacture).

Step 5: Final results

If the inclusion of local pollution served to ameliorate the divergence over time of the R-ISEW from traditional indicators such as GVA, the inclusion of resource depletion and long-term environmental damage (both global environmental costs) undoes some of that change (Figure 23). The total costs of local and global pollution have increased in absolute terms from £4,722 per capita in 1994 to £4,923 in 2007.

Looking across the GORs (Figure 24), it is the electricity-generating regions which are the biggest losers in steps 4 and 5. The East Midlands is displaced from the top spot it has had through most of the calculations, dropping to fourth place; Yorkshire and the Humber drops from sixth to last. Meanwhile, the South West moves up to first place from second, and London moves up to second place from fourth.

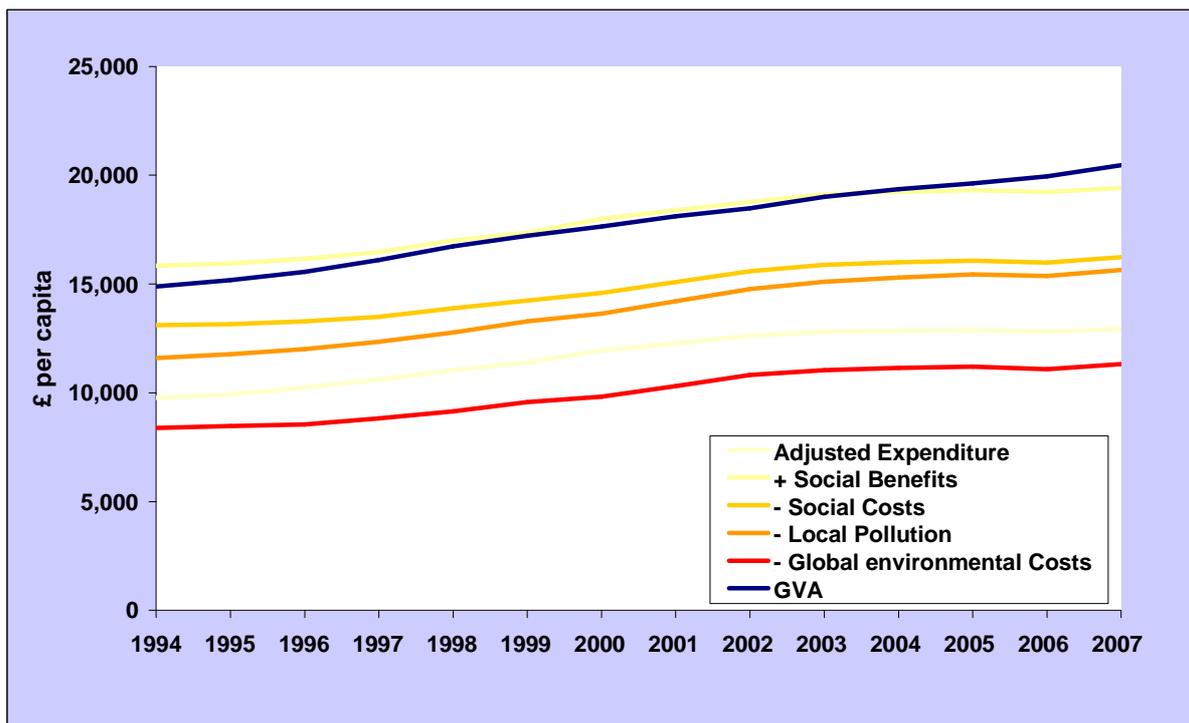


Figure 23: All steps (1–5) in the calculation of the R-ISEW for England. The red line is the final R-ISEW, after Step 5.

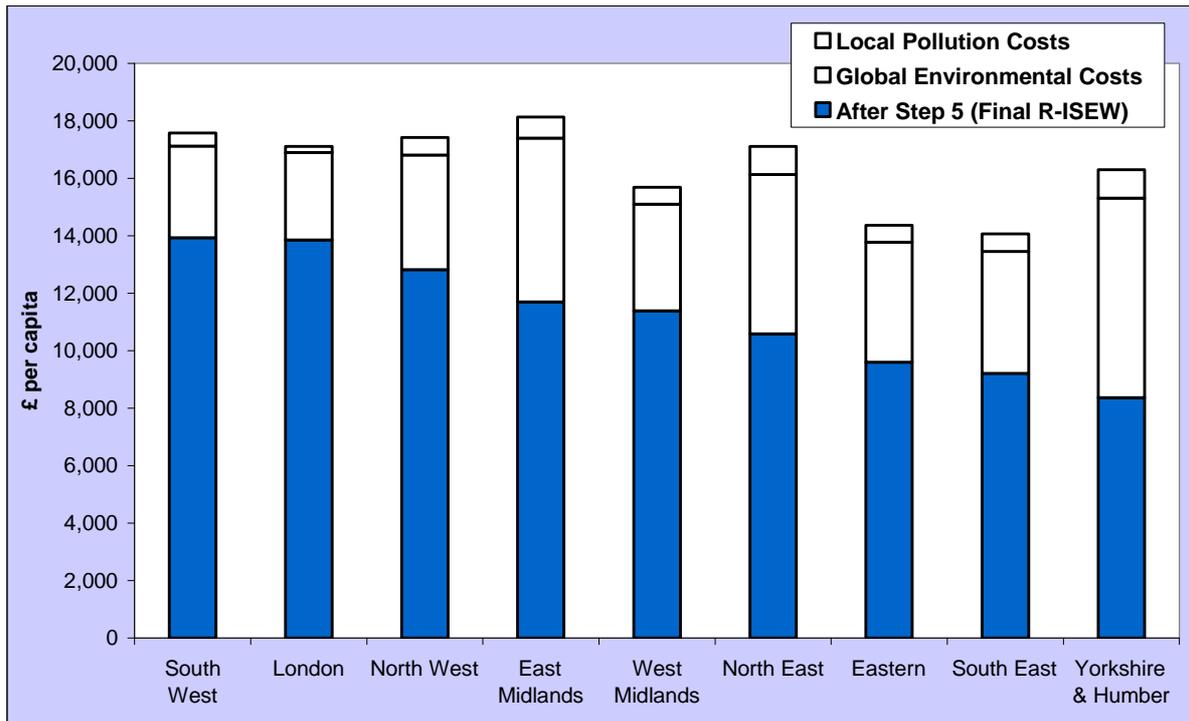


Figure 24: The final R-ISEW in 2007, having subtracted both local and global environmental costs from the figures calculated previously for Step 3.

2.4 Importance of each component

Section 3 will explore the results region by region. Before doing so, it is worth gaining a sense of which components tend to drive the variation between regions, and which tend to drive the variation between years. Figures 25 and 26 show how much absolute variation is contained in each component. In Figure 25, for each component, the lowest regional value is subtracted from the highest regional value for each year, and the differences are averaged across years, so as to get a figure which represents the mean range of each component.

It is clear to see which components are doing most of the 'work' in terms of shaping the regional pattern. Net international position surpasses even consumer expenditure here. Whilst resource depletion is a large component, it is the costs of long-term environmental damage which separate out one region from another. Other important components are the costs of income inequality and air pollution, and net capital growth.

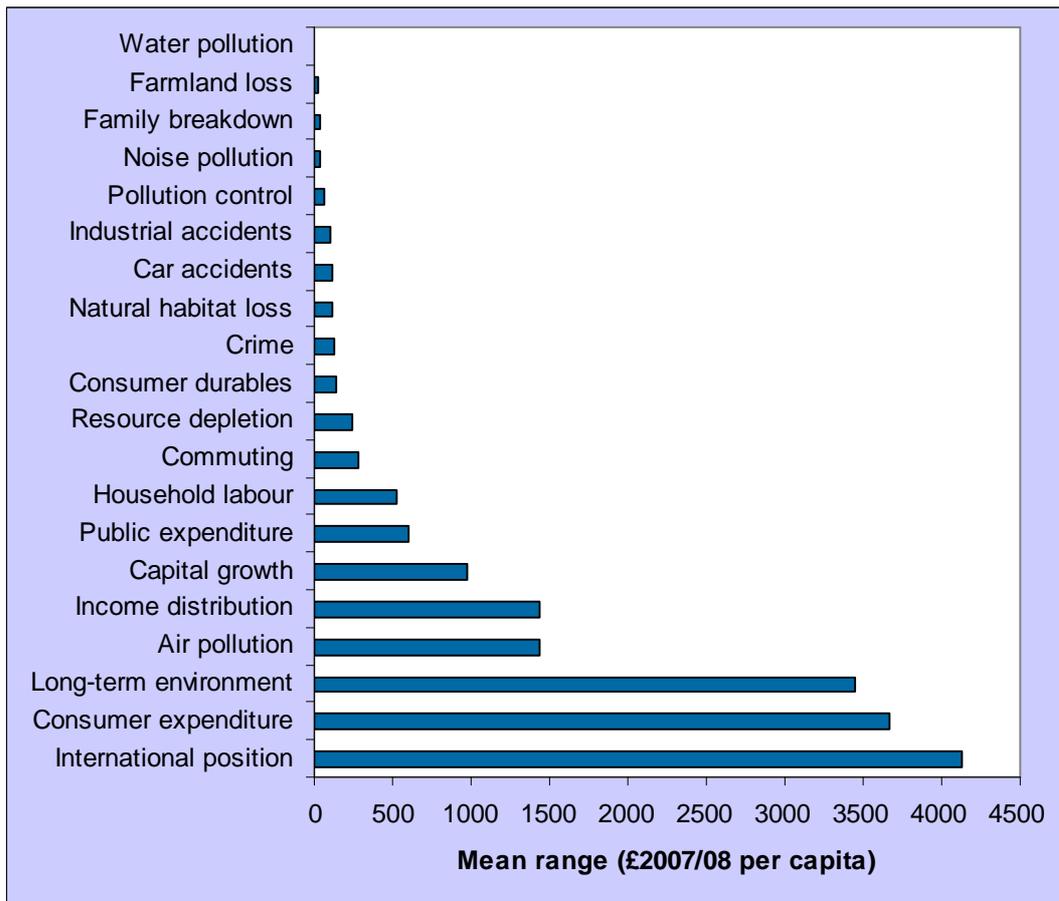


Figure 25: Mean range between GORs, over years, for each component (£ per capita).

A slightly different way of looking at this is to see which components have shaped change over the years. For Figure 26, the difference between the maximum value and the minimum value of a component was taken for each year over the 13-year series for each GOR, and then the annual differences were averaged across GORs.

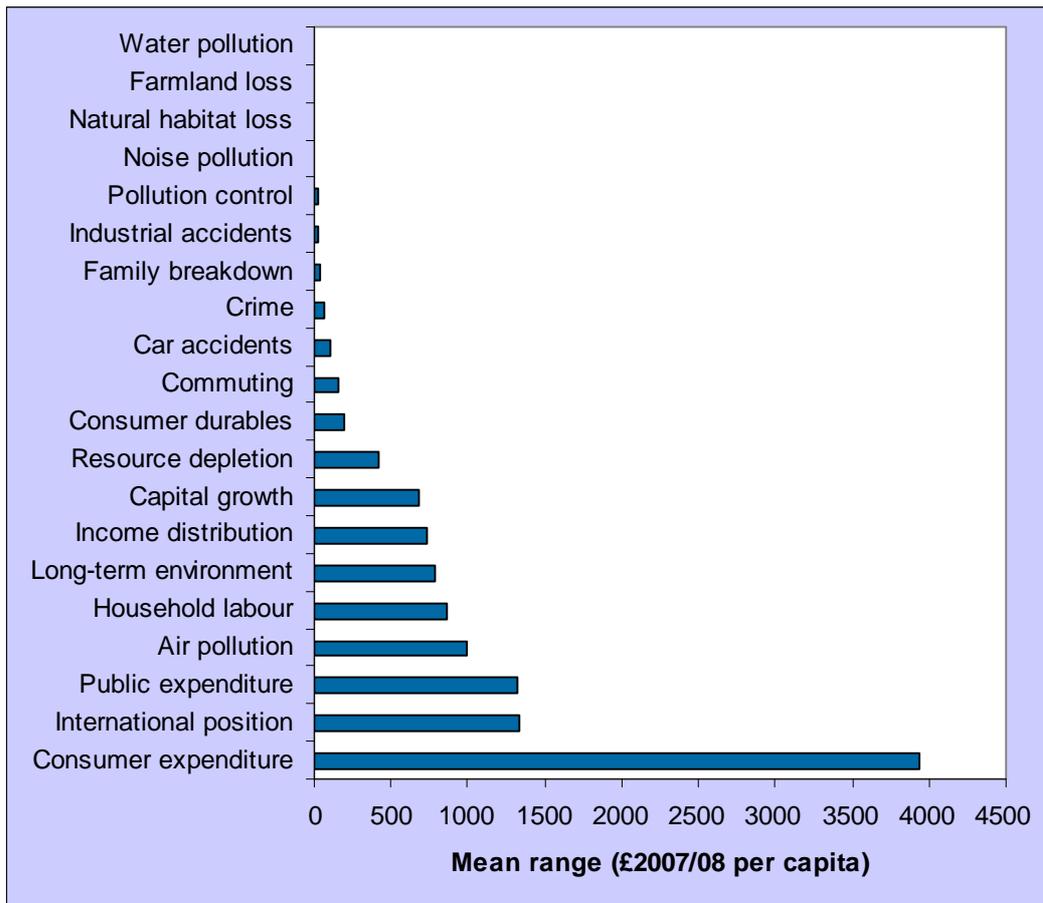


Figure 26: Mean range between years, over GORs, for each component (£ per capita 2007/08).

Now there is a slightly different pattern. Consumer expenditure is by far the single most important factor increasing the R-ISEW over the years. International position, having been so important in determining the relative performances of the regions, now plays a secondary role – in other words, the component is more stable over time than across GORs. The rise in public expenditure, and declines in household labour and air pollution are also very important in shaping how the R-ISEW has changed over time.

3. The R-ISEW in the English regions

We have explored the results component by component; now we shall now briefly explore them GOR by GOR. For each region, we shall trace the progress of its R-ISEW, exploring significant trends and fluctuations. We shall also identify where GORs were performing particularly well or poorly compared to the English average in 2007, using spider diagrams.

For these diagrams we have standardised component values across GORs so that we can compare the relative performance a region has on different components without being concerned about absolute costs. Where the blue line goes within the thick black circle, the GOR is performing worse than the English average (either due to a cost component being larger than average, or a benefit component being smaller than average). Where it goes outside of the thick black circle, and towards the outside of the diagram, the GOR is performing better than the English average (either due to a cost component being smaller than average, or a benefit component being larger than average). We have attempted to group similar components together where possible. If we imagine the diagram as a clock face, the economic adjustments are on the top right, between noon and 2 o'clock; the social benefits are around 3 o'clock; the social costs are between 4 o'clock and 7 o'clock; local pollution costs are between 7 o'clock and around 10 o'clock; and the global environmental costs are at the top left, around 11 o'clock.

