

Building a positive future for Bristol after

# Peak Oil





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# Executive Summary

In 2008 oil prices hit record levels of \$147/barrel. This event, alongside growing evidence that the global energy picture is changing has led the Bristol Green Capital Momentum Group and Bristol City Council to consider the issue of peak oil and its probable effects on the future prosperity of Bristol. Input and comment have been sought from organisations and authorities in the city. (For a list of other cities and organisations considering peak oil see Appendix 4). This report sets out to look at the evidence for peak oil, its potential impact on Bristol, and what actions could be taken now to address it.

## Why Should Bristol Act Now?

An increasing number of experts and commentators warn that the era of cheap oil is over and that an oil crunch is likely within the next decade. An oil crunch would fundamentally threaten the way our city operates with challenges to transport, healthcare, food distribution, social cohesion, public services and other sectors. With a reputation as a leader in sustainability<sup>1</sup>, Bristol has the opportunity to show the way in responding to this challenge.

## What is peak oil?

Peak oil describes the point at which the amount of oil produced globally in a single year reaches its absolute maximum. From this point onwards, oil will still be produced but at a lesser volume. After peaking, oil production will ultimately go into decline. Estimates on the timing of this vary. There is, however, a growing consensus that the era of cheap oil is over, and that an oil crunch in the next decade is likely. The consequences of constrained supply are likely to be severe and disruptive.

The current credit crunch and collapse in global oil and commodity prices may cause optimism that the 2008 spike in oil prices was

a bubble, but the underlying picture of supply and demand tells a different story. The reality is that the credit crunch is causing cancellations and delays in new oil production projects whilst existing production is in decline.

Oil discovery peaked in 1960s. In 2007 over a quarter of the world's oil production came from the twenty largest fields<sup>2</sup> and seventeen of these were discovered before 1970. According to the International Energy Agency's (IEA) *World Energy Outlook 2008*, the average annual global rate of depletion in oil fields is now 6.7%. In other words, without the discovery of new fields, oil production will fall 50% in 10 years. At current rates of discovery the world is finding approximately *one* barrel of oil for every *three* that it uses. Much of this new oil comes from deep sea fields and tar sands and is both expensive, polluting and energy intensive to exploit. Due to a combination of population increase and economic development, the IEA predicts that global oil demand will reach approximately 95 million barrels per day (mb/d) by 2015 and 106 mb/d by 2030. In order to meet this demand, the IEA estimates that the world needs the equivalent of almost six times the amount of current Saudi Arabian oil production to be brought on stream between 2007 and 2030. They add that "*Some 30 mb/d of new capacity is needed by 2015. There remains a real risk that under-investment will cause an oil-supply crunch in that timeframe.*"<sup>3</sup>

Until recently the UK was in a strong position with regard to oil supply due to its North Sea fields, but production is now in decline. Since becoming a net importer of both oil and gas between 2004 and 2006, the UK has become highly vulnerable to the global energy market. With UK oil production predicted to decline by 5-7%/year imports will need to rise to make up the gap.

Sources:

- 1 <http://www.forumforthefuture.org/node/10000>
- 2 Page 225-226 International Energy Agency World Energy Outlook 2008
- 3 Page 41 <http://www.iea.org/Textbase/npsum/WEO2008SUM.pdf>



### Why is oil so important?

Our current way of life relies on the availability of an abundant supply of cheap oil. Economic studies suggest that without a cheap and plentiful supply of energy, economic growth is not possible and that high oil prices result in recessions. Assuming that Bristol oil consumption is in line with UK averages, our city consumes approximately 11,500-12,000 barrels of oil/day<sup>4</sup>.

Oil has unique properties that make it highly versatile; it is stable as a liquid at a high range of temperatures which makes it easy to transport and store. It also has a high energy density which means that 23,200 hours of human work can be replaced with just one barrel of oil<sup>5</sup>. When we consider our dependence on oil, we usually focus on petrol and diesel but our reliance upon it runs much deeper and wider as it is used in many plastics, medicines, packaging, fabrics and other synthetics.

### Alternatives to oil

It is tempting to think that current modes of operation can simply be made more fuel-efficient, or use different fuels so that we can simply carry on as usual. However, current alternatives aren't scalable – there is no alternative available that can replace the amount and type of energy that we receive from oil at a comparable cost.

The UK is already facing challenges around gas supply as it becomes more dependent on imports in an increasingly challenging market; in addition, 30% of current electricity generation is scheduled to close by 2020. Realistically any viable solution must include a combination of increased efficiency, reduction in energy consumption and alternative fuels.

### Peak oil and climate change

Fortunately, the policies and actions required to deal with climate change and peak oil coincide in many areas and can be pursued

together. Both call for a reduction in the exploitation of fossil fuels. There is however a real danger that peak oil could lead to desperation for energy from any source regardless of the environmental impact, as is already being seen in the exploitation of tar sands. Whilst the effects of climate change are already being strongly felt in some parts of the world, it is likely that the effects of peak oil will hit the UK harder first.

### Peak oil and Bristol by sector

#### Social cohesion



In our oil-dependent society any change to the price of oil, or access to it, quickly impacts on our lives. We are used to being able to get everything we need on demand, but expensive oil increases fuel, food and transport costs while interruptions in supply can leave people stranded and cause panic.

Food and fuel poverty are already a significant problem in the UK<sup>6</sup> and with Bristol having around 16% of the population living in the lowest 10% of multiple deprivation areas, there could be serious impacts here. Examples of dysfunction due to oil shocks have already been experienced in Bristol, the UK and Europe including panic buying, increases in fuel related crime and rioting.

Sources:

<sup>4</sup> Based on UK oil consumption 2007 EIA and UK population data from ONS

<sup>5</sup> 1 Barrel of Oil = 5,800,000 BTUs, Source: Louisiana Oil and Gas Association; 1 Gallon of Gas = 125,000 BTUs, Source: US Department of Energy

<sup>6</sup> <http://www.eatingbritain.com/national-charity-fareshare-calls-on-food-industry-to-help-tackle-food-poverty-in-the-uk-today.html>

## Emergency planning



In the event of disruption in fuel supply, the emergency response for Bristol would be dealt with under existing national and local emergency planning procedures. Emergency responses however are just that; they concentrate on maintaining essential services and protecting the vulnerable.

The length of time for which emergency fuel plans could fully maintain essential services is not known. If a disruption were prolonged it would push more people into vulnerable categories and therefore stretch essential services beyond capacity. Prolonged fuel emergency could lead to shortages and result in civil disobedience and dysfunction. Frequent reoccurrence of fuel supply disruptions would put a strain on all city functions, services and budgets.

## Transport and accessibility



Bristol's passenger and freight transport are almost entirely petroleum based. In the event

of a major global oil shock, petrol and diesel based transport could become redundant almost overnight. Fuel shortages and escalating prices would mean the vast majority of people would not be able to use their cars. Alternative fuels to petrol or diesel, irrespective of cost, simply do not exist on the scale currently required for normal functioning of the city.

**Options lie in reducing the number and distance of journeys made. This means employment and services being located closer to where people live. Investment in bus and rail services and other forms of mass transit are needed as well as better provision for cyclists and pedestrians. More efficient and strategic use of alternative fuels will be important.**

## Food



The global food production and distribution systems on which Bristol relies are utterly dependent on oil. For every calorie of food energy delivered, 7-10 calories of fossil fuels are used to produce it. According to a July 2008 government report, the transportation of food alone accounts for a third of the 20.6 million tonnes of oil used in the UK food chain each year<sup>7</sup>. Any interruption in food supply or an increase in cost risks devastating consequences.

**Options include farming methods which build soil fertility and don't rely on pesticides and artificial fertiliser; protection of productive**

Sources:

<sup>7</sup> [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_matters1.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf)



farmland on the outskirts of the city; promotion of more seasonal food from more localised producers; a switch to a less meat-based diet; encouraging people to grow their own food in private gardens, community gardens and allotments; and even using some public space to produce food.

## Healthcare



Modern healthcare is dependent on oil as a raw material for medicines and supplies, for transport and for power back-ups. In 2007-8, the Great Western Ambulance Service alone made 315,399 patient journeys. Increases in oil and fuel prices would strain existing NHS budgets and care models; the NHS spends some £20 billion a year on supplies and a mere 5% increase in costs would require an extra £1bn from the budget which, in turn, may lead to a reduction in services.

**As well as existing contingency planning, options lie in less energy & resource-intensive models of healthcare, as acknowledged by the current NHS *Carbon Reduction Strategy*. Measures would include renewable energy generation at hospitals and clinics; alternatives to fossil fuels for vehicles and travel planning for health service staff; provision of care closer to people's homes and workplaces; and a greater focus on preventative care.**

## Public Services



Bristol's police, fire, Council and other public services are highly reliant on oil for transport. Fuel shortages and rising costs of food and fuel would lead to cuts in services, whilst also increasing demand.

**Strategies to reduce vulnerability include improvement of contingency planning, decentralisation of services, making priorities for constrained budgets and working with the community to build resilience. Planning policies which promote accessibility, low energy building and set aside land for food production will equip communities for the future.**

## Key Economic Sectors



Peak oil is currently not even considered as a risk for most businesses, yet its effects would make many of today's business models redundant. Peak oil will cause substantial price volatility in raw materials and fuel. It will

challenge globalized manufacturing and distribution models. Key Bristol economic sectors with a direct vulnerability to oil shortages and price rises include distribution, retail, construction and aerospace. However, large service sectors such as banking, insurance and tourism will not be immune.