We should stress again that these diagrams allow comparisons of a GOR's *relative* performance on a component, not the absolute contributions each component makes to its R-ISEW. So for example, the fact that the North East performs far below the English average on the loss of farmland and natural habitat, does not mean that this is the biggest absolute cost for the region – as we know, this component has a very small absolute effect on the R-ISEW.

After exploring each GOR in turn, we shall briefly look at how the variation across GORs has changed over time, in Section 3.2. Appendix 2 brings the spider graphs together for all regions for easy comparison.

3.1 Region by region

North East

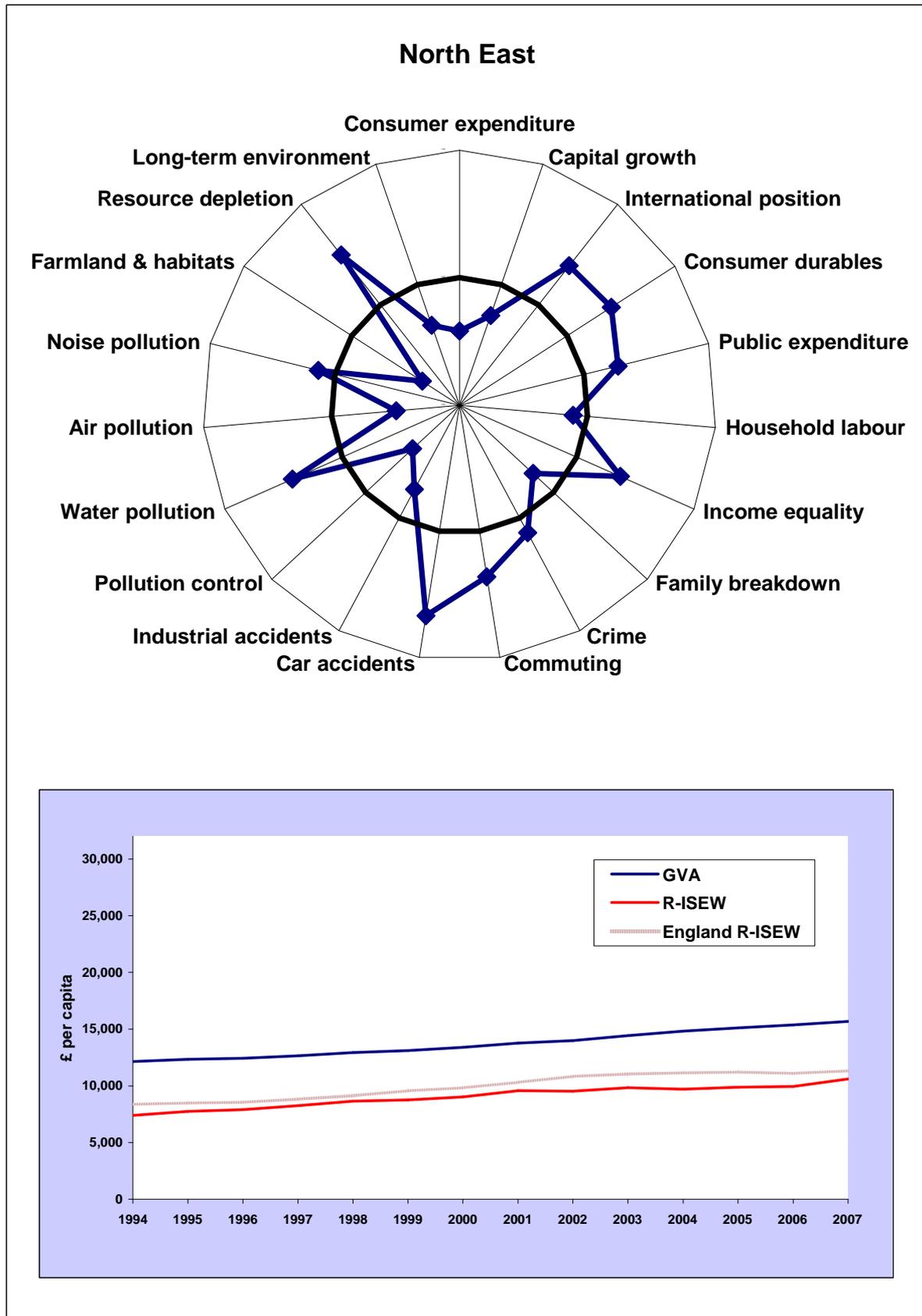


Figure 27: R-ISEW per capita for the North East.

Being on the edge of England, and, according to traditional measures, the poorest GOR in the country, it is not surprising that the pattern of results for the North East should be unique. When all components are combined, however, the region does not perform spectacularly poorly or well, remaining slightly below the English average throughout the 13-year period of these calculations. Its R-ISEW in 2007 was £10,548 per capita, 7% below England, in sixth place out of nine. Like the rest of England, the North East's R-ISEW remained relatively static between 2003 and 2006, indeed dropping slightly in 2004.

Like most GORs, the North East's early growth seems to have been driven by increases in consumer and public expenditure, and a decrease in air pollution. Since 2003, however, these benefits have been offset by a declining international position, rising income inequality, and a relentless increase in the costs of long-term environmental damage and resource depletion. Furthermore, the decrease in the costs of air pollution has somewhat flattened out, such that costs actually increased slightly in 2007, which is a unique reversal of the declining trend across the country.

Due to an apparent increase in consumer expenditure in 2007, however, and a partial improvement in net capital growth, the region's R-ISEW jumped up by 7% – the biggest one-year increase seen in the region over the 13-year period, and the biggest per capita regional increase in 2007. This increase is almost entirely driven by the change in consumer expenditure and should be treated with caution as it is based on the results from a single survey. Had consumer expenditure in the North East increased at the same rate as the rest of the UK, the 2007 R-ISEW for the region would only be £10,118 per capita. On a minor note, the region also saw a further substantial decrease in the costs of car accidents in 2007, now 20% below the English average.

The spider diagram (Figure 27) helps us to understand the North East's pattern of results. Despite the recent increase, the North East still has the lowest levels of per capita consumer expenditure in England. The other heavy cost to the North East's R-ISEW is from long-term environmental damage, which, per capita, is the third highest in England (£3,712 per capita in 2007), behind Yorkshire and the Humber and the East Midlands. Other areas where its costs are particularly high are the loss of natural habitats, pollution control (in both cases the highest costs for any GOR) and air pollution (the North East now has the second highest cost in this component, behind Yorkshire and the Humber). Of these three environmental costs, it is air pollution which has the biggest absolute impact on the region's R-ISEW, costing it £662 per capita in 2007.

On the positive side, the North East has particularly low costs of resource depletion (the lowest in England), water pollution (second lowest), and three out of the six social costs: income inequality, car accidents and commuting (the lowest in all three). For example, compared to other regions whilst commuting cost the average English resident £661 per capita in 2007, the cost in the North East was only £551 per capita. In our previous report, the North East also appeared to have the second lowest crime costs –our new estimations, however, see it now only slightly below the English average.

The North East also does well on three economic components: it benefits from the highest per capita public expenditure outside London, does best on the consumer durables component, and has the highest net international position of all the GORs, just beating the East Midlands.

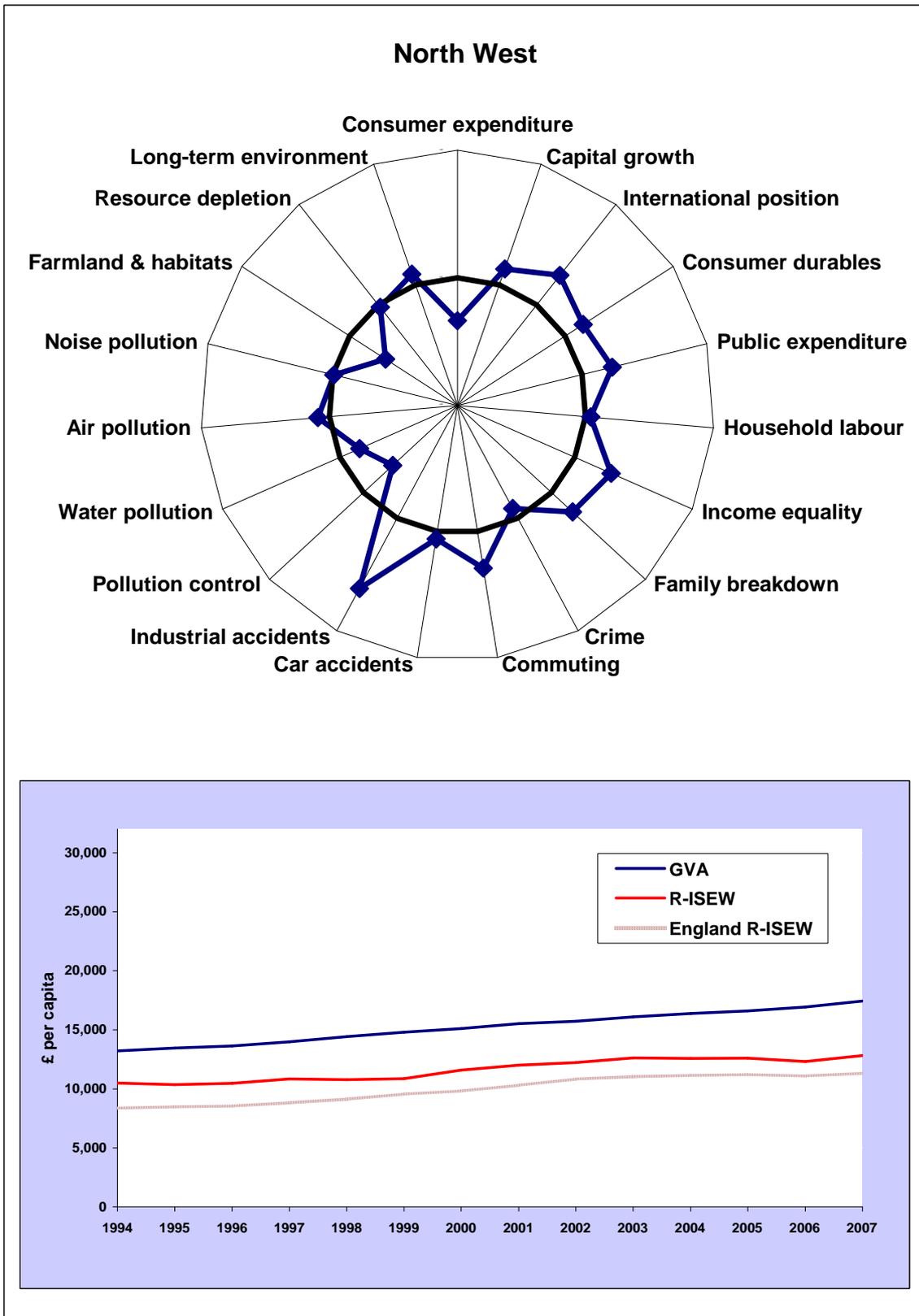


Figure 28: R-ISEW per capita for the North West.

Our revised calculations see the North West in third place in England in terms of the R-ISEW, at £12,816 per capita in 2007 (13% above the English average). The region has always had one of the highest R-ISEWs; indeed it had *the* highest R-ISEW up until 2002, when it was overtaken by both the South West and London. The region's strong performance is particularly interesting as it has a low GVA – 15% below the English average in 2007. It still has one of the smallest R-ISEW–GVA gaps of any region, at £4,618 per capita in 2007 (compared with the English average of £9,145). Nevertheless, as for England as a whole, this gap has increased in the last three years (from 22% in 2003 to 26% in 2007).

What explains this relatively strong performance? The spider diagram (Figure 28) reveals that the North West, unlike the North East, is not a region of extremes. The only component where it performs very well is industrial accidents – not a particularly major component in the index, but it does save the North West £54 per capita compared to the rest of England. Apart from a below-average level of consumer expenditure, however, and a marginally higher cost of resource depletion, it scores slightly above average in every single one of the large-value components: capital growth, international position, public expenditure, domestic labour and volunteering, income inequality, air pollution, long-term environmental damage, and commuting. The components where it does not do so well are mostly in minor environmental costs: farmland and natural habitats, pollution control, and water pollution. The biggest of these costs, relative to England, are those related to the loss of farmland and natural habitats, at £41 per capita above the English average.

Whereas, in 2006, the North West suffered higher-than-average social costs in family breakdown, crime and car accidents, it managed to achieve substantial reductions in all these costs by 2007, meaning that only the costs of crime are still (marginally) higher than the English average. For example, between 2005 and 2007, the per capita costs of crime fell by 18% in the region, whilst those of car accidents fell by 17%. By way of comparison, the relevant decreases England-wide were only 14% and 8% respectively.

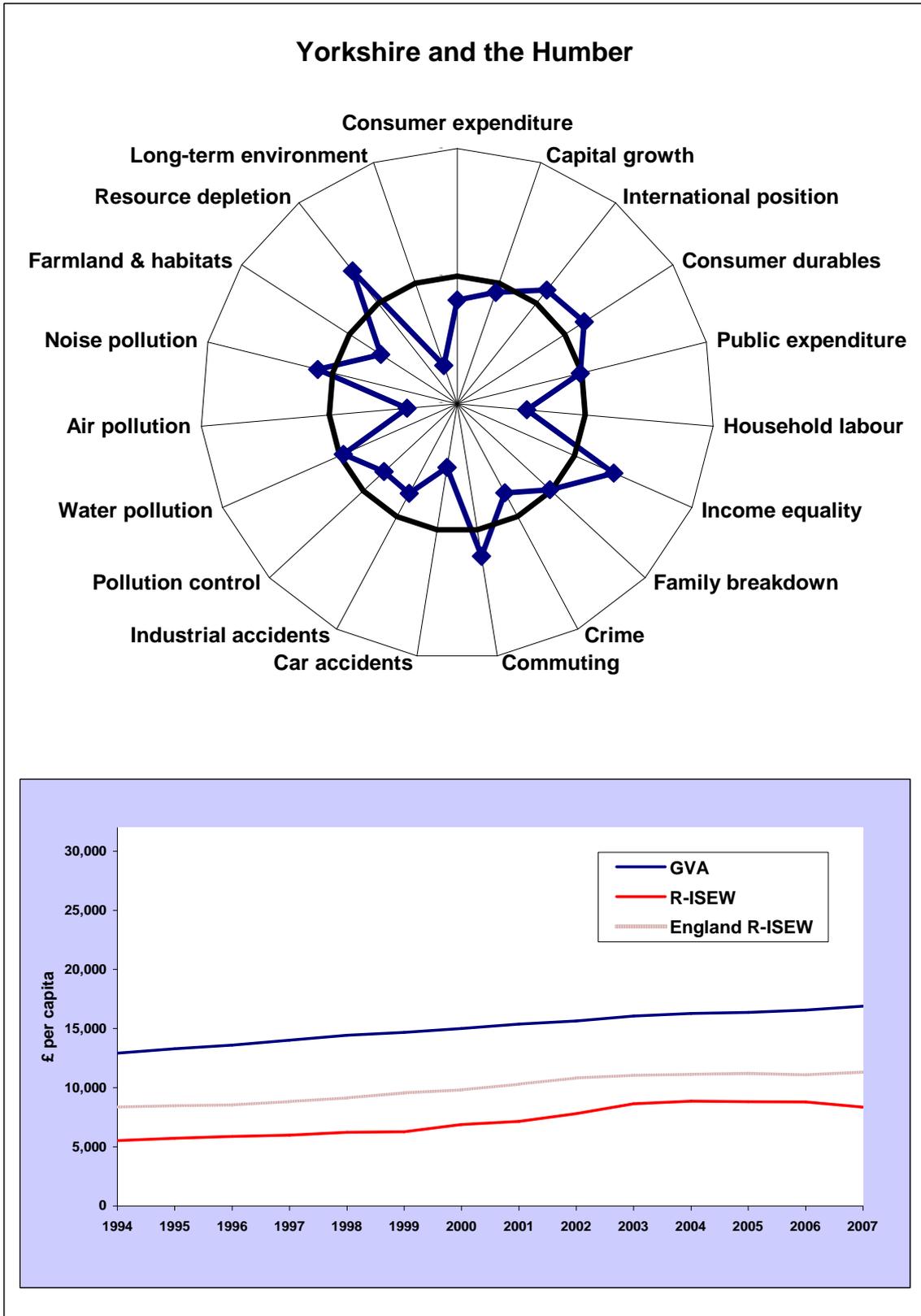


Figure 29: R-ISEW per capita for Yorkshire and the Humber.