**Energy efficient companies will be able to keep costs better under control. Businesses that provide products and services tailored to fuel efficiency, energy savings and waste recovery are likely to be at an advantage.**

**Companies located nearer their staff or allowing homeworking will cope better during acute fuel supply shocks. Overall, high oil prices will favour a more localised economy for everyday goods and services. Companies with complex supply chains are likely to have a harder time.**

## Power & utilities



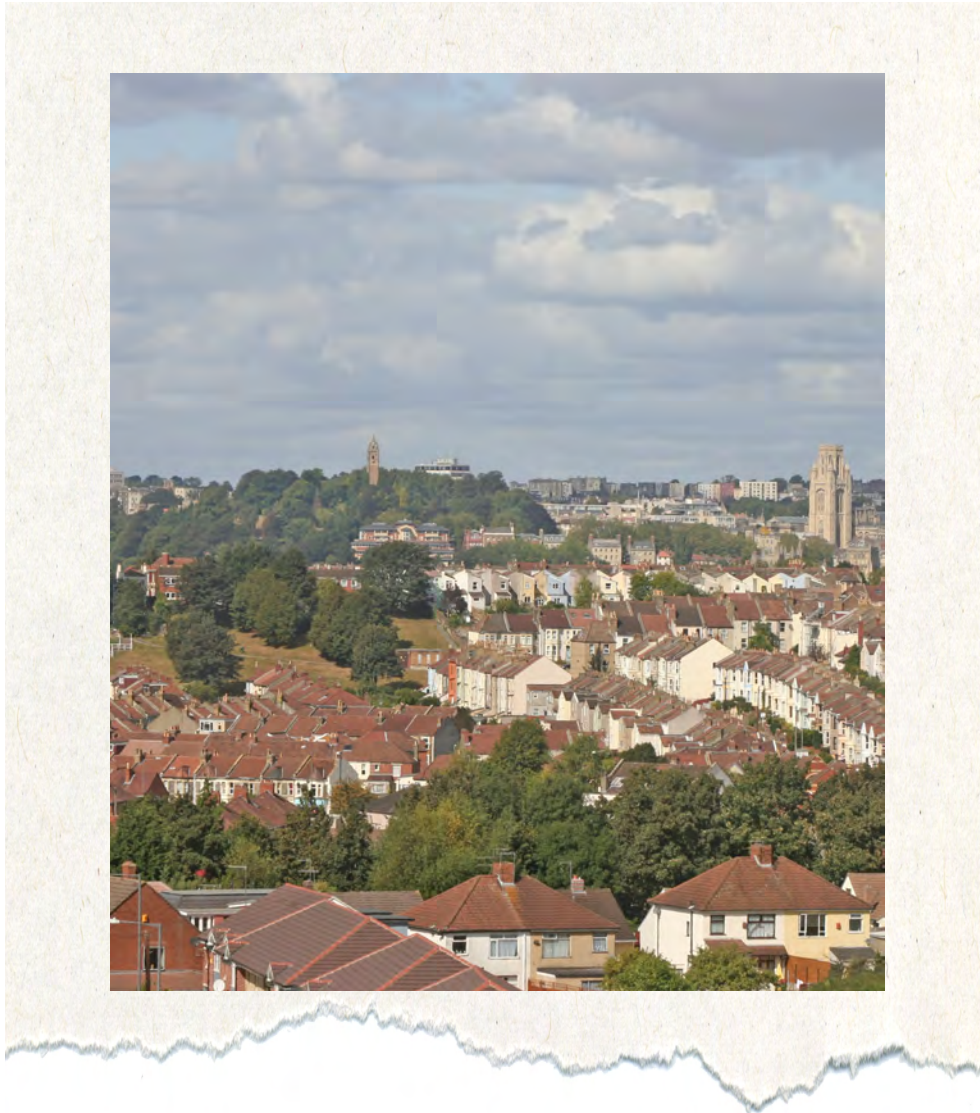
An oil crunch will result in volatility in energy costs across the board. UK gas and electricity resources are already under strain and efforts to displace oil usage to these energy sources are likely to worsen the situation. Likewise, current water and sewage systems are highly energy dependent and back-ups are reliant on diesel.

**Options lie in a combination of reduced energy use and increased efficiency. A more strategic approach to energy, heating and cooling for the city is needed, which effectively utilizes waste heat, local biomass and develops renewable sources. Further engagement with communities is required to undertake retrofitting of homes and reduce energy and water usage.**



# Part One:

## Peak Oil and its significance to Bristol



## 1.0 An introduction to peak oil and Bristol's energy vulnerabilities

### 1.1 Summary

#### Key Points

- ▲ Oil production has peaked, or will peak in the near future and subsequently decline.
- ▲ A global oil supply crunch within the next decade is highly likely.
- ▲ Bristol's current infrastructure and economy is built on the availability of cheap oil.
- ▲ There are no commercially available alternatives to oil which could replace current usage.
- ▲ The UK faces challenges in maintaining current supplies of gas and electricity.

### 1.2 What is peak oil?

'Peak oil' does **not** mean reaching a point at which the world has run out of oil. It describes the point at which the amount of oil produced globally in a single year reaches its absolute maximum. From this point onwards, oil will still be produced but at a lesser volume. After peaking, oil production will ultimately go into decline.

Of the world's 98 oil producing countries, 60 are already in decline. According to the International Energy Agency *World Energy Outlook 2008*, the average global rate of depletion in oil fields is now 6.7% per year. In other words, with no new additions, global production will fall 50% in 10 years.

Oil discovery peaked in the 1960s. In 2007 over a quarter of the world's oil production came from the twenty largest fields<sup>1</sup> and seventeen of these were discovered before 1970. Since 2005, oil production has remained virtually static at around 85-87 million barrels per day (mb/d). At current rates of discovery the world is finding approximately one barrel

of oil for every three it uses. Much of the new oil comes from deep sea fields and tar sands and is both expensive and energy intensive to exploit. Due to a combination of population increase and economic development, the IEA predicts that global oil demand will reach approximately 95 million mb/d by 2015 and 106 mb/d by 2030.

Whether global oil supply can continue to meet demand depends on a number of factors. These include – how much recoverable oil exists which is economically viable to exploit; the flow rate at which that oil can be produced; and the actual rate at which existing production declines. These factors are affected by the level of investment made into oil exploration and recovery, the type of new oil reserves available (conventional oil wells have a faster flow rate and therefore faster daily output than tar sands), whether current data about existing oil reserves is accurate (see Appendix 1) and whether the main oil producing countries find it in their interest to produce oil in line with demand. Global oil production will peak in the future. The questions which remain are about timing and how we respond. For a more detailed analysis of peak oil see Appendix 1.

### 1.3 Why does peak oil matter?

Our current way of life relies on the availability of an abundant supply of cheap oil and economic studies suggest that without a cheap and plentiful supply of energy, economic growth is not possible. Assuming that Bristol oil consumption is in line with UK averages, our city consumes approximately 11,500-12,000 barrels of oil/day<sup>2</sup>, or approximately 28.9 barrels of oil/day, per thousand people<sup>3</sup>. This compares to 68 in the United States, 5.4 in China and 2.4 in India.

Oil has unique properties that make it highly versatile; it is stable as a liquid at a high range of temperatures which makes it easy to

Sources:

1 Page 225-226 International Energy Agency World Energy Outlook 2008

2 Based on UK oil consumption 2007 EIA and UK population data from ONS

3 Based on UK oil consumption 2007 EIA and UK population data to calculate a per capita consumption

transport and store. It also has a high energy density which means that 23,200 hours of human work can be replaced with just one barrel of oil<sup>4</sup>.

In considering our dependence on oil, we commonly focus on petrol and diesel, but our reliance upon it runs much deeper and wider:

- ▲ Oil is a primary component of computers, car parts, telephones, packaging, synthetic rubbers, tarmac, perfumes, carpets, paints, detergents, inks<sup>5</sup> and innumerable other products.
- ▲ Global food production and deliveries are fuelled by oil that runs farm machinery and transport. The vast majority of food production across the developed world depends heavily on fertilizers and pesticides that are dependent on the availability of cheap oil and gas.
- ▲ Our health system is dependent on oil for transport, pharmaceuticals and equipment. 18% of the NHS energy footprint is travel related; 60% is connected to procurement. Medical equipment such as syringes, sterile gloves and packaging are highly oil reliant. Oil is also an input to many medicines.
- ▲ Oil is used as a coolant or lubricant in many industrial processes. The mining industry requires oil to move huge amounts of ore and rock using diesel powered vehicles.
- ▲ Approximately 95% of transport, of both people and supplies, is oil powered<sup>6</sup>.
- ▲ Economic growth is linked to the availability of cheap energy, currently provided by oil, gas and coal. Oil price spikes are always followed by a period of economic recession.

- ▲ We are oil dependent in dealing with natural disaster; assistance and supplies are often brought into flooded areas by truck and helicopter.
- ▲ Our dependence on affordable oil means that we also rely on it to maintain employment, social justice and the social fabric of our society. A sudden oil crisis would lead to economic crisis and possible food shortages and social crisis.
- ▲ Gas, coal and electricity prices are linked to oil prices.

### 1.4 Why should Bristol consider peak oil now?

In recent years Bristol has earned a reputation as an environmental leader and economic success story<sup>7</sup>. Bristol and the South West region are already addressing the need to reduce dependency on fossil fuels as part of their commitment to reduce greenhouse gas (GHG) emissions. The Bristol Council Climate Protection and Sustainability Energy Strategy<sup>8</sup> sets out strategies for improving energy efficiency by eliminating unnecessary usage, increasing efficiency, moving to renewable sources and increased use of cogeneration heating/cooling from fossil fuel power generation. The Bristol Cycling City project and Neighbourhood Transport Initiative are schemes aimed at reducing car dependence.

A year of record oil prices, alongside growing evidence that the global energy picture is changing, has led the Bristol Green Momentum Group to consider the issues of both peak oil and climate change together and identify possible courses of action to safeguard the city's prosperity.

#### Sources:

- 4 1 Barrel of Oil = 5,800,000 BTUs, Source: Louisiana Oil and Gas Association; 1 Gallon of Gas = 125,000 BTUs, Source: US Department of Energy
- 5 [www.zawya.com/story.cfm/sidZAWYA20081124050827/Oil%20price%20fall%20is%20no%20relief%20for%20packaging%20material%20industry%20%20](http://www.zawya.com/story.cfm/sidZAWYA20081124050827/Oil%20price%20fall%20is%20no%20relief%20for%20packaging%20material%20industry%20%20)
- 6 "Preparing Transport for Oil Depletion" slideshow <http://tinyurl.com/4d89pt>, based on Transport Revolutions: Moving People and Freight without Oil by Richard Gilbert and Anthony Perl, [www.transportrevolutions.info](http://www.transportrevolutions.info)
- 7 <http://www.gos.gov.uk/gosw/news/newsarchive/382477/>, <http://www.forumforthefuture.org/node/10000>
- 8 [www.bristol.gov.uk/climatechange](http://www.bristol.gov.uk/climatechange) Bristol Climate Protection and Sustainable Energy Action Plan 2004/6



Bristol is already pursuing a number of strategies to reduce our dependence on fossil fuels in relation to climate change, and while many of these apply equally well to lessening our oil dependence it is important to consider the possible timing of an oil crunch in forming priorities. The impact of peak oil on Bristol will be relative to our dependence on oil. If we are able to reduce our demand for oil in time, the impact will be less severe. If Bristol can do this, it will give the city and local region a pioneering role in developing a low carbon economy both within the UK and internationally.