Yorkshire and the Humber, burdened by the high pollution of heavy industry and power generation, has had the lowest R-ISEW in England throughout the time series. By far the greatest cost to the region is the long-term environment damage component, the cost of which exceeded £5,000 per capita in 2007 – more than double the English average. Were this cost not factored into the R-ISEW, the region's overall figure would be around the average for England. More than current emissions, it is actually past emissions that bring Yorkshire and the Humber's R-ISEW down. The region's current emissions per capita are still the highest in England, but the differences are not as acute as those calculated based on past emissions. Costing current emissions at £240 per tonne of carbon, and excluding past emissions, Yorkshire and the Humber's R-ISEW in 2007 would be only 3% below the English average, and considerably higher than the R-ISEWs of the South East and East of England.

This steadily increasing cumulative cost is partly responsible for the region's poor performance over recent years. Yorkshire and the Humber has seen year-on-year declines in its R-ISEW since 2004, the current figure of £8,357 per capita being lower than the figure in 2003. Indeed, between 2006 and 2007, the figure dropped by 5%. Other factors which seem to have caused this decline are negative net capital growth in 2007 and a growing balance deficit. The decline in consumer expenditure seen in Yorkshire and the Humber is also a key factor – however it should be reiterated that that this apparent decline may be an artefact of small sample sizes. As such, Yorkshire's particularly low R-ISEW in 2007 should be interpreted with caution.

The decline in capital growth in the region appears to be the most consistent trend. Whilst it enjoyed the highest regional per capita figures in this component between 2002 and 2004, it is now below the English average. As this component is calculated using some estimation, it is worth understanding the exact causes of this. Two factors are responsible. It is clear that absolute levels of per capita capital expenditure in the region have been low for the last three years, indeed the lowest in England over the last two years. However, this has been only been a particular problem for the region given the relatively large growth of the population of working age over the last five years – by almost 6% – compared with less than 4% for England overall. In other words, the region's low capital expenditure is unable to keep up with its rising population of working age.

It is worth highlighting one of the more positive trends in the region as well: air pollution decreased in the region from a cost of £2,234 per capita in 1994 to only £720 per capita in 2007.

Looking at the region's pattern in 2007, we can see that it suffers lower-than-average costs of commuting, resource depletion and, importantly, income inequality – indeed its Atkinson Index is the lowest of any region. Other social costs are higher than average, however, including those of car and industrial accidents, and crime. The per capita costs of car accidents are the highest in the country, and those of crime are the highest outside London. Also, for some reason, the region derives the lowest benefit from household labour and volunteering outside London. On a positive note, the costs of family breakdown have fallen substantially in the region over the last three years from being second highest in England in 2004, to being at the English average in 2007.

East Midlands

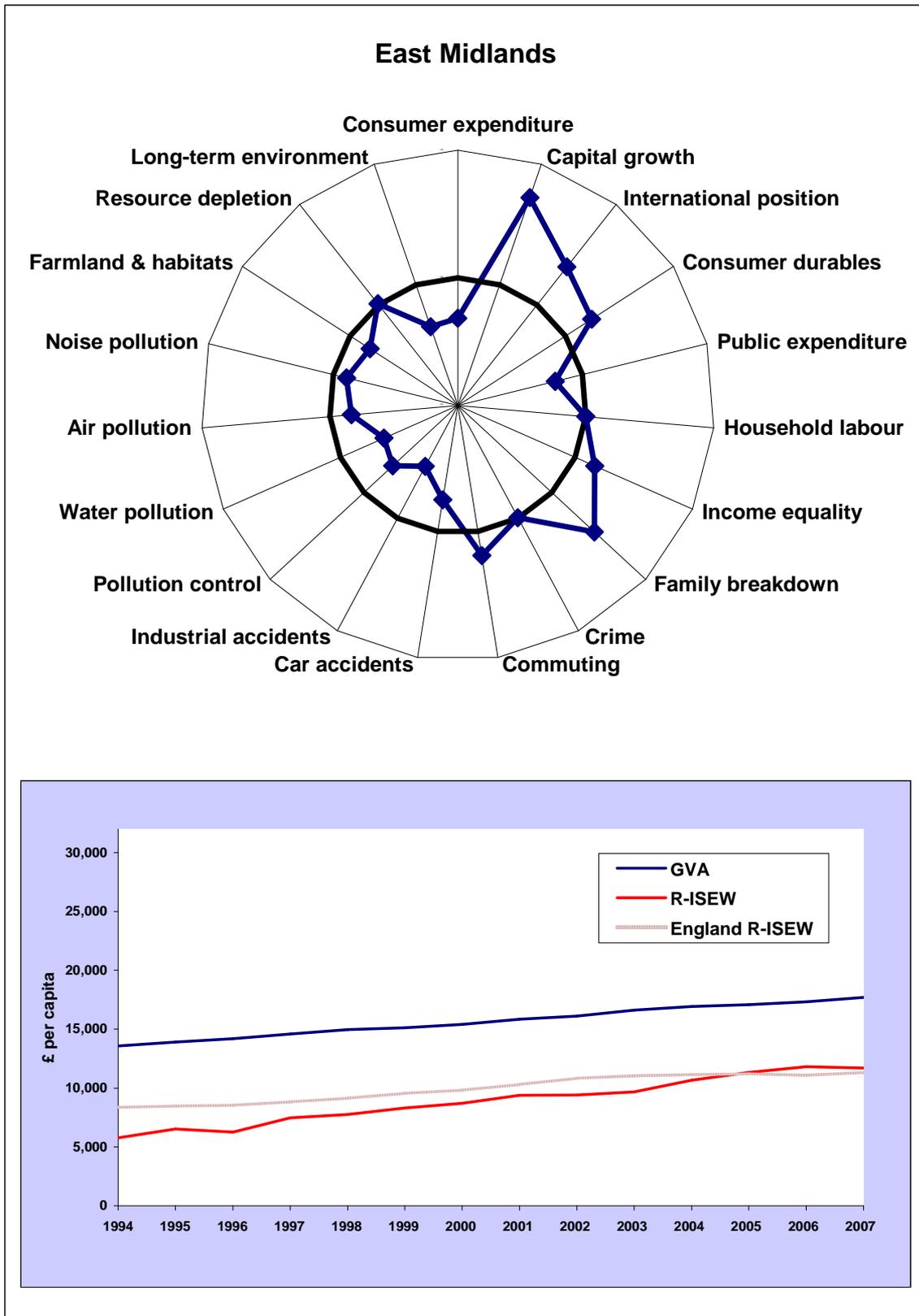


Figure 30: R-ISEW per capita for the East Midlands.

Whilst the East Midlands fared little better than its neighbouring region Yorkshire and the Humber back in 1994 (with an R-ISEW per capita of £5,773 compared to £5,535), it has successfully moved from second-to-last to being above the English average as of 2005. Its R-ISEW had more than doubled by 2007, representing the fastest growth of any English region. It is the only GOR to have seen any substantial growth since 2003, enjoying growth rates of over 4% per annum between 2003 and 2006. The slight dip in the region's R-ISEW in 2007 appears to be mostly driven by a drop in estimated regional consumer expenditure which, as we have already discussed, should be treated with a little caution.

What explains this good performance? It cannot be attributed to growth in consumer expenditure, which has been at a lower rate in the region than elsewhere in England. On average, per capita consumer expenditure grew at 1.7% per annum in the East Midlands, compared with 2.4% in England overall.

Rather, the region's gains appear to be primarily due to the two macro-economic components – net capital growth and net international position. The net capital growth rate has almost quadrupled from £325 per capita in 2002 to £1,189 per capita in 2007. This is due to growing levels of per capita capital expenditure. Capital expenditure per capita per year in 2007 in the East Midlands was 23% higher than in 1998, whilst in London it had fallen by 5%. Meanwhile, the net international surplus has grown from £650 per capita in 2003 to £973 per capita in 2007, whilst the *deficit* for England has grown by an even greater amount over the same period. These two components alone mean that the region has gained £560 per capita over England since 2003.

The other main reason for a change in the region's relative position is the rapid drop in the costs of air pollution, even faster than in other GORs that previously were heavy polluters, such as Yorkshire and the Humber. In 1994, air pollution was the single greatest cost to the region at £3,253 per capita. By 1996, air pollution costs had fallen to £2,581 and had been overtaken by long-term environmental damage as the region's greatest cost. By 2007, the cost was only £471 per capita, less than the costs of commuting.

Lastly, whilst the trend for the costs of resource depletion has generally been of growth, costs fell substantially in the East Midlands in 2007, taking them below 2003 levels.

The spider diagram (Figure 30), focusing on 2007, highlights some other areas of note. The excellent performance on the economic adjustments manifests itself in the top-right corner of the diagram. The diagram, however, also reveals better-than-average performance on three social components, including income inequality, family breakdown and commuting. The region then performs below the English average for eight of the nine remaining components. The costs of industrial accidents and water pollution are particularly high relative to other regions.

But of course it is still the cumulative cost of *past* greenhouse gas emissions which brings the region down the most in absolute terms. Were past emissions excluded from the R-ISEW, as done in the example for Yorkshire and the Humber, then the East Midlands would have had the highest per capita R-ISEW in 2006 and 2007.

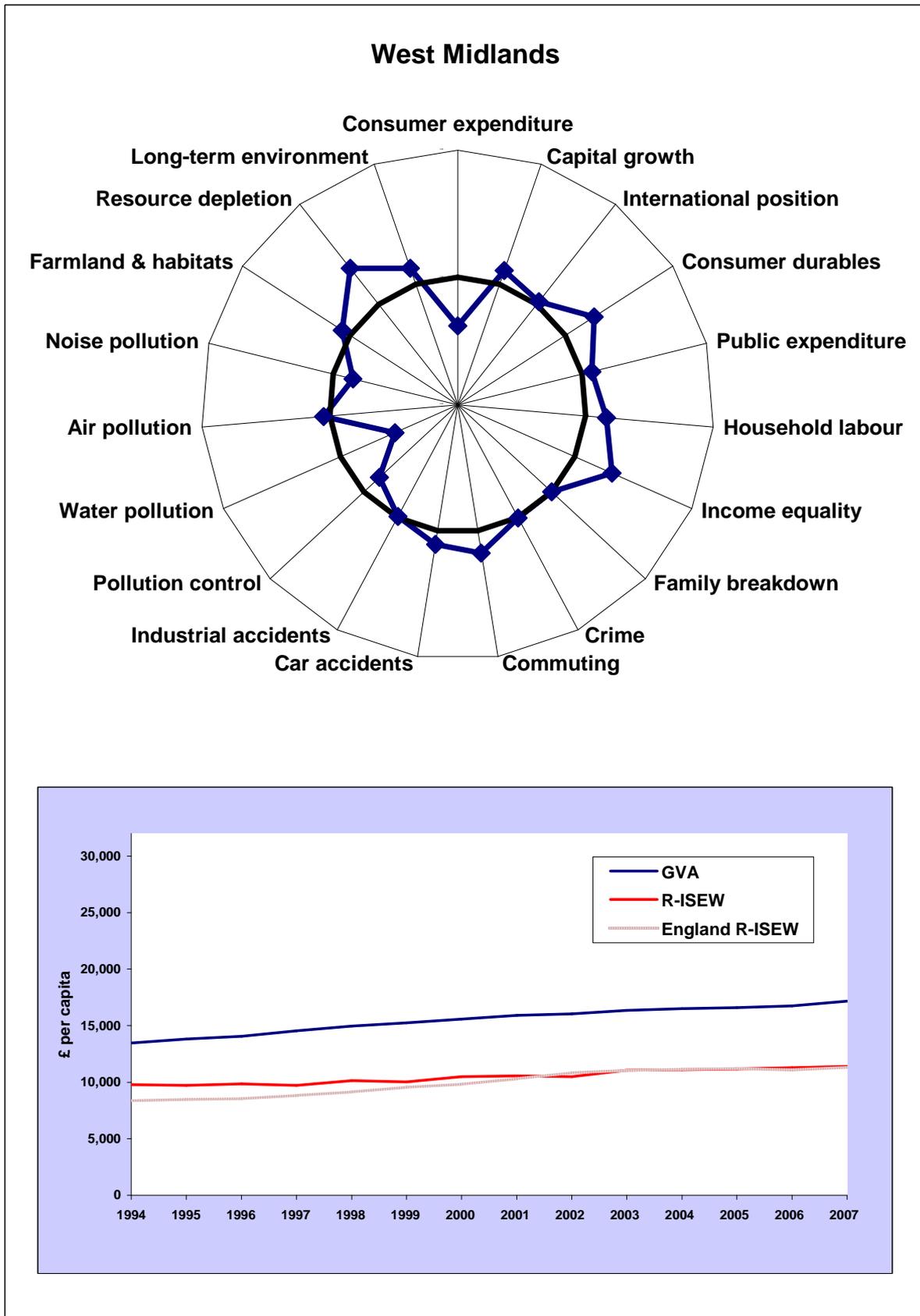


Figure 31: R-ISEW per capita for the West Midlands.