### 1.5 Don't current low oil prices show that there is no problem?

The current recession and collapse in global oil and commodity prices may cause optimism that the 2008 spike in oil prices was a bubble, but the underlying picture of supply and demand tells a different story. The reality is that the credit crunch is causing cancellations and delays in new oil production projects whilst existing production is in decline.

In February 2009, the Executive Director of the International Energy Agency, Nabuo Tanaka, warned that currently "the demand is very low due to the very bad economic situation ... when the economy starts growing and recovery comes again in 2010 and onward, we may have another serious supply crunch if capital investment is not coming."<sup>9</sup>

### 1.6 Is peak oil imminent?

The Estimates on the timing of geological peak oil vary but there is a growing consensus that the era of cheap oil is over and that an oil crunch in the next decade is increasingly likely.

The following is a selection of current views on the timing of peak oil:

#### **Fatih Birol, Chief Economist of the International Energy Agency, December 2008:**

"In terms of non-Opec [countries outside the big oil producers' cartel]," ... "we are expecting that in three, four years' time the production of conventional oil will come to a plateau, and start to decline. In terms of the global picture, assuming that Opec will invest in a timely manner, global conventional oil can still continue, but we still expect that it will come around 2020 to a plateau as well, which is, of course, not good news from a global-oil-supply point of view."<sup>10</sup>

**August 2009:** "Many governments now are more and more aware that at least the day of cheap and easy oil is over... [however] I'm not very optimistic about governments being aware of the difficulties we may face in the oil supply,"<sup>11</sup>

#### **International Energy Agency, World Energy Outlook, November 2008:**

"Although global oil production in total is not expected to peak before 2030... the projected increase in global oil output hinges on adequate and timely investment. Some 64 mb/d of additional gross capacity – the equivalent of almost six times that of Saudi Arabia today – needs to be brought on stream between 2007 and 2030. Some 30 mb/d of new capacity is needed by 2015. There remains a real risk that under-investment will cause an oil-supply crunch in that timeframe."<sup>12</sup>

#### **Christophe de Margerie, CEO Total, February 2009:**

"The world will never be able to produce more than 89m barrels a day of oil." He cites high costs in areas such as Canada and political restrictions in countries such as Iran and Iraq amongst his reasons for this estimate. Christophe de Margerie, chief executive of Total, has revised his forecast for 2015 oil

#### Sources:

9 [www.telegraph.co.uk/finance/financetopics/oilprices/4640290/IEA-warns-of-oil-supply-crunch.html](http://www.telegraph.co.uk/finance/financetopics/oilprices/4640290/IEA-warns-of-oil-supply-crunch.html)

10 <http://www.guardian.co.uk/business/2008/dec/15/oil-peak-energy-iea>

11 <http://www.independent.co.uk/news/science/warning-oil-supplies-are-running-out-fast-1766585.html>

12 [www.iea.org/Textbase/npsum/WEO2008SUM.pdf](http://www.iea.org/Textbase/npsum/WEO2008SUM.pdf)

production downward by at least 4m barrels a day because of the current economic crisis and the collapse in oil prices."<sup>13</sup>

**Andris Piebalgs, EU Energy Commissioner, May 2009:**

"The current relatively low oil prices give a respite to prepare for the coming new oil crisis. We have to reduce our dependency in all those areas in which black gold is not indispensable... And in all sectors, we have to accelerate our efficiency being aware that every barrel of oil that we are using is one of the last."<sup>14</sup>

**Vince Cable, Lib Dem Shadow Chancellor of the Exchequer, June 2009:**

"Long-term thinking is difficult in the current political crisis, when most politicians are obsessed by tomorrow's headlines, ...but our future as a country depends much more on our ability to plan ahead for the next oil shock and the post-oil world."<sup>15</sup>

**Jeroen van de Veer, CEO of Royal Dutch Shell, 22nd January 2008:**

"Shell estimates that after 2015 supplies of easy-to-access oil and gas will no longer keep up with demand."<sup>16</sup>

**Jeremy Bentham, Vice-President Global Business Environment, Royal Dutch Shell, November 2008:**

"Our scenario outlooks indicate that the maximum production of easily accessible oil could come as early as the coming decade. And maintaining a production plateau for all oil and natural gas will become a serious challenge in the 2020s."<sup>17</sup>

**Chris Skrebowski, Peak Oil Consulting and Executive Editor of Petroleum Review, November 2008:**

"The immediate conclusion from the analysis is that the peaking of oil supplies is imminent and will occur in the window 2011-2013. In

planning terms 2011-2013 is effectively tomorrow. This means the crisis is already upon us and companies and individuals need to be planning their response now."<sup>18</sup>

**Sadad al-Huseini, former head of exploration and production at Saudi Aramco, October 2007:**

"The evidence is that in spite of the increases – very large increases – in oil prices over the last four years, we haven't been able to match that with increasing capacity. So, essentially, we are on a plateau."<sup>19</sup>

**Lord Oxburgh – former CEO of Shell, September 2007:**

"...you've got three main variables: rising world demand, and it's a bit hard to predict exactly how fast that is going to rise, how much oil is going to be available and how fast substitutes for oil come to market (synthetic fuels can be made in quite a number of ways). But all of that said I don't think this is going to happen in the next five years, and I would be surprised if the difficulties ahead had not really emerged within the next twenty."<sup>20</sup>

**Tony Hayward, CEO, BP, July 2008:**

"I think we have to be blunt about this: the era of cheap energy is probably over at least for the medium term... Demand is being driven by exceptional economic growth and an unprecedented level of development... In addition to that, the world's population is growing... In short, the world's demand for energy is relentlessly increasing... The world has more than 40 years of proven oil reserves, 60 years of natural gas and 130 years of coal... It will be more expensive to extract some of these resources. There's no doubt about that. But the problems in bringing on new production are not really below ground. They are above it."<sup>21</sup>

Sources:

13 [www.ft.com/cms/s/0/1df0bc9c-fbc7-11dd-bcad-000077b07658.html](http://www.ft.com/cms/s/0/1df0bc9c-fbc7-11dd-bcad-000077b07658.html)

14 <http://blogs.ec.europa.eu/piebalgs/are-we-moving-towards-a-new-oil-crisis/>

15 <http://www.dailymail.co.uk/debate/article-1191266/VINCE-CABLE-Oil--shock-waiting-pipeline.html>

16 <http://business.timesonline.co.uk/tol/business/economics/wef/article3248484.ece>

17 [http://www.arup.com/\\_assets/\\_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf](http://www.arup.com/_assets/_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf)

18 [http://www.arup.com/\\_assets/\\_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf](http://www.arup.com/_assets/_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf)

19 <http://globalpublicmedia.com/transcripts/2851>

20 <http://www.davidstrahan.com/blog/?p=40>

21 <http://www.arabianbusiness.com/524452-bp-ceo-tony-haywards-speech-at-the-world-petroleum-council-madrid>

### 1.6.1 The UK government position

In 2007 Downing Street responded to a petition asking the Prime Minister to acknowledge the situation facing the UK around peak oil and peak gas by stating that “The Government’s assessment is that the world’s oil resources are sufficient to prevent global total oil production peaking in the foreseeable future. This is consistent with the assessment made by the International Energy Agency (IEA) in its recent 2007 World Energy Outlook (WEO), which concludes that proven reserves are already larger than the cumulative production needed to meet rising demand until at least 2030.”

In its 2008 report, the IEA warns of a real risk of an oil supply crunch by 2015. The government has yet to change its position.

## 1.7 What are the current alternatives to oil?

### 1.7.1 Alternative fuels

If we are facing a crisis in our oil supply it would seem obvious that we should switch to different fuels and some changes have been made in recent years. Over the past decades the UK has moved away from oil generated electricity and oil for heating. It has been replaced largely by gas.

The difficulty in making rapid switches for other uses of oil is that there is no alternative liquid fuel available in sufficient quantity to replace current consumption. Some alternative fuels are beginning to emerge, but at present they are either not production ready, and/or, they require replacement or upgrade of infrastructure to implement them.

The many trillions of dollars invested in the global oil production and refinement infrastructure is the result of many decades of investment. It cannot easily be substituted in a short space of time, especially as the economy is already struggling to cope with high energy

prices. Some alternative fuels have the potential of far higher GHG emissions with a corresponding negative effect on climate change - **see Appendix 2.**

Gas and coal (or electricity generated from these) could be used to substitute some uses of oil. However, the peak in oil and gas in the North Sea means the UK is now dependent on imports for gas in an increasingly volatile market and 30% of the current total generation capacity for UK electricity is scheduled to be closed by 2020 with plans to replace it still in flux. Coal is also ultimately a limited resource. Although current stated global reserves are large a number of studies are now reassessing these assumptions. According to one 2007 report it could reach a production peak as early as 2025-30<sup>22</sup> – **see Appendix 3.**

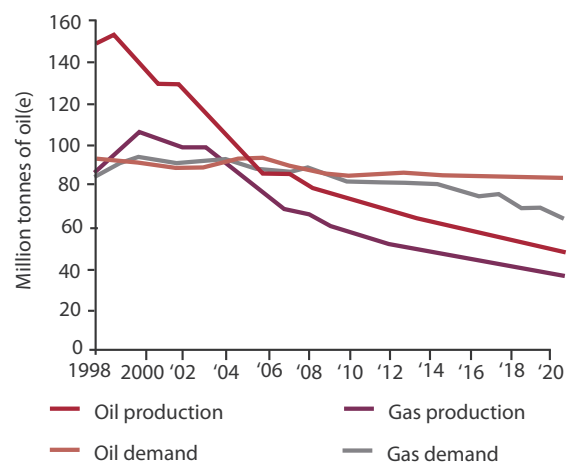


Figure 1: UK production of oil and gas 1998 - 2020, Source: Department of Energy and Climate Change<sup>23</sup>

### 1.7.2 Alternatives for other uses of oil

Bioplastics (also called organic plastics) are a form of plastic derived from renewable biomass sources, such as vegetable oil and corn starch, which can be used in place of petroleum based plastics. Ramping up to the scale of petroleum based plastic production would be a huge endeavour<sup>24</sup>.