It is fitting that the middle of the country, the West Midlands, should have an R-ISEW more or less equal to the English average – £11,406 per capita. It is important to note, however, that this has only been the case since around 2001 – prior to that its R-ISEW was the third highest in the country. Indeed, the region's R-ISEW has been perhaps the most stable in the country, having only increased by 16% between 1994 and 2007, whilst others have risen more dramatically (e.g., the East Midlands and London), or risen and fallen (e.g., the South East).

Why did the West Midlands lose its earlier comparative advantage? Consumer expenditure plays an important part in the explanation. Whilst it grew at 3.1% per annum per capita across England overall between 1994 and 2002, it only grew by 2.6% per annum in the West Midlands during that period. Meanwhile, income inequality grew at a faster rate than in the rest of the country. The most important factor in the region's decline, however, has been its steadily worsening net international position – from a surplus of £903 per capita in 1994 (second highest in England), to a deficit of £860 per capita in 2007 (third lowest). As we saw in Section 2.1, this decline has been driven predominantly by a shift from a balance of goods surplus to a balance of goods deficit.

Looking at the last five years, the region has departed from the English pattern by actually reducing the costs of income inequality (by £58 per capita between 2002 and 2007) whilst it has increased in most regions, by only suffering a marginal decline in net capital growth (£70 per capita versus £282 per capita) and by holding the costs of resource depletion constant whilst they rise in other regions. In the case of this last component, per capita costs in the West Midlands were lower in 2007 than they were in 2001, and the region has moved from being above the English average to having one of the lowest costs.

Aside from resource depletion and income inequality, the region also performed relatively well in 2007 in terms of the costs of commuting, and the component on consumer durables. Aside from consumer expenditure, the region performs relatively badly on water pollution. Other than that, the region's spider diagram (Figure 31) is quite undramatic, with no other component more than half a standard deviation away from the English average.

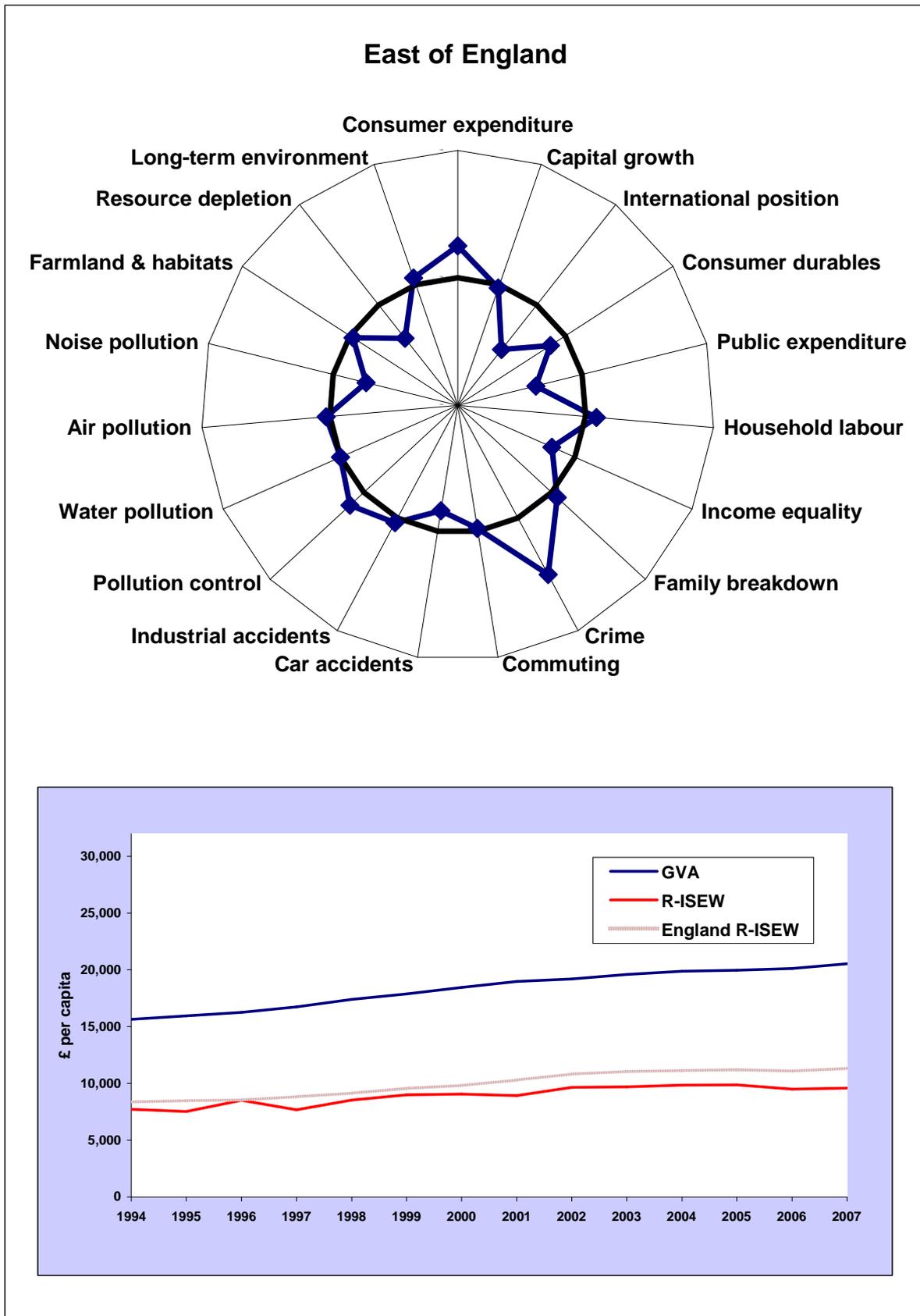


Figure 32: R-ISEW per capita for the East of England.

The East of England is a wealthy region with above-average per capita GVA and consumer expenditure – the latter even rising above consumer expenditure in London in 2007. In that year, however, it had the third lowest R-ISEW at £9,581 per capita – 15% below the English average. Like the rest of England, its R-ISEW fell between 2005 and 2006. Unlike the rest of England, however, it did not recover from this fall in 2007, and its per capita R-ISEW in the last year of the time series is still below that of 2002. Indeed, like the West Midlands, the region has lost ground to the rest of England over the 13-year time series.

The region's main problems with regard to the R-ISEW are its low net international position (second lowest in the country, with a deficit of £3,329 per capita in 2007), the lowest public expenditure in the country, the second highest cost of resource depletion (behind the South East), and, particularly in 2007, high levels of income inequality. The increasing deficit in international position seems to be the main reason for the region's R-ISEW's steep decline since 2004. Indeed, if the deficit had remained constant since 1994, the region would have overtaken the English per capita R-ISEW by 2002.

On the positive side, aside from its high consumer expenditure levels, the region is also characterised by having the lowest per capita costs of crime – over 20% below the English average. This has been the case throughout the 13-year time series.

London

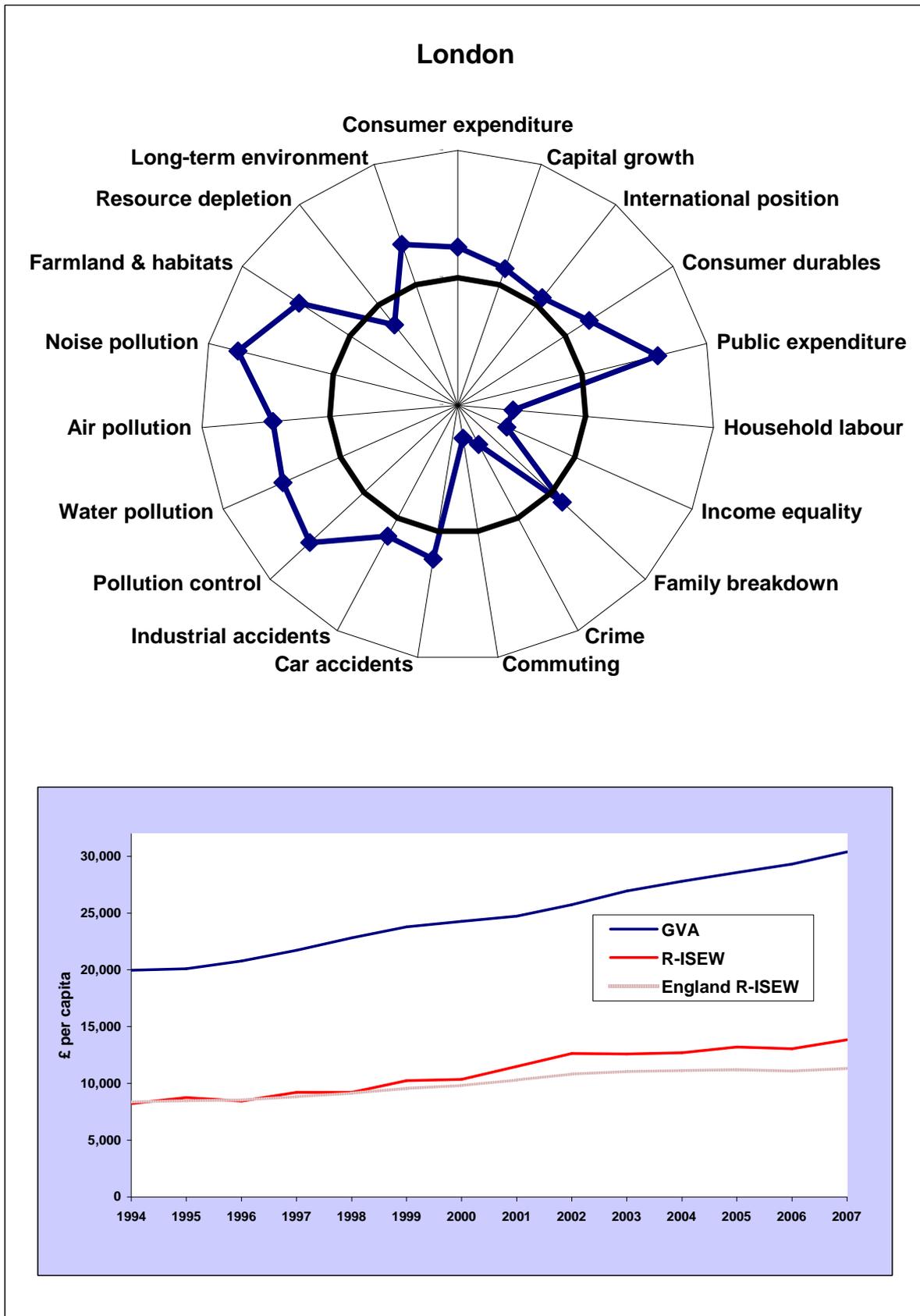


Figure 33: R-ISEW per capita for London.

London is the smallest GOR in England in terms of land area, but the second largest in terms of population. It has by far the largest GVA per capita of any GOR – almost 50% above the English average and 34% above the next richest GOR, the South East.²¹ Its R-ISEW, however, is lower than that of the South West – a region whose GVA is not much more than half that of London's.

What explains such a difference? The answer is almost entirely to do with the differences between regional GVAs and consumer expenditures. Whilst London does have above-average consumer expenditure, it is actually lower than that of the South East, East of England and South West. Indeed, between the years 2000 and 2004, consumer expenditure in London fell from £15,068 per capita to a low of £14,198. This is perhaps partly related to the migration of wealthier families to the commuter belt towns of the South East and the East of England.

Whilst London's per capita consumer expenditure has risen again since then, so has expenditure in the neighbouring regions. In short, London's exceptionally high GVA is not matched by equally high consumer expenditure. Therefore, rather than being surprised at London's low R-ISEW compared to its GVA, we should rather be impressed by its *high* R-ISEW compared to the neighbouring wealthy regions.

Looking at the GOR this way, we note that it has, and has always had, the highest per capita levels of public expenditure on health and education in the country (at £3,392 per capita compared with a mean of £2,885 for England). Whilst per capita costs of resource depletion are above average, at £1,988 per capita, they are lower than those in the South East and East of England. Aside from that, the region has the lowest per capita costs for every other environmental cost. This is for two reasons, one perhaps less interesting than the other. First, cities may play a role in reducing per capita environmental damage by sharing the costs amongst a large population. Whilst London has the lowest proportions of good quality waterways, the *per capita* costs are small when we take into account the GOR's huge population. Similarly, dense settlements can reduce costs associated with transportation. For example, London's residents use the lowest amounts of fuel for cars per capita of any region – approximately one-third less than the English average. Similarly, the region has the second lowest rate of car accidents per capita – particularly interesting as it had the *highest* rate until 1998. A second reason for low apparent environmental costs is perhaps less interesting – simply that most costs are attributed at the point of production rather than the point of consumption. The CO₂ emitted in the production of electricity in the East Midlands consumed in London has no impact on London's R-ISEW.

By contrast, social costs are very high in the region. London's has the greatest per capita costs for commuting (due to the value of the *time* spent commuting, rather than the direct costs), crime, and income inequality. It also has the lowest levels of value from household labour and volunteering.

The region's second place in the R-ISEW represents a marked improvement over earlier years. In 1994, the region was below the English average. Indeed, after the East Midlands, London has seen the biggest percentage increase in its R-ISEW over the time series – up 68%. The biggest gains were made between 1998 and 2002, when the region's growth rate averaged over 8% per annum. This growth was driven predominantly by the region's vastly improving net international position, slashing a £2,229 per capita deficit in 1999 down to £402 per capita in 2002 and only £97 per capita in 2003. Meanwhile, the region's global environmental costs did not increase quite as fast as those in the rest of the country; its public expenditure increased at a faster rate; and it enjoyed a sharp drop in the rate of car accidents.

Looking at the most recent data, the leap in public expenditure on health and education seen across England in 2007 has had particular benefits for London, adding almost £200 per capita to the R-ISEW.