Sources:

22 [http://www.energywatchgroup.org/fileadmin/global/pdf/EWG\\_Report\\_Coal\\_10-07-2007ms.pdf](http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Report_Coal_10-07-2007ms.pdf)

23 Department of Energy and Climate Change, The UK Low Carbon Transition Plan – National strategy for climate and energy, 2009

24 [http://business.timesonline.co.uk/tol/business/industry\\_sectors/industrials/article4192987.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/industrials/article4192987.ece)



### 1.7.3 Behavioural changes and demand reduction

New business and behavioural models will be central to reducing dependence on oil across a spectrum of uses. Changing the way in which we travel and how often we do so; changing how goods are packaged; reducing waste and targeted recycling will be instrumental in creating change.

## 1.8 Could peak oil have an impact on climate change?

We have already seen that the types of strategy proposed to reduce our dependence on fossil fuels in relation to climate change can apply equally well to lessening our vulnerability to an oil crunch. There are, however, some important differences. Ways to reduce our consumption of fossil fuels linked to climate change tend to focus on Greenhouse Gas (GHG) reductions rather than the ongoing availability or affordability of a fuel. The aim is to set strategies which allow a gradual change in behaviour towards a more sustainable situation. With peak oil there are likely to be sudden shocks created by price rises and lack of availability of oil, food, and other products and services. At these points change is not gradual and voluntary, but sudden and unavoidable.

Some strategies for combating peak oil may also work against climate change policy. For example, a switch to coal for energy would increase carbon emissions. Should carbon capture and storage be made commercially viable, it will still take 15 to 20 years to get it up and running<sup>25</sup>. Increasing exploitation of tar sands to keep up global oil production figures is also damaging to the environment as the process emits approximately three times more CO<sub>2</sub> than other 'conventional' oil sources.

Nuclear power is often cited as a lower carbon power option but new nuclear installations are only likely to replace old existing plants

and will not be in place for at least a decade which is further out than many peak oil scenarios.

Whilst gas is a lower GHG alternative than coal the supply risks that arise from increased dependence on imports described in Appendix 3 need to be considered.

Failing to address peak oil in the development of a Climate Change Adaption strategy could lead to an unsustainable reliance on oil to power emergency responses.

## 1.9 Conclusion

While there are still differences of opinion in relation to the timing of peak oil, there is a consensus that raising, or even maintaining, current oil production levels would require an unprecedented level of investment and the current economic climate makes this investment less likely. Any investment is highly dependent on the global economy and the political will and financial ability of the members of OPEC, Russia, Venezuela and other national producers. The rate of global oil production has not increased for three years despite a period of increasing prices and oil discovery is in decline. The general consensus is that the era of cheap oil is over. An oil crunch within the next decade is now highly probable.

Access to cheap energy and oil based products has defined our city and the way that we live in it. Changing this relationship will take time and require prioritisation. Bristol has already recognised the need to develop a low carbon economy which decreases dependence on fossil fuels. Recognising the threat of peak oil and developing strategies to adapt to the changes will allow Bristol to build resilience to future impacts and to lead the way to a genuinely sustainable future.

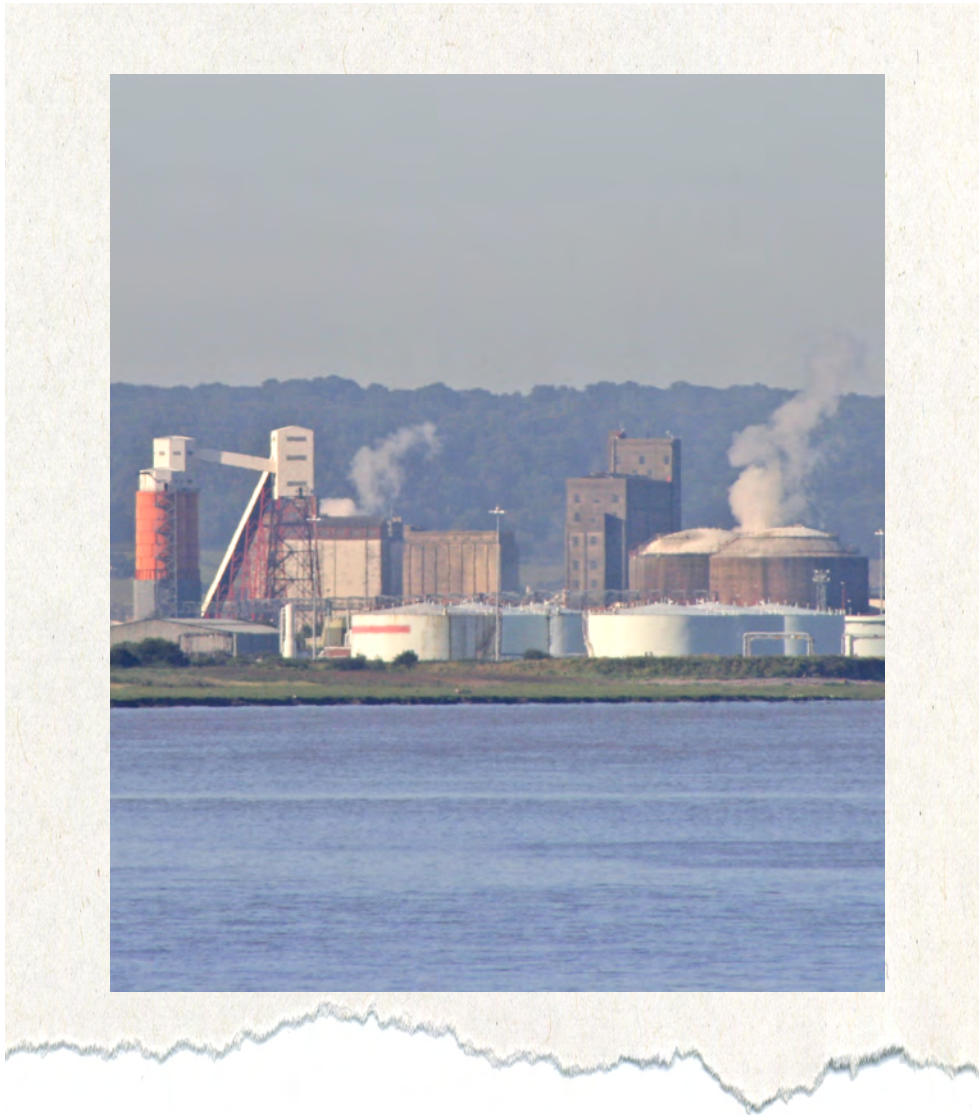
Source:

25 <http://www.guardian.co.uk/business/2009/feb/26/centrica-british-gas-green-jobs>



# Part Two:

## 1.0 Peak Oil in Bristol





## 1.0 Introduction

*“If everyone does a little, we’ll achieve only a little. We must do a lot. What’s required are big changes in demand and supply”*

**David JC MacKay,**  
Sustainable Energy – without the hot air

Modern Bristol is a city built on certain basic assumptions: a growing national and global economy, a state of peace, a mild climate and access to cheap and abundant energy. If we accept both that climate change exists, and that there is an impending risk to our fuel and energy supplies, then these assumptions must change accordingly.

Addressing changes to such fundamental assumptions requires a major shift in thinking. A useful point to start is to look at the current situation and determine where changes should best be focused. This section of the report looks at the oil dependence of key sectors of Bristol’s society and economy in order to understand the potential impact of a sustained oil crunch. Input from organisations and authorities from each sector is included. In a questionnaire sent to a range of public and commercial organisations in Bristol, 80% of respondents identified a need for significant change in energy use within 5 years.

### 1.1 Summary of Bristol’s vulnerability to peak oil, key sectors

Transport	
<b>Direct impact</b> Immediate, severe	Rising fuel prices would directly impact on costs and choices for private and business travel as well as public services. Fuel supply shortages would affect the entire oil dependent transport infrastructure.
<b>Secondary impact</b> Developing, severe	Changes in travel choices would affect both the motor and airline industries. Public transport providers would be hit by high fuel costs and changing demand. Growing economic constraints would make fare prices a big issue for the public.
Food	
<b>Direct impact</b> Immediate, severe	High oil costs would lead to rising pesticide costs. Heavily industrialised farming methods and globalised delivery infrastructures will be affected. In the event of supply shortages food distribution systems would be strained.
<b>Secondary impact</b> Immediate, severe	Rising price of food due to increases in production, packaging and transport costs would affect the public with a knock on effect on the economy and public services as more people fall into food poverty.
Health	
<b>Direct impact</b> Developing, Moderate	Costs of oil based drugs and equipment would increase. As stockpiles run out and fixed price contracts expire this would have a knock on effect on health-care budgets.
<b>Secondary impact</b> Immediate, severe	Many aspects of healthcare rely heavily on transport of patients, staff and visitors, provision of home care and daily delivery of supplies. Frequent supply shortages would put this system under strain and cause significant distress. Rising prices would affect the cost of service delivery. Some contracted suppliers may be unable to afford to deliver services.

<b>Economy</b>	
<b>Direct impact</b> Developing, Moderate	Rising costs of fuel, plastics and metals would affect many businesses. Supply stoppages would affect businesses that rely on daily supplies and dispatches, or transport links.
<b>Secondary impact</b> Developing, severe	Transport costs would affect most business and their employees. The rising cost of gas, electricity and other commodities linked to oil would have an impact on business as the cost of running servers and other electrical services rose. The rising need for imported oil and gas due to depleting domestic supplies could result in a weaker currency and increase the effect of price rises on imports.
<b>Public services</b>	
<b>Direct impact</b> Developing, Mild	Institutions still using oil for heat would suffer from rising fuel costs. BCC runs many essential services which rely on motorised transport which would be put under strain.
<b>Secondary impact</b> Developing, Moderate/Severe	Frequent supply stoppages would result in backlog and delays to services (for example waste removal). Rising fuel costs would affect staff travel. As existing contracts expired rising costs would hit public service budgets. Rapidly rising fuel costs could result in service providers on unfavourable contracts being forced out of business. Rising price of raw materials would add to the costs of construction and repairs for social housing. Economic contraction would lead to funding cuts.
<b>Utilities</b>	
<b>Direct impact</b> Mild	In the UK approximately 1% of electricity generation is oil powered (for peak capacity management) so initial direct impact would be mild.
<b>Secondary impact</b> Developing, Severe	The link between the oil prices and other commodities would cause power prices to rise. Power and water companies would be hit with increasing repair and maintenance costs based on rising transport costs. Increased demand for gas and electricity demand could lead to power cuts.

Table 1: Summary of impact to peak oil of Bristol key sectors





# Part Two:

## 2.0 Cross-sector implications



## 2.0 Cross-sector implications

### 2.1 Summary

#### Cross-sector implications – Key Points

- ▲ Severe disruption in energy supply and rising costs would put additional strain on vulnerable sectors of the community and could threaten social cohesion.
- ▲ Frequent oil supply shortages would be challenging to public services and business.
- ▲ Evidence suggests that economic growth is linked to fuel/energy supply.
- ▲ The UK is facing electricity generation and gas supply challenges in the next decade.
- ▲ Existing emergency planning is in place to mitigate the effects of short term oil supply shocks.

This section covers important issues which impact on the sectors discussed in subsequent chapters.

### 2.2 Threat to social cohesion & social justice

#### Flashback!

"In May 1974, Ulster had its fuel supply cut off. Richard St George, from the Schumacher Society, recalled how this event produced a near-collapse of basic food supplies. "The Ulster Workers Council objected to the Sunningdale Agreement for power sharing between the Catholics and Protestants...on the first day it managed to close the Belfast oil refinery. The oil-fired power station had some reserves but shut down on the fourth day. The authorities immediately ordered all frozen food to be destroyed as it was now a health hazard. The distribution of emergency water supplies was hampered by lack of fuel... Towards the end of that week there were reports of raiding parties slaughtering livestock, dragging them into town and cooking them on fires of broken furniture."<sup>1</sup>

#### 2.2.1 Social Cohesion

In our oil-dependent society any change to the price of oil, or access to it, quickly impacts on our lives. We are used to getting everything we need on demand. Expensive oil however increases fuel, food and transport costs while interruptions in supply can leave people stranded and cause panic. Examples of dysfunction due to oil shocks have already been experienced in Bristol, the UK and Europe including panic buying, increases in fuel related crime and rioting.

#### Examples of the effects of an oil shock

##### Fuel crime

#### Bristol Evening Post, 4 October 2008

"DRIVERS are being left stranded by thieves who drill holes in their fuel tanks to drain out petrol. A spate of attacks on parked cars in south Bristol has seen drivers left with bills of up to £500 per car to replace ruined tanks."<sup>2</sup>

#### Bristol Evening Post, 22 July 2008

"Fuel thefts in the South West have tripled since the beginning of the year, as the soaring price of oil makes petrol and diesel more valuable to thieves. New figures from breakdown service RAC show the region has been hit by a fuel theft rise of 218 per cent – the second worst area behind Greater London, where incidents have risen 500 per cent."<sup>3</sup>

#### BBC Five Live, 29 July 2008

"We've been investigating the growing problem of motorists who fill up their tanks and drive off without paying. 5 Live's reporter Rowan Bridge has been to Bristol to speak to those affected."<sup>4</sup>

Sources:

1 p.233 The Big Earth Book, James Burges, published by Alastair Sawday Publishing

2 <http://www.thisisbristol.co.uk/news/Guard-fuel/article-374633-detail/article.html>

3 <http://www.thisisbristol.co.uk/news/Rising-pump-prices-fuel-crime-surge/article-229806-detail/article.html>

4 <http://www.thisisbristol.co.uk/news/Strike-action-hits-Bristol-schools-services/article-222125-detail/article.html>



## Panic buying

### Bristol Evening Post, July 16th 2008

"Motorists are queuing for petrol at garages across the Bristol area as filling stations started to run dry in the tanker drivers' dispute. As many as 20 cars at any one time were reported to be queuing at the Tesco station at Eastville. And at Sainsbury's, at Arnos Vale, the demand for petrol was so heavy that the filling station expected to run out altogether last night."<sup>5</sup>

### The Guardian, 14 September 2000

"Customers appeared to be clearing the shelves of smaller stores as well as supermarkets. Grocery chain Spar, which has 2,700 shops in the UK, said food sales had increased by 300% in recent days."<sup>6</sup>

## Global effects

### The Independent, 31 May 2008

"British pensioners who cannot afford to heat their homes. European hauliers and fishermen whose livelihoods are under threat. Palestinians forced to fill up their cars with olive oil. Americans asked to go down to a four-day week. All around the world, in a multitude of ways, the soaring price of oil is hurting rich and poor alike."<sup>7</sup>

### 2.2.2 Social Justice

An oil crisis in a society which is oil reliant would very rapidly increase disparities in social equity. Record oil prices in 2008 had a direct impact on petrol prices, public

transport fares, food and other essential items like soap. Food and fuel poverty are already a significant problem in the UK<sup>8</sup> and with Bristol having around 16% of the population living in the lowest 10% of multiple deprivation areas, there could be serious impacts in the city. Economic strain caused by rising fuel prices is also likely to increase unemployment and push more people into financial crisis.

Planning for peak oil in advance offers the opportunity to alleviate existing poverty and inequity, as well as building our resilience to an oil crunch through increased accessibility to employment and services.<sup>9</sup>

## 2.3 Oil and the economy

### 2.3.1 Sensitivity to oil price and supply

Severe strains were exerted on the global and national economy<sup>10</sup> when oil prices rose more than 100% in a year between July 2007 and July 2008. The degree to which high oil prices fuelled the global credit crunch as opposed to the lack of financial regulation is difficult to determine; however there is evidence that oil shocks are followed by global recession.<sup>11</sup>

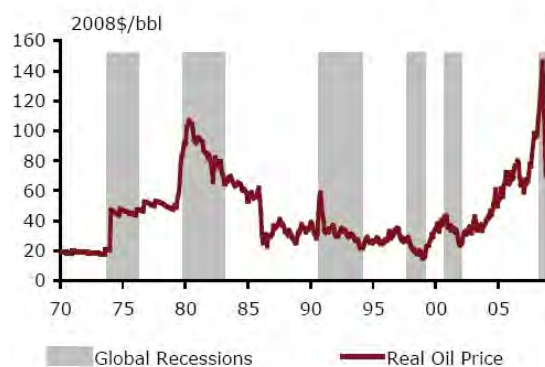


Figure 3: Past recessions and oil spikes, Source: Jeff Rubin, CIBC World Markets Inc.<sup>12</sup>

#### Sources:

- 5 <http://www.thisisbristol.co.uk/news/article-213623-details/article.html>
- 6 <http://www.guardian.co.uk/uk/2000/sep/14/oil.business7>
- 7 <http://www.independent.co.uk/environment/green-living/shocked-how-the-oil-crisis-has-hit-the-world-837477.html>
- 8 <http://www.eatingbritain.com/national-charity-fareshare-calls-on-food-industry-to-help-tackle-food-poverty-in-the-uk-today.html>
- 9 [http://www.sustrans.org.uk/webfiles/Info%20sheets/FF46\\_info%20sheet.pdf](http://www.sustrans.org.uk/webfiles/Info%20sheets/FF46_info%20sheet.pdf)
- 10 <http://news.bbc.co.uk/1/hi/business/7421778.stm>  
<http://www.telegraph.co.uk/finance/economics/2789507/Growth-forecast-for-UK-economy-will-be-hit-by-rising-oil-price.html>  
[http://business.timesonline.co.uk/tol/business/industry\\_sectors/natural\\_resources/article4087314.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/natural_resources/article4087314.ece)
- 11 [http://research.cibcwm.com/economic\\_public/download/soct08.pdf](http://research.cibcwm.com/economic_public/download/soct08.pdf)
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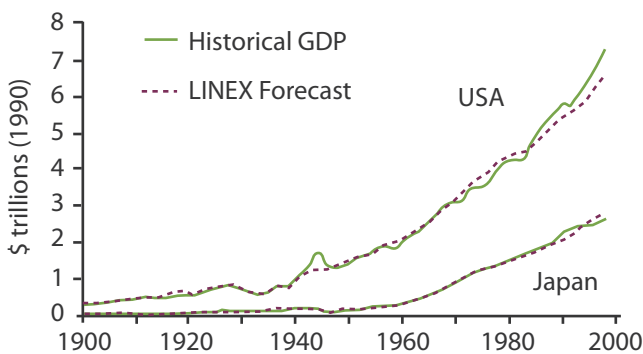


In the event of an oil shock, businesses and service providers face a double impact. First they are hit by an increase in the price of resources and transport, then by a reduction in available capital and revenue as the economy slows. Many industries are currently in crisis as a result of recent economic events.

Fuel shortages, even at a time of economic prosperity, cause huge damage to the economy. It is estimated that the 2000 fuel dispute in the UK cost the economy in the realm of £1bn<sup>13</sup> (at 2000 value of sterling). This was an isolated crisis lasting a week. Longer or more frequent stoppages would be more costly.

### 2.3.2 Energy inputs and economic growth

The relationship between economic growth and energy consumption is the subject of studies by physicist Reiner Kuemmel and economist and physicist Robert Ayres<sup>14</sup>. Kuemmel calculated the relative importance of capital, labour and energy inputs on economic growth. Ayres refines the work to show the actual work produced from energy input (taking efficiency factors into account). Ayres 'predictions' show a near perfect fit with actual historic growth in the US and Japan. In both studies, energy far outweighs other factors in importance for economic growth<sup>15</sup>.



**Figure 4:** Actual historic GDP growth in the USA and Japan vs Professor Robert Ayres 'forecasts' based on energy productively used, **Source:** *The Last Oil Shock – A Survival Guide to the Imminent Extinction of Petroleum Man*, David Strahan

According to Ayres, "the economy is utterly dependent on petroleum, and I think it is highly likely that when oil production peaks, so will the world economy."

These studies suggest that even with gains in efficiency, the energy input requirements for growth are such that when oil supply peaks without new sources of energy the current system cannot be maintained. It is essential to find a way to uncouple economic success from energy consumption.

### Economic growth and finance

The existing financial system is built on the assumption of economic growth. Investment, government borrowing, mortgages and personal pensions are only possible because economic growth and rising incomes allow for future repayments. If the economy can no longer grow due to energy constraints caused by peak oil, then incomes will not increase and there will be a rise in defaults, similar to the current credit crunch. If this happens in a situation in which a return to growth is unforeseeable then the financial system as we know it will stop working.

## 2.4 Increased demand for electricity and gas as alternatives to oil

### 2.4.1 Gas

Bristol has made great strides in reducing its reliance on oil for heating by replacing oil boilers with more efficient gas boilers. Oil now accounts for only 7% of energy for buildings, down from 17% in 2000/1.

It is important to note, however, that the UK and Europe face increasing insecurity over gas supply in the coming decade as discussed in greater depth in Appendix 3. The UK's growing reliance on gas imports due to the decline of North Sea gas will affect all gas uses including electricity generation as gas prices and supply become more volatile<sup>16</sup>.