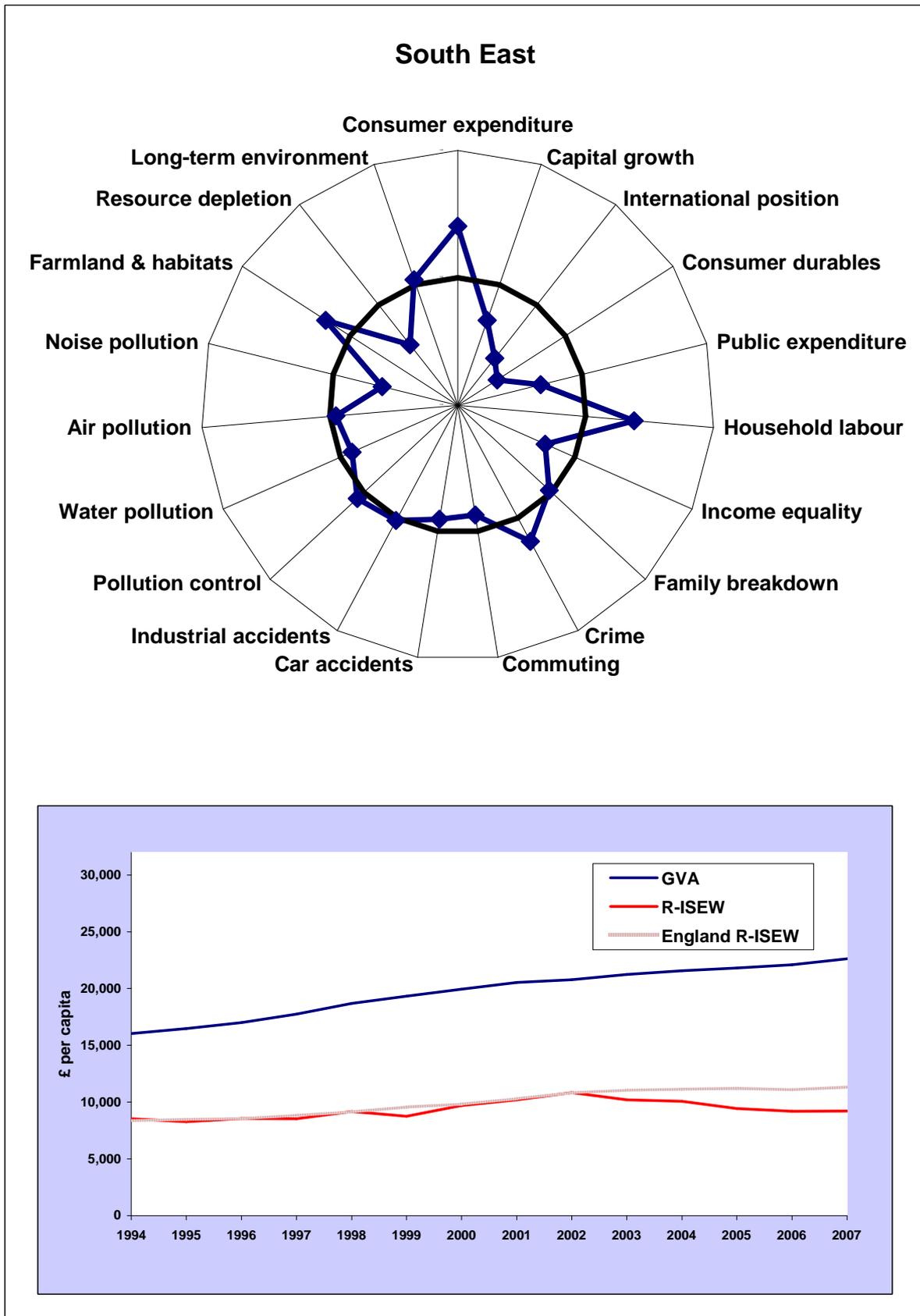


Figure 34: R-ISEW per capita for South East.

The South East is the second richest GOR in terms of GVA, and the richest in terms of consumer expenditure. It is also the largest GOR in England in terms of population. It is therefore of concern that, whilst its GVA has continued to grow, the region has suffered from a falling R-ISEW since 2002, when it peaked at £10,831 per capita. By 2007, it had dropped to £9,214 per capita, falling at an average annual rate of 3.1%, such that the region now has the second lowest R-ISEW in England, 19% below the national average.

The biggest cost to the South East's R-ISEW is its huge apparent balance of payments deficit – £3,797 per capita in 2007. Looking at the raw data, this is mainly due to importing twice as many goods as it exports. As a result, even before social and environmental costs are considered, the South East has the lowest adjusted consumer expenditure in England. Aside from this component, it also has the second highest income inequality in England, the highest levels of noise pollution thanks to its reliance on the automobile, and the highest levels of resource consumption (also, partly due to its reliance on the automobile). The only component where the region does relatively well, aside from consumer expenditure, is domestic labour and volunteering – according to the 2000 Time Use Survey, people in the South East spend over one hour more per week on domestic labour than the British average, and seven minutes per week more on volunteering.

Following the steps in Section 2, we remember that the South East remained the poorest performing region throughout the analysis until the point where the costs of long-term environmental damage are included and Yorkshire and the Humber drops into last place. Were past emissions not taken into account, the South East would have the lowest R-ISEW by some measure.

The South East's declining R-ISEW in the last four years is mainly due to growth in its balance of payment deficit and to the net capital growth component turning from a healthy positive (joint highest in 2001), to a large negative (second lowest in 2007). Like elsewhere in England, global environmental costs associated with resource and energy consumption also play a part.

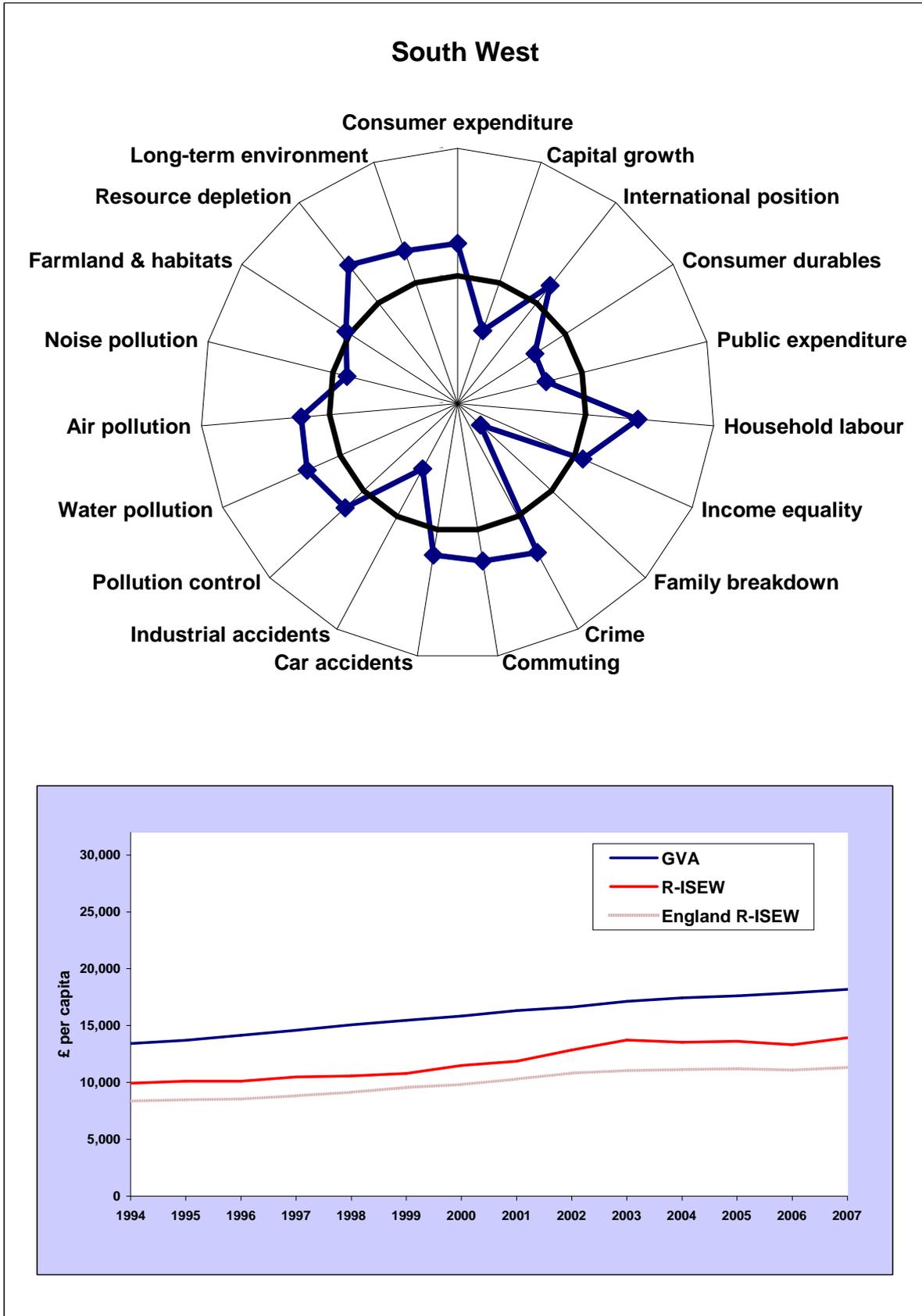


Figure 35: R-ISEW per capita for South West.

The South West of England is neither associated with the high energy consumption typical of the wealthy Home Counties, nor the social problems of London, nor the environmental damage of traditional industrial GORs of the north. As such it is perhaps not surprising that it has the highest R-ISEW in England – £13,946 per capita, 23% above the English average. The story for this region, however, is not all positive. It, too, has suffered some fluctuations since 2003, with a negative trend between that year and 2006, only reversed in 2007. As a result, its lead over the rest of England is less dramatic than it has been previously.

The spider diagram (Figure 35) confirms the suggestions raised in the previous paragraph. The South West performs above average on six out of the seven environmental components, including the largest ones – long-term environmental damage, resource depletion, and air pollution. It also performs above average on income equality, crime, commuting and car accidents, and household labour and volunteering. It even performs reasonably on international position – the main problem for its neighbour the South East. As a result, it is in third place behind the East Midlands and London as soon as consumer expenditure has been economically adjusted, before social and environmental costs are subtracted. It overtakes London once social costs are included.

It is important to note that, despite its GVA per capita being well below the English average, the region actually had the second highest levels of consumer expenditure per capita in 2007, just pipping the East of England and London. This is a relatively new pattern of results – until 2002, the region's consumer expenditure was below the English average.

The region's failure to improve its R-ISEW in recent years can be put down to net capital growth switching from a positive to a negative figure, dropping in tandem with the South East, whilst resource depletion has grown at a faster rate, and the costs of commuting have grown marginally, having gone down the previous three years. Having said that, both these costs came down in 2007, whilst the decline in capital growth began to level off, suggesting a rectification of some of these issues.

For reasons which are not clear, the South West has the highest rates of divorce in England, performing particularly badly in 2007, and it suffers the second highest per capita costs from industrial accidents.

3.2 Trends in variation

As well as looking at the absolute values of the R-ISEW for different GORs, it is of interest to explore how the level of *variation* across GORs has changed over time – are regions becoming more or less similar? Figure 36 shows the coefficients of variance for the R-ISEW, GVA and consumer expenditure over time. The coefficient of variance is calculated by dividing the standard deviation of a particular indicator for a particular year by the mean of that indicator for that year. Higher percentages indicate high variance in that indicator.

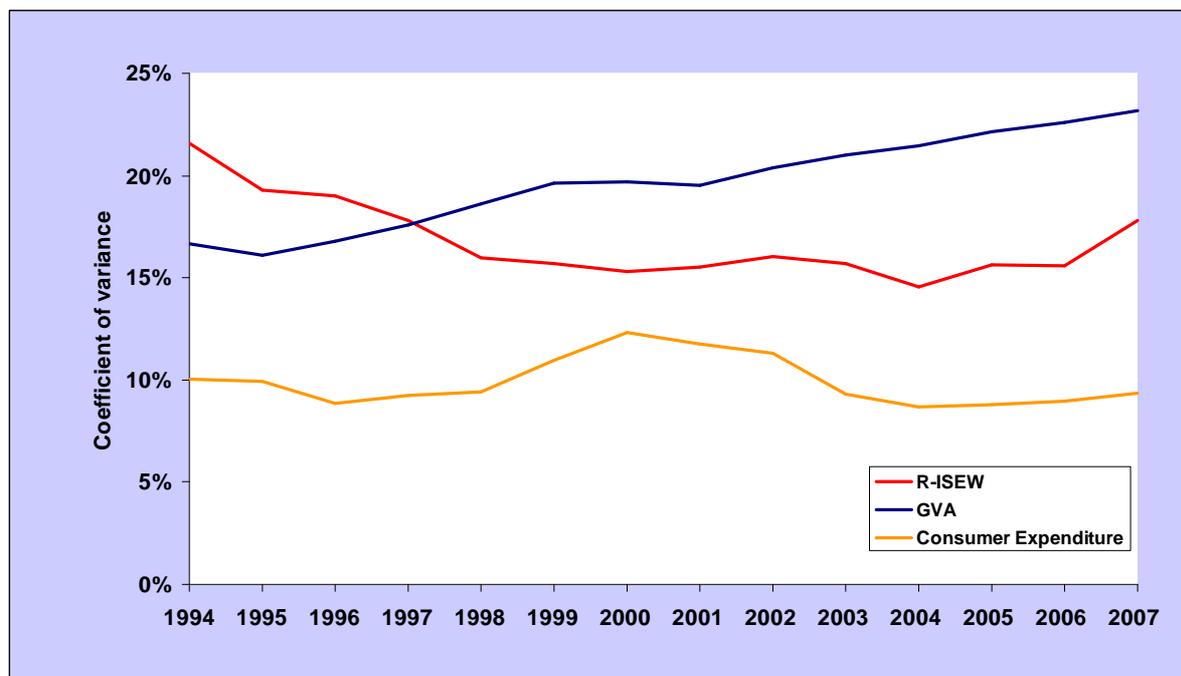


Figure 36: Coefficients of variance over time for the R-ISEW, GVA and consumer expenditure.

Whilst England appears to be getting more unequal in terms of GVA (the coefficient of variance has risen from 17% in 1994 to 23% in 2007), regional R-ISEWs seem to be converging slightly, or at least did so between 1994 and 1999. The coefficient of variance has fallen from 22% in 1994 to around 16% in more recent years. The last year of our time series, however, saw the coefficient increase again to 18%, as high-scoring regions such as the South West, London and the North West increased their R-ISEW, whilst Yorkshire and the Humber and the South East stagnated. Meanwhile, little trend can be discerned based on consumer expenditure, though it is interesting to note that, overall, coefficients of variance for this measure are much lower (at around 10%) than those for GVA.

Judging from earlier sections of this report, we suggest that this convergence of R-ISEWs came about as poor performers, such as the East Midlands, gained ground over the late 1990s as a result of improving economic indicators, and decreasing local pollution. Another peripheral, less positive, explanation might be the spread of social costs such that they are not exclusive to London.

Figure 37 lends support to the former idea, with the coefficient of variance for air pollution having decreased somewhat since 1994, though not such clear support to the latter – the coefficient of variance for the combined social costs (excluding income inequality) has more or less stayed the same. The coefficient of variance for net international position is quite hard to interpret, however, partly thanks to its volatility. It appears to have risen dramatically between 1994 and 1997, as the deficits of GORs such as the South East and the East of England grew rapidly.