Sources:

<sup>13</sup> <http://www.iwar.org.uk/cip/resources/PSEPC/fuel-price-protests.htm>

<sup>14</sup> [http://en.wikipedia.org/wiki/Robert\\_Ayres](http://en.wikipedia.org/wiki/Robert_Ayres)

<sup>15</sup> David Strahan 'The Last Oil Shock-A Survival Guide to the Imminent Extinction of Petroleum Man' – p119-123

<sup>16</sup> <http://www.whatprice.co.uk/utilities/gas-prices.html>

### 2.4.2 Electricity

Electricity offers opportunities to diversify fuel sources away from oil, for example for transport through electrification and virtual alternatives to travel like video conferencing and 'home shoring' (working from home).

The UK, however, also faces serious challenges in maintaining current levels of electricity supply while meeting goals for GHG emissions reductions, with much of the current supply coming from coal & gas, (see Appendix 3).

It follows that in order to create resilience and be sustainable, we should seek ways to reduce and improve efficiency in our use of electricity. For example, it would be more energy efficient to electrify public transport which can transport many people rather than private cars. Decisions to promote 'homeshoring' should be weighed against the energy required for increasing numbers of servers and also the relative energy efficiency of many people working in their homes rather than together in an office.

Producing more renewable energy locally could provide a degree of resilience to these issues. Powering key public transport routes and other essential services locally would protect the region from any national power cuts.

## 2.5 Fuel emergency planning

### 2.5.1 Existing emergency planning

#### Bristol emergency planning procedure

In the event of a fuel supply disruption in the Bristol area the emergency response would be dealt with under existing national and local emergency planning procedures governed by the Civil Contingencies Act of 2004. Bristol's planning is part of the Avon and Somerset Local Resilience Forum (LRF).

According to the Avon and Somerset LRF Community Risk Register, the risk of an oil supply stoppage due to an industrial dispute resulting in loss of essential supplies lasting for up to a week is considered high. There are

a number of named Category One responders designated to keep essential services going during a fuel emergency, including Local Authorities, Health Trusts, Primary Care Trusts, Fire, Ambulance and the Police. Communication would be coordinated by the Police. Increased fuel bunkering for emergencies is being considered as part of the plan.

#### The National Emergency Plan for Fuel

A National Emergency Plan for Fuel<sup>18</sup> managed by the Department of Energy and Climate Change is in place to deal with a national fuel emergency. The UK holds fuel stocks based on EU and IEA obligations<sup>19</sup> which would be made available and allocated during an emergency. The national plan sets out the strategic principles from which the LRF determines measures such as demand calming, priority use schemes and stock draw. Major food retailers would be allocated fuel in order to distribute food. LRFs are also responsible for response planning for fuel shortages that do not trigger national emergency.

#### Other emergency planning

In addition to emergency fuel planning, the LRF plans for emergencies ranging from industrial disputes to major flooding. Much of the response for specific emergencies relies on the deployment vehicles such as fire trucks, ambulances and helicopters which are fuelled by petrol and diesel.

#### Summary

Emergency responses are just that. They concentrate on maintaining essential services and protecting the vulnerable. The length of time that fuel emergency plans could fully maintain essential services is unknown. If a fuel supply stoppage were prolonged it would likely have knock-on effects that would push more people into the vulnerable categories and therefore stretch essential services beyond their capacity. A prolonged fuel emergency could lead to shortages and result in instances of civil disobedience.

Sources:

18 [https://www.og.berr.gov.uk/downstream/emergencies/down\\_emerge.htm](https://www.og.berr.gov.uk/downstream/emergencies/down_emerge.htm)

19 <http://www.berr.gov.uk/files/file37711.pdf>

Frequent fuel supply disruptions would put a strain on all city functions, services and budgets. Given the strains on UK gas and electricity supply, oil supply shortages could overlap with other power outages.

Current emergency plans make no provision for a situation in which there is a rapid rise in fuel price resulting in a worsening economic crisis in which fuel and food become unaffordable to people on low incomes.

### 2.5.3 A selection of existing actions that support Bristol's emergency fuel crisis contingency planning

- ▲ Bristol City Council Civil Contingencies Unit is working with other Category 1 responders including other Local Authorities and NHS Trusts to identify possible travel synergies during a fuel emergency. Efforts are being made to find instances where journeys could be combined or roles changed in order to reduce the total number of journeys necessary.
- ▲ Bristol City Council's Civil Contingencies Unit already engages the business community on Business Continuity Planning (BCP) and on building resilience for handling emergencies. Government guidelines on both are available at [pfe.gov.uk](http://pfe.gov.uk). There are plans to extend this work to communities in order to build knowledge and resilience to oil shocks and other energy security issues and lessen climate change.

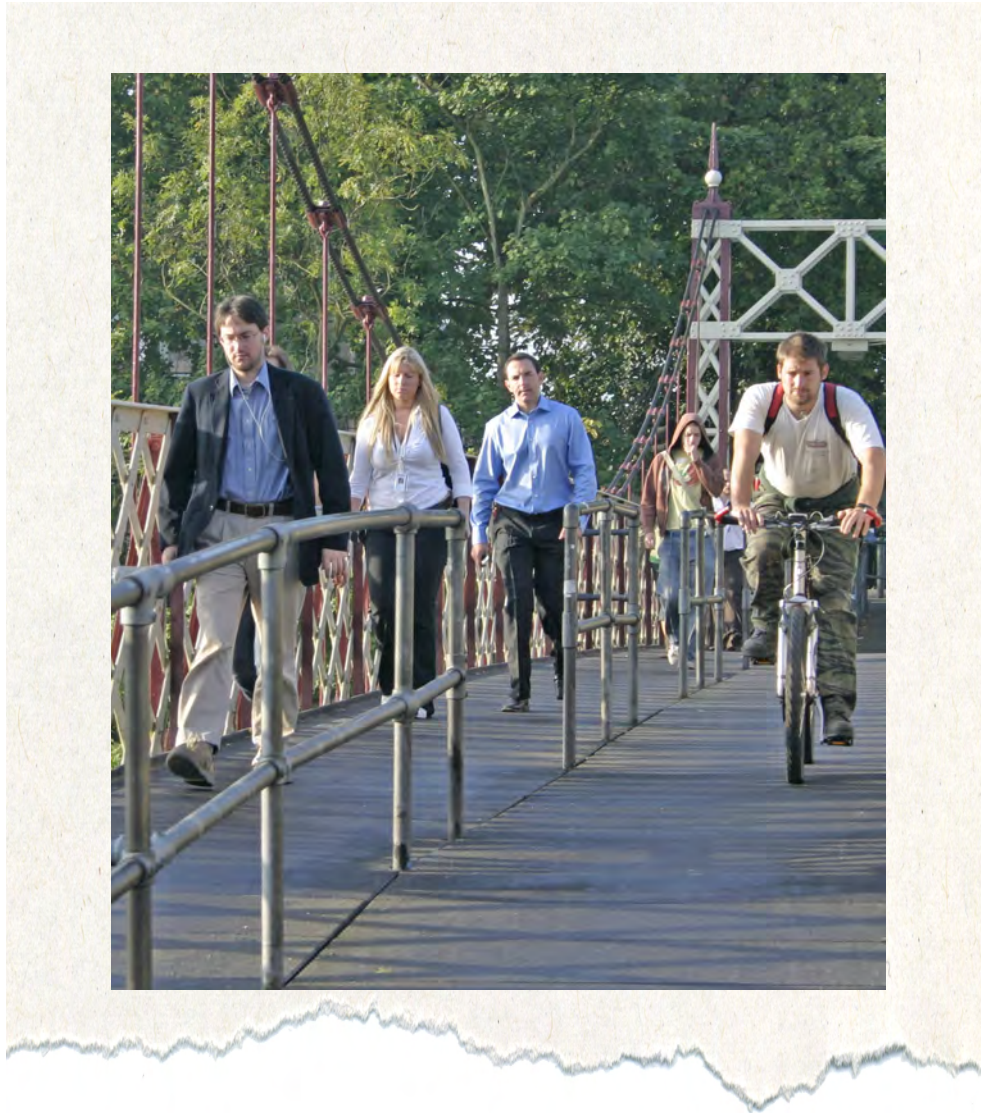
### 2.5.4 A selection of further opportunities to improve resilience to peak oil

- ▲ If Bristol adopts a strategy of building resilience through planned reduction in fossil fuel dependence, the city will minimise the need to implement emergency procedures for minor fuel supply disruptions. This would put Bristol at an advantage over cities with no such resilience.
- ▲ Start to transition away from petroleum dependent emergency planning.
- ▲ Assess the need for emergency plans to address economic crisis due to rising oil prices. These could have long-term and short-term goals for reducing impacts on the vulnerable and deprived.
- ▲ Devise and implement a fuel emergency policy for instances of simultaneous oil and gas/electricity outages based on research of key vulnerabilities for different lengths of outage.



# Part Two:

## 3.0 Transport and mobility



## 3.0 Transport & mobility

### 3.1 Summary

#### Transport & mobility – Key Points

- ▲ The first step to reducing vulnerability to transport disruption is improved accessibility and a reduction in number and length of journeys.
- ▲ Bristol’s passenger and freight transport systems are almost entirely oil dependent.
- ▲ Current transport policy does not account for peak oil. Some measures focused on reducing congestion and CO<sub>2</sub> emissions have overlapping benefits, but policy does not take account of fuel supply vulnerability and cost escalation.
- ▲ Plans for major infrastructure projects including public transport, port, airport and road expansion do not factor in risk assessment for fuel supply vulnerability or cost escalation.

### 3.2 Background

Much mobility today is a substitute for accessibility; we do not need the journey itself so much as access to whatever we reach at the end of it. Affordable and abundant fuel has led to it making economic sense to have people travel to jobs, schools, shops and healthcare rather than to have these within walking distance of homes.

**Table 2:**  
Bristol Health Services Plan predicted comparison journey times to specific healthcare facilities based on plan without transport improvements<sup>1</sup>

	% of households living within 15 minutes		% of households living within 30 minutes	
	At present	After BHSP implementation	At present	After BHSP implementation
By bus and rail	23%	25%	70%	79%
By car	78%	81%	99%	99%
By bicycle*	53%	57%	75%	79%
On foot*	12%	12%	31%	36%

Note\* walking and cycling are significant modes of transport for staff, although infirmity makes it difficult for many patients to use these modes.