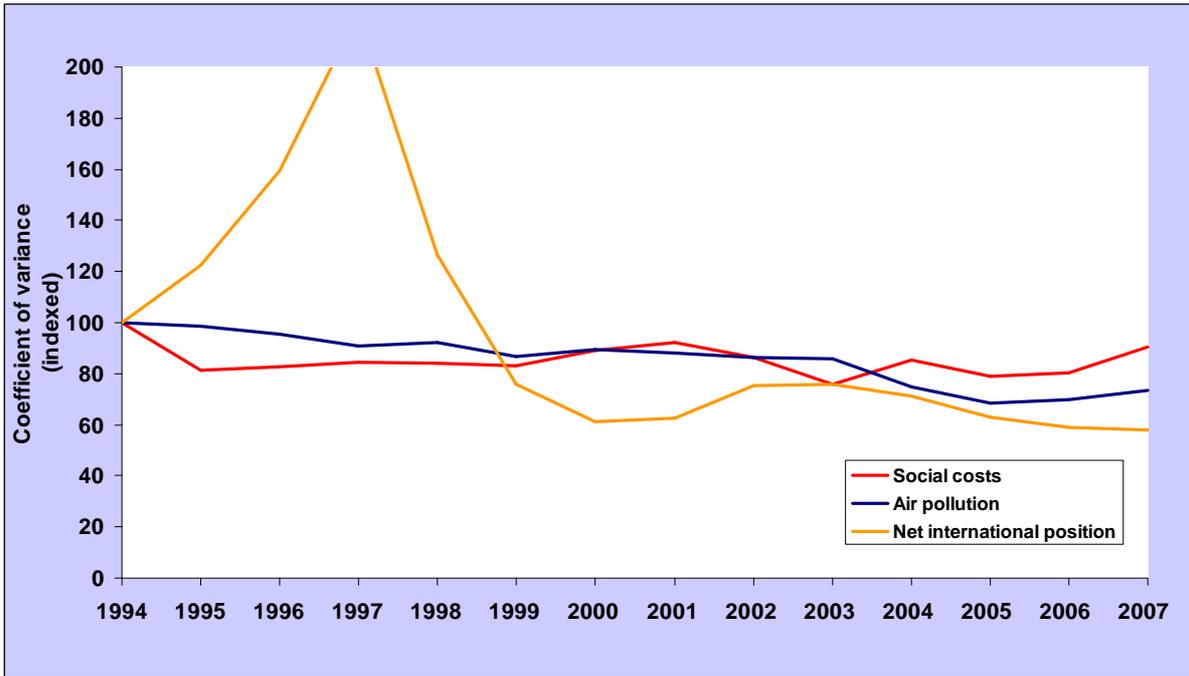


Figure 37: Coefficients of variance over time of selected components and component sets.

4. Amendments to the R-ISEW methodology

As with many complex indicators, updates of R-ISEWs from one year to the next are subject to adjustments and modifications. There are several reasons for this:

1. Updates of the source data on which the R-ISEW is dependent.
2. Linear trends used to estimate values for some years are affected by later data.
3. Occasionally, figures that previously had to be estimated can be replaced by new data sets. Similarly, unit costs are subject to updates.

This section explores the difference between this year's R-ISEW and last year's. It then summarises the changes made and the difference the changes have made to the results.

Overall R-ISEW

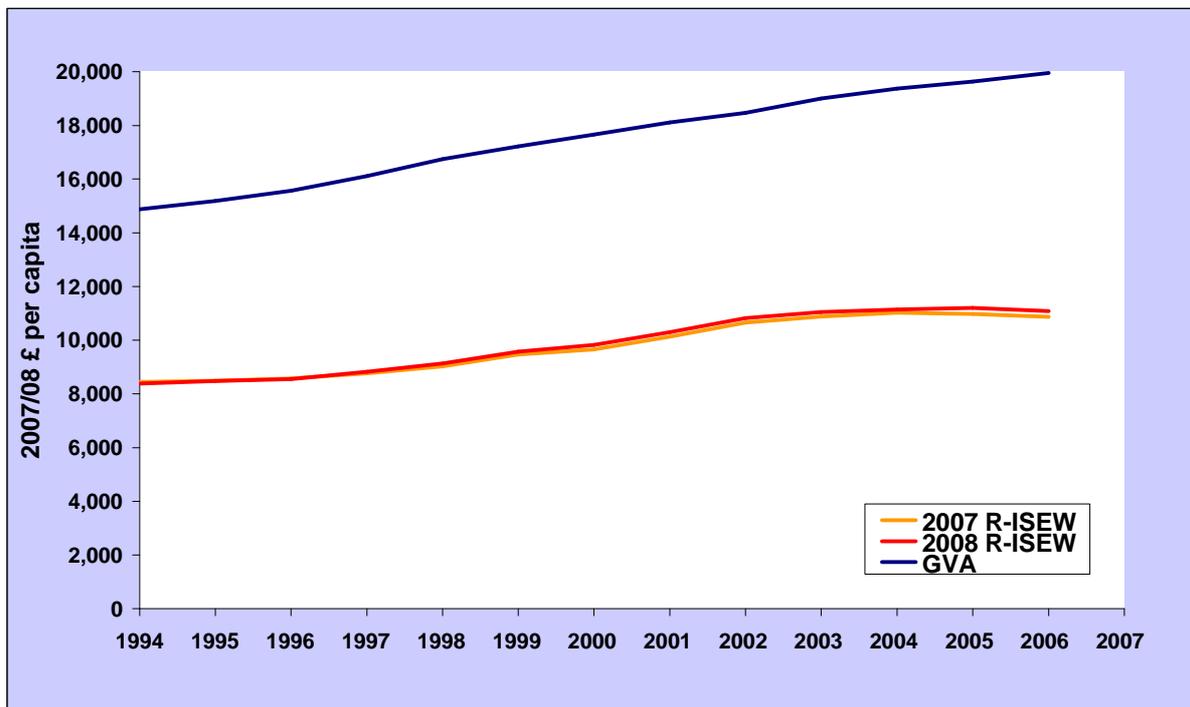


Figure 38: This year's R-ISEW per capita for England compared with last year's R-ISEW.

Figure 38 highlights the fact that, overall, the changes have made very little difference to the total R-ISEW for England, once last year's figures are deflated to 2007/2008 prices. Overall, there is a general trend of having increased the UK R-ISEW for most years, particularly the most recent ones. Our current estimates for 2006 are 1.9% higher than the last calculation.

Some decreases in the R-ISEW in earlier years, however, have also resulted and our estimate for 1994 is 0.8% lower.

These changes are substantially smaller than those resulting from adjustments last year, in 2008. Then, estimates for some years were up to 8% higher than those calculated in 2007.

Re-calculations, however, have had a more substantial effect on the ordering of GORs (Figure 39). London's 2006 R-ISEW is boosted considerably (by 9%), taking it from third place in last year's rankings, to second place this time around. Meanwhile, Yorkshire and the Humber's estimated 2006 R-ISEW is reduced by 7%, dropping it below the South East and East of England. No other region sees a change of greater than 3% in 2006. The newly calculated R-ISEWs for the East Midlands and the North East, however, are considerably lower for the earlier years in the time series. The North East's 1994 R-ISEW is now 5% lower, the East Midlands' one is 14% lower. The average absolute change for any given year for any given region is 3.3%. More detail can be seen in Appendix Table 4.

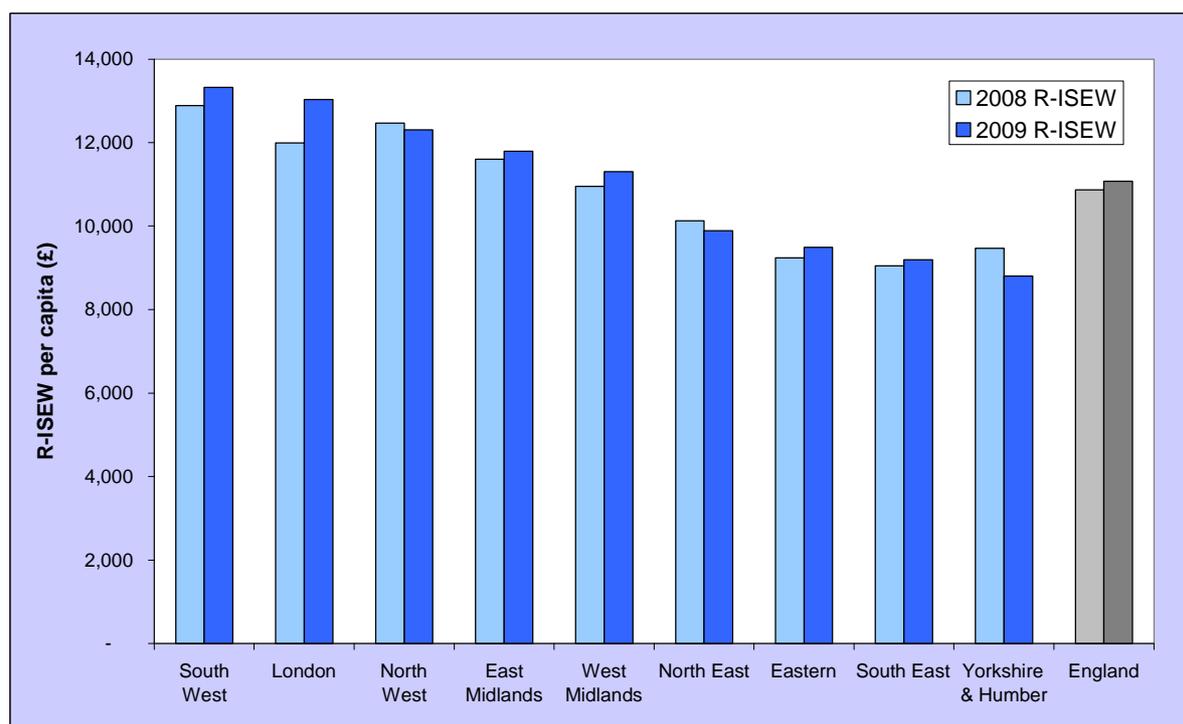


Figure 39: This year's R-ISEW per capita for each GOR, compared with last year's R-ISEW (data here for 2006).

The following sections offer some explanation for these differences, based on the changes that have been made to the calculations.

Deflation figures

The first thing that should be noted is that the deflators used in this year's R-ISEW have been updated since the previous year's calculations. This results in marginally different figures. The deflation factors we used this time around lead to lower values than those used last year. For example, a sum of £1,000 at 1994/1995 prices, would have been deflated to £1,402 in 2007/2008 prices using the older factors, but only to £1,388 using the updated ones – a difference of 1%. This can have quite substantial effects on large components, such as consumer expenditure.

Air pollution and long-term environmental damage

The most substantial change to our results comes from a slight modification of how the distribution of air pollutant emissions (including greenhouse gases) is estimated for earlier years, when regional data was not available. For the last R-ISEW, we only had regional distribution data for all regions for 2005 and 2004, with a few data points for 2003. The distribution for earlier years was estimated for each region based on a weighted average of the data available.

This time around, we had access to regional data for 2006 and 2007 as well. With the extra data available, it becomes more appropriate to use a more sophisticated method for estimating the regional distribution for earlier years. Rather than an average, we used a linear trend to estimate proportions of pollutants in each region for 2002. As we cannot be too confident about this trend, however, we use the distribution estimated for 2002 for all prior years, too. As such, we have still taken a cautious approach.

The change in estimation method leads to quite substantial changes in both the costs of air pollution and long-term environmental damage for the years 1994 to 2002. These changes also affect the total for England, as the absolute data used for earlier years cover the whole of the UK, and the English proportion needs to be estimated just like the regional proportions. The change in methodology has another impact on the long-term environmental damage component: as the costs for any given year are based on all past emissions, changing the estimated distribution for earlier emissions affects *all* years in the time series.

The resulting changes are substantial. For example, our current estimate for the costs of long-term environmental damage for Yorkshire and the Humber in 2007 are £5,079 per capita. Had we used the old methodology for estimating past emissions, this would only have been £4,467 per capita. Conversely, the estimate for this cost for London in 2007 would have been £1,295 per capita using the old methodology. Instead, it is £1,060 per capita. Meanwhile, the estimated costs of air pollution in the East Midlands in 1994 have risen from £2,547 per capita to £3,253 per capita.

This single methodological change accounts for more than half of the difference between this year's R-ISEW data set and last year's. Were we to use the old methodology, then the largest difference for any year for any region would have been only 3.4% – with the exception of differences in London which we shall come to in the next section. The mean difference drops from 3.3% to 1.5%. Whilst Yorkshire and the Humber would still be the bottom region in 2007, it would actually score above the South East in 2006, as it did in the previous R-ISEW.

A minor change was also made to the way N₂O emissions are distributed across regions, but this has little impact on the final costs of long-term environmental damage.

Capital growth and net international position

Capital growth and net international position are large volatile components that require rolling averages to be taken during their calculation. Such rolling averages, as well as new data, mean that new figures can be substantially different from previous ones. This year, changes in estimations for these components have particularly impacted the R-ISEW for London. There are two reasons for this. The first is to do with the data for 2007 affecting estimates for earlier years. The capital growth estimate for 2007 for London, before taking rolling averages, was £7.1 billion. This is considerably higher than the figure for 2006 (£3.2 billion) and the *deficit* in 2005 (-£3.5 billion). As a result, taking a five-year rolling average significantly increases the estimates used for those years. For example, last year, we estimated net capital growth for London in 2005 to be -£81 per capita. This time round, the estimate for the same year was positive: £140 per capita.

The other reason is to do with the underlying data. As was noted in Section 3.1, the latest regional GVA estimates for London, taken from the ONS, are 7–9% higher than those used

in the last R-ISEW. Regional GVA figures in service sectors are used as a proxy to estimate regional levels of service exports in the net international position component. As a result, the net international position calculated for London this time around is higher across the board, reaching £3.5 billion higher by 2006 – £324 per capita.

These two changes to the economic adjustments substantially lift London's R-ISEW, particularly in the last years of the time series. Without them, London would only come third in the R-ISEW, behind the North West.²² Most of the increase London has seen in its R-ISEW relative to last year's calculations depends on these changes – leaving only a 0–2% increase unexplained.

Commuting

Another substantial change to the R-ISEW this year was made in the commuting component: the change results in the direct costs of commuting being revised upwards, such that the total costs are some 10–13% higher over the time series. Including this change as an explanatory factor for the difference in the R-ISEW sets means the average absolute difference between sets is 0.9%, and no individual difference (for any given region for any given year) exceeds 3.0%.

Crime

In the crime component, the method for estimating the costs of *other violent crimes* has changed. Our unit costs distinguish between, on the one hand, common assault and harassment and, on the other hand, other violent crimes. Before 1998, the raw data also make this distinction at the regional level. From 1998 onwards, however, these two crime categories are not distinguished at the regional level. Hence the rates of *other violent crimes*, excluding common assault and harassment have to be estimated, based on national trends. Previously this estimation was done by looking at the average share of *other violent crime* in the combined crime figures in 1998 and assuming that this share remains constant throughout the coming years. This was changed to an estimation method where the total levels of *other violent crime* are assumed to be distributed across regions in proportion to the distribution of all crimes.

Whilst this might seem like quite a trivial change, it has some impacts on the regional distribution of costs, increasing the total costs in London and the West Midlands, whilst decreasing them in the South East, South West and East of England.

Consumer expenditure

The latest ONS estimates for UK consumer expenditure are 2–3% higher than earlier ones. Consumer expenditure directly feeds into the consumer expenditure component and the income inequality component.

Resource depletion

Two changes were made to the methodology for estimating earlier data in this component – specifically regional fuel efficiency in cars, and regional domestic energy consumption. In both cases, we replaced an average with a linear trend, as we have done for regional emissions of air pollutants.

Pollution control

Defra now publishes more thorough and easier to use data on expenditure on pollution control in different sectors. This data, however, omits expenditure on research and development, which we had previously included. Furthermore, we corrected the omission of a subsector of the manufacture of chemicals and chemical products sector. The relative effects of these changes are fairly substantial. For England as a whole, total costs fell by up to 7% (for the first four years of the time series). Meanwhile, costs for some regions, such as the East of England and London fell by up to 16% in some years. In absolute terms, however, these changes make little difference to the overall R-ISEW.

Water pollution

The Environment Agency is in the process of revising its waterway surveying categories in compliance with European standards. The raw data available this year were quite different from that available in previous years, with the quality of many waterways upgraded. Furthermore, it is likely that further changes will be made next year.

This time around, the total costs of water pollution for England were approximately 20% lower. The benefits of this change are spread unequally across regions, with costs falling particularly in the South West, but actually rising in London and the Midlands. As with the pollution control component, this is such a small component in the R-ISEW that these changes have little absolute effect on the final values.

5. Concluding remarks

This year's results appear somewhat less gloomy than those calculated for 2008. Whilst the R-ISEW appeared to stagnate and indeed fall between 2003 and 2006, it rose slightly in 2007, buoyed by increasing consumer and public expenditure. With hindsight we know that this increased expenditure was somewhat a mixed blessing and in part responsible for the advent of recession in the latter half of 2008. It remains to be seen how these effects will play out on the R-ISEW.

Either way, however, it is clear that the R-ISEW provides a more sober vision of the economic state of England since 1994. Once environmental and social costs and benefits are accounted for, and economic adjustments are made, England's R-ISEW stood at £11,318 per capita in 2007, compared to a GVA per capita of £20,463 per capita. Furthermore, whilst GVA per capita increased by £1,987 in the five years leading up to 2007, the increase in the R-ISEW per capita was only £495. The suggestion is that the GVA seriously overestimates the economic health of the country.

As in last year's report, a less rosy picture of progress in England emerges as soon as economic adjustments are made to account for the country's declining net international position and net capital growth. Taking these and other economic adjustments into consideration, adjusted economic growth appears to have been unstable since 2003. Whilst social costs and many local environmental costs have generally declined since then, rising costs of long-term environmental damage, and the decrease in household labour wipe out these gains.

Looking across the regions, the R-ISEW paints a very different picture to GVA. Regions traditionally seen to be economically successful, such as the South East and the East of England, have the lowest per capita R-ISEWs. London, which has by far the highest GVA per capita, is only second in terms of the R-ISEW. Meanwhile, it is the South West which has the highest R-ISEW.

The order of the regions has remained relatively stable over recent years. The notable exceptions have been the South East falling from fourth to eighth place between 2002 and 2007, and the East Midlands rising from eighth to fourth over the same period of time.

The R-ISEW is an evolving methodology. Even whilst preserving the overall methodology, subtle changes to our estimation methods have had some substantial effects on the final values calculated. For example, the changes to estimations for long-term environmental damage have altered the relative performances of regions such as the East Midlands and London. Meanwhile, the constant updating of underlying data, such as regional GVA figures themselves, has led to sharp revisions of some region's ISEWs, such as London.

nef will be calculating R-ISEWs for a further year using the same methodology as that used in this report. After that, however, it is likely that the methodology will undergo further development. Such developments might lead to quite different patterns of results.

One theoretical challenge that needs to be faced is the growing disconnect between points of production, and therefore experience of environmental costs, and points of consumption

and benefits from economic activity. Increasingly, our consumption habits are met through the importing of goods manufactured in other countries. For example, imports to the UK from China rose by 115% between 2001 and 2006.²³ This change in trade patterns may lead to decreased local pollution impacts and indeed decreased costs in the long-term environmental damage and resource depletion columns as our manufacturing base shrinks. These decreases may have served to allow the R-ISEW to have risen up until 2004. It is arguable, however, whether they represent a move to a more sustainable economic well-being. If the environmental costs are simply being exported to another country, they are simply being shifted around, not reduced. This is particularly pertinent for global environmental issues such as climate change. Meanwhile, differences between regions that are net importers and those that are net exporters may be distorting the attribution of environmental costs. The scoping report produced this summer begins to explore the possibility of tackling these issues, though it makes it clear that the appropriate attribution of environmental costs is no easy matter.

Appendix 1. The numbers

A.1 R-ISEW by GOR (£m 2007/08)

	North East	North West	Yorkshire & Humber	East Midlands	West Midlands	Eastern	London	South East	South West	England
1994	19,126	71,676	27,455	23,508	51,400	39,954	56,467	65,807	47,334	404,230
1995	20,010	70,808	28,403	26,703	51,142	39,209	60,596	64,201	48,384	410,025
1996	20,333	71,341	29,146	25,691	51,865	44,544	58,807	66,710	48,476	414,726
1997	21,194	73,681	29,685	30,813	51,141	40,443	64,554	66,996	50,599	429,465
1998	22,130	73,177	30,900	32,066	53,483	45,178	65,164	72,386	51,235	446,016
1999	22,291	73,555	31,140	34,534	52,807	48,035	73,262	69,739	52,716	469,186
2000	22,939	78,591	34,217	36,237	55,295	48,715	74,911	77,482	56,532	483,711
2001	24,280	81,400	35,561	39,363	55,803	48,243	84,130	81,943	58,605	509,065
2002	24,201	82,923	39,090	39,766	55,602	52,464	92,988	87,157	63,945	537,356
2003	24,975	85,821	43,505	41,231	58,798	53,073	92,798	82,512	68,685	550,894
2004	24,655	85,837	44,822	45,813	59,160	54,225	93,887	81,806	68,301	558,307
2005	25,173	86,205	45,067	49,051	59,860	54,947	98,576	77,193	69,326	565,496
2006	25,287	84,320	45,258	51,471	60,675	53,225	97,907	75,728	68,279	562,382
2007	27,046	87,967	43,263	51,433	61,389	54,297	104,419	76,556	72,213	578,247

A.2 R-ISEW per capita by GOR (£ 2007/08)

	North East	North West	Yorkshire & Humber	East Midlands	West Midlands	Eastern	London	South East	South West	England
1994	7,388	10,481	5,535	5,773	9,792	7,716	8,215	8,533	9,950	8,381
1995	7,747	10,370	5,725	6,526	9,728	7,532	8,766	8,270	10,118	8,475
1996	7,893	10,476	5,875	6,254	9,855	8,512	8,432	8,553	10,114	8,548
1997	8,253	10,845	5,987	7,479	9,719	7,679	9,202	8,531	10,483	8,825
1998	8,641	10,774	6,232	7,759	10,147	8,521	9,224	9,176	10,566	9,136
1999	8,741	10,860	6,283	8,317	10,016	8,997	10,241	8,767	10,800	9,569
2000	9,020	11,602	6,900	8,694	10,492	9,063	10,351	9,696	11,497	9,825
2001	9,559	12,018	7,145	9,395	10,567	8,934	11,490	10,213	11,856	10,295
2002	9,524	12,234	7,815	9,419	10,501	9,657	12,631	10,831	12,859	10,822
2003	9,829	12,621	8,653	9,692	11,069	9,694	12,602	10,203	13,723	11,047
2004	9,699	12,586	8,851	10,676	11,106	9,839	12,706	10,068	13,546	11,141
2005	9,872	12,603	8,823	11,333	11,187	9,877	13,221	9,431	13,628	11,205
2006	9,893	12,304	8,802	11,794	11,305	9,493	13,033	9,192	13,325	11,079
2007	10,548	12,816	8,357	11,689	11,406	9,591	13,818	9,214	13,946	11,318

A.3 R-ISEW per capita by component for England (£ 2007/08)

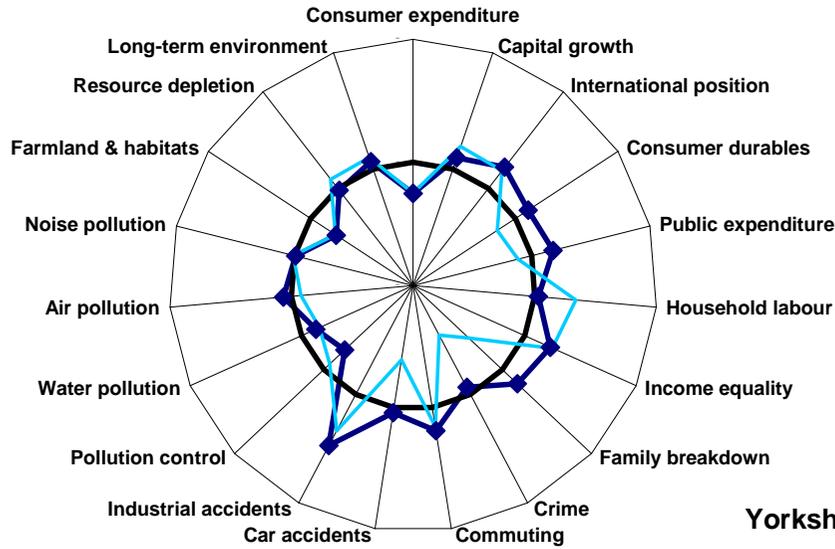
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Consumer expenditure	10,398	10,576	10,908	11,293	11,831	12,298	12,881	13,123	13,317	13,543	13,680	13,875	13,940	14,181
Effects of income distribution	1,312	1,362	1,414	1,507	1,653	1,633	1,926	1,813	1,707	1,761	1,729	1,785	1,817	1,787
Household labour and volunteering	4,465	4,395	4,336	4,271	4,224	4,166	4,075	3,966	3,900	3,854	3,780	3,711	3,660	3,587
Public expenditure on health & education	1,617	1,632	1,571	1,608	1,737	1,821	1,976	2,147	2,250	2,464	2,609	2,738	2,767	2,885
Net service flow from consumer durables	-242	-270	-325	-384	-390	-389	-402	-427	-402	-399	-375	-345	-333	-337
Costs of commuting	563	577	599	644	650	685	687	656	639	629	665	668	658	661
Costs of crime	212	205	204	190	189	193	186	199	229	236	237	235	222	202
Costs of family breakdown	162	164	166	156	152	152	152	171	178	176	174	157	151	149
Costs of car accidents	318	308	311	308	295	288	284	280	273	264	245	235	227	216
Costs of industrial accidents	175	175	175	174	174	173	172	172	167	177	169	165	169	162
Costs of pollution control	83	80	78	76	75	71	73	73	58	69	61	57	65	75
Costs of water pollution	8	7	7	8	7	7	6	6	6	6	6	6	6	6
Costs of air pollution	1,280	1,159	1,055	932	890	750	720	665	604	561	510	432	407	377
Costs of noise pollution	69	70	72	73	74	76	76	76	78	78	79	79	80	80
Costs of loss of natural habitats	47	47	47	47	47	47	47	47	47	46	46	46	46	46
Costs of loss of farmlands	15	15	15	14	14	15	16	13	15	14	14	13	12	13
Depletion of non-renewable resources	1,545	1,577	1,693	1,695	1,758	1,780	1,838	1,889	1,863	1,909	1,942	1,966	1,972	1,942
Long-term environmental damage	1,676	1,724	1,775	1,826	1,878	1,929	1,982	2,036	2,092	2,149	2,208	2,263	2,323	2,384
Net capital growth	166	105	96	62	88	179	278	355	389	331	272	218	161	107
Change in net international position	-557	-493	-426	-377	-498	-706	-818	-775	-678	-670	-739	-884	-961	-1,006
R-ISEW	8,381	8,475	8,548	8,825	9,136	9,569	9,825	10,295	10,822	11,047	11,141	11,205	11,079	11,318
GVA	14,878	15,180	15,562	16,108	16,743	17,219	17,652	18,118	18,476	19,004	19,367	19,630	19,952	20,463

A.4 Changes in calculated R-ISEW resulting from updated data

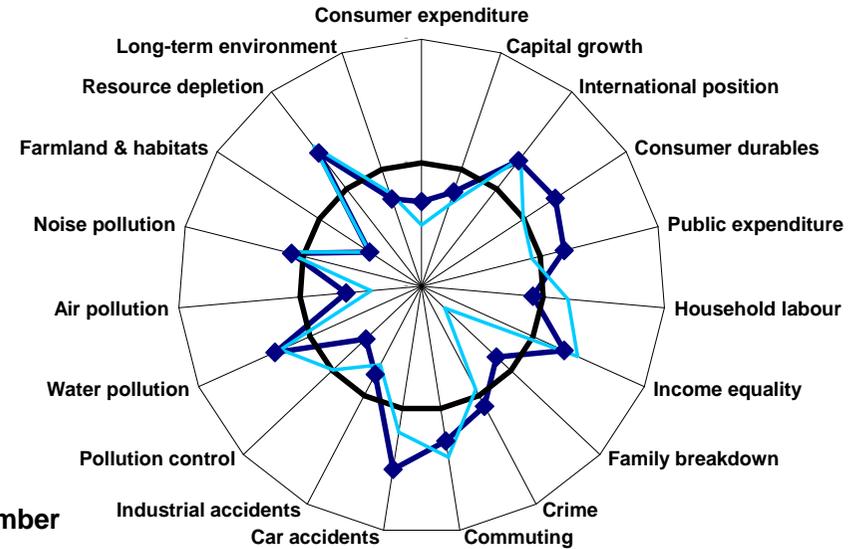
	North East	North West	Yorkshire & Humber	East Midlands	West Midlands	Eastern	London	South East	South West	England
1994	-4.7%	0.1%	-7.8%	-13.7%	-0.5%	0.3%	4.8%	0.7%	1.5%	-0.8%
1995	-4.4%	0.3%	-7.1%	-10.9%	-0.1%	0.8%	5.2%	1.1%	2.1%	-0.3%
1996	-4.8%	0.3%	-7.5%	-10.6%	-0.2%	0.9%	5.5%	0.9%	1.8%	-0.3%
1997	-3.7%	0.9%	-6.3%	-7.0%	0.7%	1.9%	6.4%	1.3%	2.5%	0.7%
1998	-3.1%	1.4%	-5.5%	-6.1%	1.2%	2.5%	7.0%	1.9%	3.2%	1.3%
1999	-3.6%	1.1%	-6.0%	-5.0%	1.1%	1.9%	6.2%	1.4%	2.9%	1.0%
2000	-2.9%	1.9%	-5.0%	-4.3%	1.8%	2.8%	7.4%	2.3%	3.5%	1.8%
2001	-3.1%	1.9%	-4.9%	-3.5%	1.8%	2.2%	6.6%	2.0%	3.3%	1.7%
2002	-3.5%	1.7%	-4.9%	-3.4%	1.7%	1.9%	6.0%	2.0%	3.1%	1.5%
2003	-4.3%	1.5%	-4.9%	-1.0%	2.2%	1.5%	6.1%	1.5%	2.7%	1.5%
2004	-4.4%	1.3%	-5.1%	-1.0%	1.4%	1.4%	6.0%	0.5%	2.3%	1.1%
2005	-2.0%	1.4%	-6.1%	1.2%	3.2%	2.9%	9.3%	-0.5%	2.8%	2.1%
2006	-2.3%	-1.3%	-7.0%	1.6%	3.2%	2.7%	8.7%	1.6%	3.4%	1.9%

Appendix 2.