Source: Joint Local Transport Plan (JLTP) 2007-11

The same applies to business and retail. Cheap and reliable transport makes it economically viable to use complex supply chains to transport goods and supplies long distance rather than produce or purchase locally.

### 3.3 Bristol’s accessibility & mobility - specific vulnerabilities

#### 3.3.1 Accessibility- access to facilities in Bristol without the need for transport

In the event of an oil shock, people need access to essential supplies and services. Those cities that have reduced the need to travel by offering ease of access to services and employment would be at an advantage.

Accessibility is achieved either by creating and relying on transport systems to move people to services, or by providing services as close to people’s homes as possible. The former allows for centralised and specialised service centres and is most common today; it is also very vulnerable to peak oil. The ‘close to home’ option provides a decentralised system which creates a variety of employment in each area. The latter model is considered less economically efficient whilst fuel for transport is abundant and relatively cheap, but that is changing.

#### Access to public services

Health and public services are covered in more detail in sections 5 and 6. Access to public services in Bristol varies around the city. Comparative journey times to Bristol hospitals show heavy reliance on cars for access (see Table 2).

Currently the accessibility of a service or facility is only one of the reasons why people choose to use it. For example, many people choose to attend a school or dentist that is not the closest one to home – this may be because of suitability or perception of superior service. A change in access to transport could mean people having to patronise their nearest service. If this happens quickly without advance planning it may lead to services collapsing. Services would also be at risk if the employees or service providers need to travel from outside the community to work.

**Access to shops**

Many retail centres, especially those out of town, rely on customers who travel by car. Evidence from 2008 shows that shopping patterns changes when fuel prices are high. "Britain's biggest out-of-town shopping centres suffered a fall in customer numbers of almost 7% last month showing that spiralling petrol prices have hit consumer spending...SPSL, the footfall monitor, said visits to retail parks such as Meadowhall in Sheffield and Gateshead's Metro Centre were down by 6.8% in May against the same month last year."<sup>2</sup>

Many areas of Bristol have accessibility built into their shopping facilities due to the relatively high number of 'town centre' shopping areas such as Cabot Circus and Broadmead in the city. A 2007 study by DTZ showed 48 town shopping centres around Bristol. However, the dispersion of the facilities is not equal, with South Bristol in particular more reliant on 'out of town' retail parks. Food retail is covered in section 4.

**Access to employment**

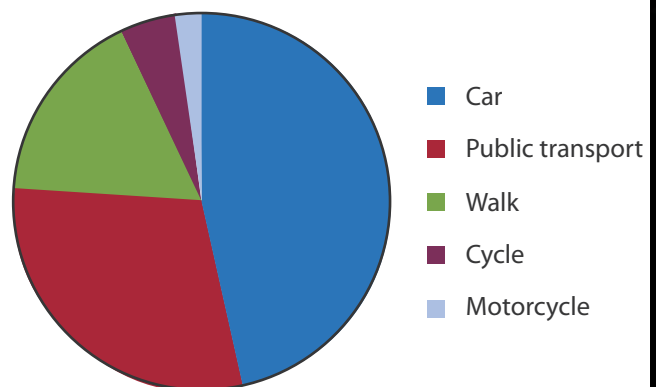
Bristol is highly vulnerable to an oil shock in its reliance on commuters into and around the city. The expansion of the Northern Fringe has resulted in a situation in which "there are over 70,000 jobs, about double the resident workforce. About 26% of these jobs are held

by local workers. Nearly 40% of persons employed in the North Fringe travel more than 10km to their workplace. In Weston-super-Mare, in contrast, local employment growth has fallen far behind the resident workforce with the excess of local workforce over local jobs rising by nearly 5,000 between 1991 and 2001. Some 65% of working residents hold local jobs while about half of the remainder travelling to jobs in the Bristol area."<sup>3</sup> (2007 West of England Economic Review)

**3.3.2 Mobility – the vulnerability of Bristol's transport system to peak oil**

Bristol's transport system is exceptionally vulnerable to peak oil due to its almost exclusive reliance on petroleum fuels. In 2006, transport accounted for 85% of Bristol's direct consumption of petroleum products<sup>4</sup>. Our transport system is heavily road based but oil dependence extends to both rail and water transport. Walking and cycling, the two existing alternatives to oil fuelled transport in Bristol, both face safety and accessibility challenges, though some barriers are more perception than reality.

Major Bristol transport planning schemes do not currently consider the potential impact of different fuel prices. A 6% pa cost escalator to cover inflation is built into business cases when developing major schemes.



**Figure 5:** Commuter trips to Bristol's Cabot Ward by mode, Source: 2001 census

Sources:

- 2 [http://business.timesonline.co.uk/tol/business/industry\\_sectors/retailing/article4133026.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/retailing/article4133026.ece)
- 3 <http://www.westofengland.org/media/65072/annual%20economic%20review%202007%20-%20ammended.pdf>
- 4 <http://www.berr.gov.uk/energy/statistics/regional/total-final/page36187.html>



**Private car**

Bristol is highly reliant on car travel which is especially vulnerable to peak oil. The region suffers from some of the worst congestion in the country. 2001 census data on commuter trips into Bristol City Centre (Cabot Ward) show that car travel is the most heavily used mode, (see Figure 5). Household Travel Survey data from 2007 for the West of England found that 92% of shopping trips in the West of England are made by car. The regional *Joint Local Transport Plan (JLTP) 2007-11* states that traffic in the region has grown 21% over the last 10 years, which is above the national average. Car travel in Bristol is supported by a large amount of city centre parking including 16,500 public spaces and 20,000 private non-residential spaces. Years of prioritisation of private cars also means that alternative systems remain undeveloped.

In the event of fuel supply shortages demand management measures would restrict access to fuel for private usage so a fuel supply shortage prevents accessibility to jobs and services where no alternative transport solution is available. High fuel costs could make it uneconomic to hold down a job that is only accessible by car.

Peak oil fundamentally alters the viability of the private car as the leading mode of transport. There are potential substitutes for petrol and diesel but none are commercially available at the volumes approaching current private use levels (see Appendix 2). More efficient petrol and diesel cars are being developed, but it will take years for these to replace the existing fleet. For people on low incomes the wait is likely to be longer; new cars are expensive. Electric cars face the additional challenge of needing new infrastructure to charge them. There is a real risk that pursuit of any of these technologies as a silver bullet solution would distract energy and funds from urgently needed investment in sustainable forms of transport

leaving a large majority of people with no affordable options.

**Bristol public transport**

Public transport is far more energy efficient than travel by private car but the actual efficiency is directly related to the number of people that use it. It is important therefore that a public transport system is designed to be both convenient and affordable at a scale which meets the travel needs of the community it serves.

Example energy efficiencies of different modes of transport:

Vehicle	Efficiency
Car	80 kWh per 100 passenger km, based on UK car average of 33mpg
Transport systems	Efficiency
Bus	32 kWh per 100 passenger km, based on all London buses year 2006/7
Tram	9 kWh per 100 passenger km, based on Croydon Tramlink System & facilities year 2006/7

**Table 3:**  
Source: Data from *Sustainable Energy Without Hot Air* – David McKay<sup>5</sup>

Bristol’s primary mode of public transport is its bus service. More efficient than cars, diesel powered buses and coaches provide much greater flexibility than fixed route transport such as rail or tram but are still highly vulnerable to peak oil. Efficiency is also lower than some other modes of public transport such as light rail, trolleybus and rail. Some compromise modes exist, such as the rapid transport link currently under review (depending on the fuel choice) and trolley buses like those planned for Leeds.<sup>6</sup>

Sources:

- 5 <http://www.withouthotair.com/download.html>
- 6 <http://www.insideyorks.co.uk/tbus/>,  
<http://www.timesonline.co.uk/tol/news/uk/article1940408.ece>,  
<http://www.cambridgeshire.gov.uk/transport/guided/>

Trains are more energy efficient than buses and Bristol is well connected to the rest of the country by rail. However, Bristol's rail service is still fuelled by diesel and is therefore vulnerable to peak oil impacts. In January 2009 the government announced that the line to London is being considered for electrification which, if approved, would increase resilience.<sup>7</sup> Bristol's local city rail service is very limited with many local trains terminating at Bristol Temple Meads and requiring a change and wait for onward destinations in the city. Rail capacity into the city for commuters is under strain during peak times with reports of serious overcrowding.<sup>8</sup> These factors in combination with high fares act as a disincentive to use the service and increases reliance on cars. UK train fares are the most expensive in Europe<sup>9</sup> so in spite of the higher fuel efficiency of rail, car travel is often a cheaper alternative - especially if more than one passenger is travelling.

Bristol's public transport services have already been impacted by high oil prices and are vulnerable to the type of economic downturn caused by peak oil. First Group, the main operator, reported impacts to their business in 2008 due to high fuel prices and many fares have been increased as a result. Fares were often already high compared to driving and have proved contentious. Privately run transport services are vulnerable to high oil prices which may lead to service cuts for business reasons which might not serve the broader needs of the city.<sup>10</sup>

### Cycling

Cycling is highly resilient to peak oil since it relies on person power rather than oil derived fuel (assuming that production of food-human fuel - can be decoupled from oil dependence). Ensuring that cycling is a viable

transport option in the face of peak oil relies on building up levels of cycling and bike ownership in advance. Currently 5% of all journeys in Bristol are undertaken by bike.<sup>11</sup> There are plans to double the number of regular cyclists by 2011 through the Bristol Cycle City project.

Examples of cities which have successfully increased the modal share of cycling are Copenhagen, Denmark, and Portland in Oregon. Both of these cities have long-term programs of city planning over decades which prioritise cycling and the provision of facilities for cyclists.

**"[In Copenhagen, Denmark]** The share of the total number of all purpose trips is slightly less than one fifth, but the share of home-workplace traffic is as high as one third. The proportion of cyclists over 40 has increased from 25% to 38% in the period from 1998 -2000."<sup>12</sup>

**In Portland,** cycle traffic has nearly trebled since 2001. Between 2007 and 2008 cycle traffic increased by 28%. Cycling has shown a double digit increase each year for the last 4 years.