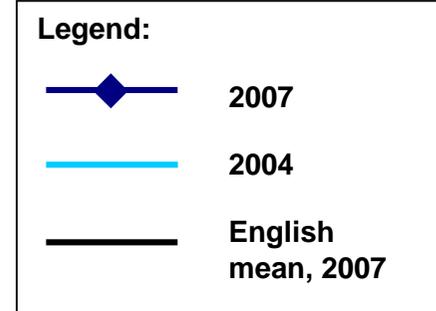
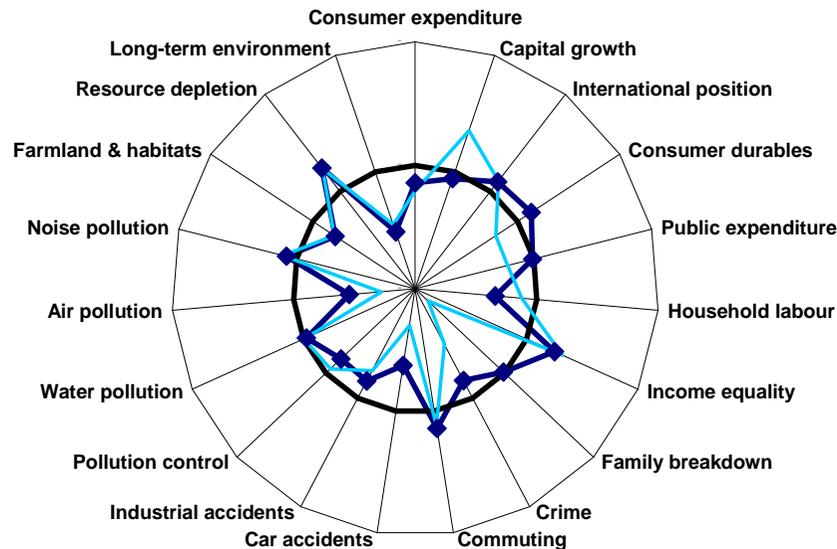
North West



North East

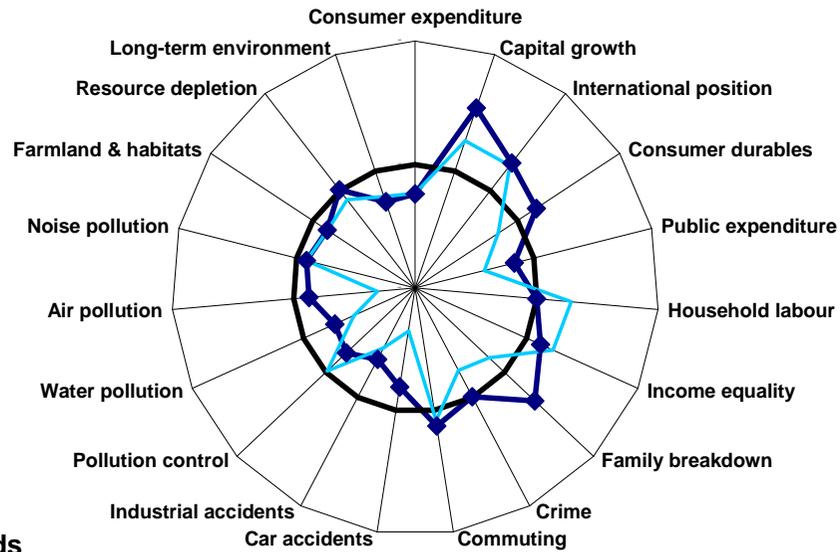


Yorkshire and the Humber

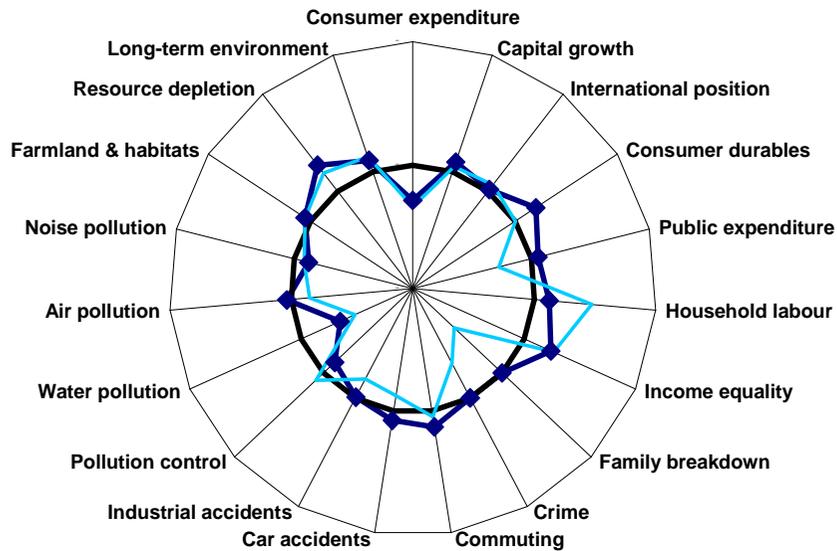


Spider diagrams for each GOR showing relative performance on each component

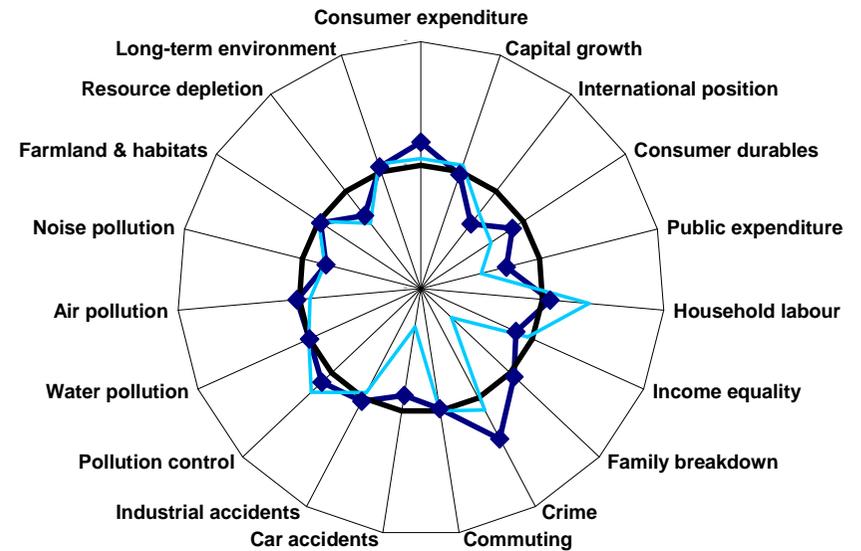
East Midlands



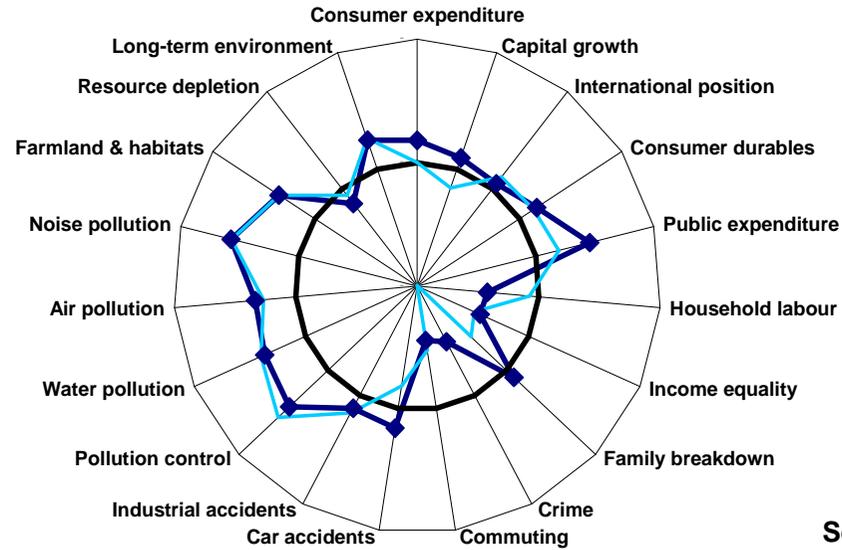
West Midlands



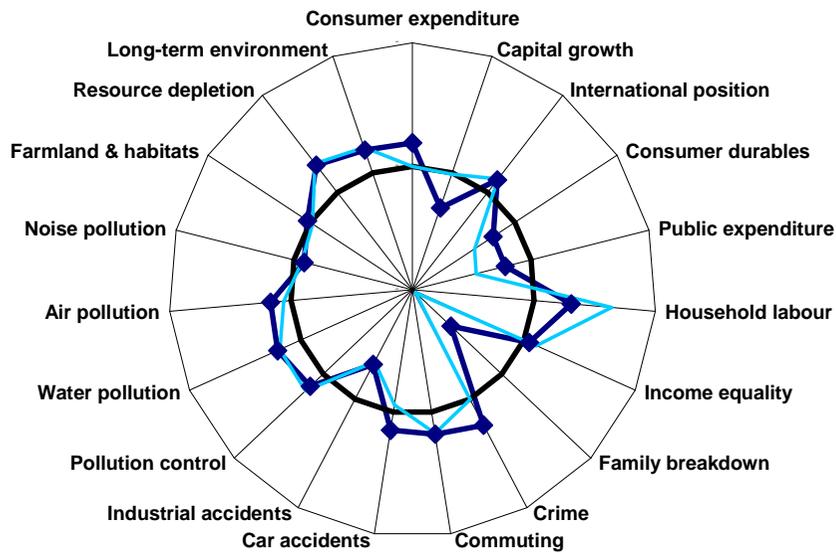
East of England



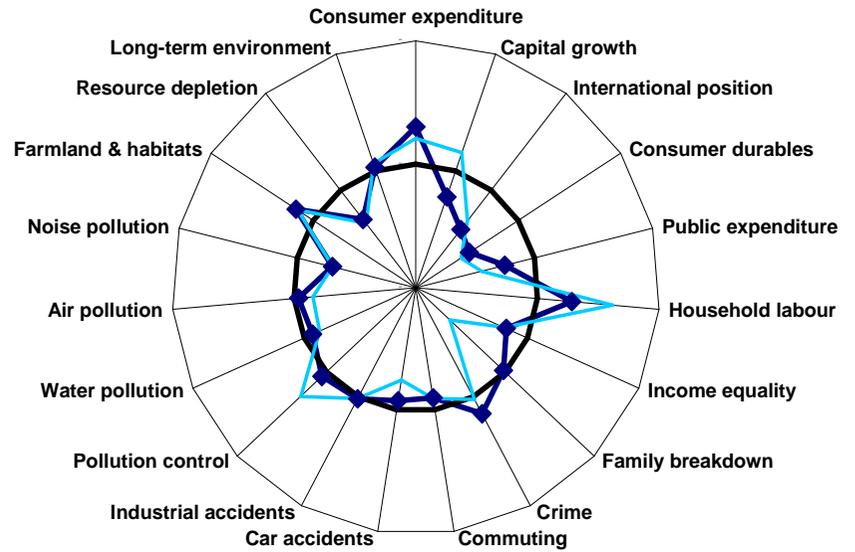
London



South West



South East



Endnotes

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- ¹ Jackson T, McBride N, Abdallah S and Marks N (2008) *Measuring regional progress: regional index of sustainable economic well-being (R-ISEW) for all the English regions* (London: nef).
- ² Abdallah S, Jackson T and Marks N (2008) *The 2008 R-ISEW (regional index of sustainable economic well-being) for all the English regions* (London: nef).
- ³ Abdallah S, Knuutila A, Neitzert E, Lawlor E, Esteban A and Jackson S (2009) *Scoping project for development: Regional Index of Sustainable Economic Well-being* (London: nef)
- ⁴ For all maps, 'well below mean' refers to any region falling below 1 standard deviation of the figure for England, and 'well above mean' refers to any region with a figure 1 standard deviation above the figure for England (standard deviation defined with respect to the nine regions).
- ⁵ It is worth noting that updated estimates for regional GVA now see the North West as wealthier, per capita than the West Midlands since 2005. The previous GVA estimates used put the West Midlands as slightly wealthier than the North West.
- ⁶ Ranks in green denote the top three GORs, ranks in red denote the bottom three GORs, whilst the amber colour denotes GORs in the middle of the ranking.
- ⁷ Jackson *et al.* (2008) *op. cit*
- ⁸ Abdallah S, Jackson T and Marks N (in prep) *The R-ISEW (regional index of sustainable economic well-being) technical specification* (London: nef).
- ⁹ '+125%' indicates that the total value of consumer expenditure is 125% that of the final R-ISEW, and makes a positive contribution.
- ¹⁰ As of 2008, this data has been collected as part of the Integrated Household Survey.
- ¹¹ Looking at *total* figures, increases in both consumer expenditure and GVA of course appear more dramatic (44% and 46% respectively).
- ¹² ϵ is a parameter which represents the degree to which the marginal utility from increased income falls with increasing income. A value of 0.8 is suggested by the literature as suitable. This is discussed further in Jackson T, Marks N, Ralls J and Stymne S (1997) *Sustainable economic welfare in the UK 1950–1996* (London: nef).
- ¹³ Serial killer Harold Shipman, responsible for at least 172 deaths.
- ¹⁴ We have excluded here consideration of global pollutants, such as carbon dioxide and methane, as these are included in the category of climate change costs. Also excluded are pollutants such as lead and benzene which may be important but for which we found no reliable estimate of cost.
- ¹⁵ Simms A, Johnson V and Smith J (2007) *Chinadependence: The second UK interdependence report* (London: nef).
- ¹⁶ Abdallah *et al.* (2009) *op. cit.*
- ¹⁷ See Appendix 4 of Jackson *et al.* (2008) *op. cit.* for details.
- ¹⁸ Abdallah *et al.* (2009) *op. cit.*

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- ¹⁹ Cobb C and Cobb J (1994) *The green national product* (University of Americas Press: Lanham, MD).
- ²⁰ Formally the Department for Business, Enterprise, and Regulatory Reform
- ²¹ It is worth noting that London's annual GVA figures have been estimated upwards by 7–9% since the last ONS statistics were published.
- ²² Comparison for 2006, using new R-ISEW but replacing capital growth and net international position components with the figures from last year's R-ISEW.
- ²³ Simms *et al.* (2007) *op. cit.*