"Since the first *Bicycle Master Plan*<sup>13</sup> was adopted, Portland has more than doubled our bikeway network, to 270+ miles. We've added thousands of bicycle parking spaces. There are almost daily bike rides, events, and activities. We have a successful Safer Routes to School program, and a burgeoning bicycle industry. And we can be proud of how many more people are bicycling these days, with more than 16,000 daily riders crossing our downtown bridges in 2008. That's more than six times as many as in 1991!"<sup>14</sup>

#### Sources:

- 7 <http://www.transportbriefing.co.uk/story.php?id=5464&PHPSESSID=95476870f2bc5d9317a2f95cb400625d>
- 8 <http://www.thisisbristol.co.uk/news/Great-Western-struggling-meet-demandarticle-396728-details/article.html>
- 9 <http://www.passengerfocus.org.uk/news-and-publications/document-search/document.asp?dsid=2526>
- 10 <http://business.timesonline.co.uk/tol/business/markets/article5729064.ece>
- 11 [http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset\\_id=29348212](http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset_id=29348212)
- 12 <http://www.gmfus.org/doc/Copenhagen%20Cycle%20Policy%202002-2012.pdf>
- 13 <http://www.portlandonline.com/shared/cfm/image.cfm?id=40414>
- 14 <http://www.portlandonline.com/Transportation/index.cfm?a=71843&c=34812>

The feasibility of walking and cycling as travel options is limited by the distances to be travelled. Travel behaviour studies find, however, that many trips made by car are between 1km (0.6 miles) and 5km (3.1 miles), distances which can be covered by bike or on foot by many people. In Bristol, a 2001 census showed that more than 50% of journeys to work of less than 5km are made by car. Carrying capacity for luggage or young children, as well as health or disability are limiting factors though bikes and trailers intended for carrying passengers and luggage are available and are frequently seen in Scandinavian cities like Copenhagen. In a 'bike friendly' city there may also be opportunities for successful bike taxi schemes.

### Air travel

Air travel is particularly vulnerable to peak oil as there is no way to fuel planes other than with liquid aviation fuel. Air travel's vulnerability to high fuel prices was seen in 2008, with global losses for the industry estimated at \$5billion.<sup>15</sup>

Bristol is primarily a passenger airport<sup>16</sup> and 2007 figures show that 22% of travel from Bristol airport was domestic; these are journeys which could be made more fuel efficiently by train. Air travel is also vulnerable to economic downturns as people reduce unnecessary expenses. Travel figures for Bristol airport in 2009 show a decrease in both passenger numbers and flights from 2008<sup>17</sup>. Bristol airport is currently planning an extension to meet anticipated future growth. Peak oil will threaten the business model of cheap air travel as it relies on cheap fuel.

### 3.3.3 Oil dependence of freight transport

The Freight Supporting Statement of the JLTP shows that freight traffic in the West of England area is dominated by road transport. In 2003, 81% of total freight transport was conducted by road (this total excludes goods

originating outside Great Britain). Bristol is well connected to the rest of the country via the M4 and M5 motorways. Supply chains have been developed around this easy access and are planned in such a way that expensive storage in the city is minimised by 'just in time' delivery systems. This road transport distribution system is highly vulnerable to peak oil, adding insecurity and cost to long and complex delivery chains. The economic conditions arising from peak oil will therefore favour local products and essential services. The impact of high fuel costs on the road haulage industry was illustrated both in the 2000 fuel blockade and again in 2008 when protesting drivers held up traffic on motorways and in London.

### Flashback!

**The Independent, 11 September 2000**

"Worst hit areas were: BRISTOL: severe fuel shortages were reported across the city, which is near the site of a blockade by hauliers of an oil terminal on Avonmouth docks on the Severn Estuary."<sup>18</sup>

The next largest conveyer of the area's freight is rail with usage currently dominated by commodities from the port, for example coal transport to power stations. Increased use of rail for freight in the city would require infrastructure investment.

Like the passenger link, the local freight train link is powered by diesel and thus vulnerable to peak oil. Freight rail services are privatised and may struggle to maintain vital services in the event of the economic pressures of an oil crunch; the current downturn has already resulted in job losses at EWS<sup>19</sup>. Electrification of services would provide some diversification of fuel and some mitigation in the event of oil supply shortages.

#### Sources:

15 <http://www.ft.com/cms/s/0/b5ec41d0-79fc-11dd-bb93-000077b07658.html>

16 P.33 [http://www.bristolairport.co.uk/upload/bia\\_master\\_plan\\_low\\_resolution.pdf](http://www.bristolairport.co.uk/upload/bia_master_plan_low_resolution.pdf)

17 [http://www.bristolairport.co.uk/about\\_us/how\\_we\\_do\\_%20business/facts\\_and\\_figures.aspx](http://www.bristolairport.co.uk/about_us/how_we_do_%20business/facts_and_figures.aspx),  
<http://www.caa.co.uk/default.aspx?catid=80&pagetype=90>

18 <http://www.independent.co.uk/news/uk/home-news/panic-buying-triggers-fuel-shortages-699126.html>

19 [http://news.bbc.co.uk/1/hi/england/south\\_yorkshire/7767523.stm](http://news.bbc.co.uk/1/hi/england/south_yorkshire/7767523.stm)



Commercial ports in the South West handled about 5% of total UK seaborne freight in 2003<sup>xx</sup> and the government is promoting greater use of water based transport as part of its Sustainable Distribution strategy<sup>21</sup>. Bristol's port is the country's 14th largest and has the deepwater capacity to handle vessels up to 130,000 tonnes dead weight. It also has good access to rail and motorways. This has led to an assessment that there is potential to double the throughput of the port, albeit with extensions to the facilities. Extension plans are under consideration though possible threat to the viability of the port comes from plans for a Severn barrage which could restrict access.

Whilst shipping has a high oil dependency for fuel and has recently shown high vulnerability both to high oil prices and to the global economic downturn<sup>22</sup>, freight shipping is a relatively efficient form of transportation using approximately 4kWh/day/person as opposed to 7kWh/day per person for heavy goods vehicles<sup>23</sup>.

### 3.3.4 Oil dependence of service transport

Bristol's public and emergency services are dependent on petrol and diesel vehicles and are highly vulnerable to peak oil.

Vulnerabilities in these sectors are further covered under sections 2.5 Emergency Planning, 5 Health, and 6 Public Services.

#### Flashback!

##### Bristol Evening Post, 21 July 2008

"The fuel bill for Avon and Somerset's police cars will jump by almost £800,000 this year because of spiralling petrol prices...For the last two years, the constabulary has paid out about £1.7 million a year on unleaded and diesel. It expects to pay almost £2.5 million this year...The £800,000 extra needed to pay for this year's fuel bill would pay for almost 40 newly qualified police officers."<sup>24</sup>

## 3.4 Existing transport policy and its effectiveness in preparing Bristol for peak oil

Bristol transport policy is based on the regional Joint Local Transport Plan (JLTP) 2007-11, which aims to:

- ▲ Tackle congestion
- ▲ Improve road safety for all road users
- ▲ Improve air quality
- ▲ Improve accessibility
- ▲ Improve the quality of life

Current transport policy does not recognise peak oil as a challenge and will not lead to a transport system that is resilient to peak oil. However, some of the goals have led to complementary policies which could be useful if pursued alongside additional measures at the necessary scale and speed.

Political challenges undoubtedly exist around making changes while fuel remains affordable and available. However, the need to drastically reduce GHG emissions, the economic cost of congestion (currently estimated at £350 million<sup>25</sup>) and potential well-being benefits all support the case to build a genuinely sustainable public transport system with vastly improved accessibility.

- ▲ The JLTP sets out a number of strategies to reduce private car travel, including upgrades to public transport, promotion of cycling/walking, changes to peak flows and the possible introduction of a road charging scheme. Reducing private car dependence is essential for a post peak oil transport system but current targets for reduction assume continued growth in overall traffic. Policy is currently not structured to create a fundamental shift away from the car towards more sustainable access and transport, but rather to limit growth in car use.

Sources:

20 [http://db.cornwall.gov.uk/LTP/freight-strategy/section\\_191315223478.html](http://db.cornwall.gov.uk/LTP/freight-strategy/section_191315223478.html)

21 <http://www.dft.gov.uk/pgr/freight/sustainable/>

22 <http://www.independent.co.uk/news/business/analysis-and-features/shipping-holed-beneath-the-waterline-995066.html>

23 P.91 <http://www.withouthotair.com/download.html>

24 <http://www.thisisbristol.co.uk/news/Avon-Somerset-police-budget-hit-rising-fuel-bills/article-228431-detail/article.html>

25 [http://www.westofengland.org/media/62734/transport\\_jltp\\_13-08-08\\_jltpmain-ch3.pdf](http://www.westofengland.org/media/62734/transport_jltp_13-08-08_jltpmain-ch3.pdf)

- ▲ Bristol has identified accessibility as an important goal in the JLTP to reduce congestion, reduce CO<sub>2</sub> emissions, and improve quality of life - especially for the vulnerable. "A strong link emerges between deprivation and transport when accessibility is plotted against particularly disadvantaged areas (those that fall within the bottom 10% of the revised English Indices of Deprivation 2004)."<sup>26</sup>
- ▲ The Bristol Cycle City project will strengthen investment in cycling and aims to double the number of regular cyclists in Greater Bristol in 2 years. In order to create a more peak oil resilient transport system, cycling policy will need to be highly ambitious, raising bike ownership and the number of people who regularly cycle to more than 70%. This means creating safe cycling conditions for cyclists of all ages with an infrastructure which makes cycling an easy option.
- ▲ Investment in the bus service via the GBBN aims to provide a reliable alternative to private car transport with improved services and information. Providing reliable and user friendly public transport at an affordable price is essential for peak oil resilient longer distance travel. Diesel powered bus services are however vulnerable to peak oil and volatile oil prices are likely to lead to difficult market conditions for public transport providers.
- ▲ BCC understands that orbital and radial public transport in parts of Bristol, particularly the South and East, have poor levels of accessibility. An initial rapid bus route is planned as a first radial route. Investing in a complete integrated network which drastically reduces the need to rely on cars would reduce Bristol's vulnerability to an oil shock.
- ▲ BCC is taking steps to reduce its own transport fuel dependency by reducing business mileage and the percentage of council staff regularly commuting by single occupancy car. Ensuring workplace accessibility by sustainable modes of transport will enhance the resilience of services.
- ▲ Increased use of the Port of Bristol has the potential to shorten freight routes to many UK destinations, especially Bristol. The Secretary of State for Transport is currently considering the planning application for an extension to the Port. Taking peak oil into consideration in developing these plans is an opportunity to make decisions that will result in a practical infrastructure for the future.
- ▲ BCC has identified the need to increase the modal share of walking, cycling and public transport in the transport mix and has made use of personal transport planning (PTP). In order to speed up change Bristol could expand these programmes and also improve transport information, for example, by implementing a system like the Nottingham trip planner<sup>27</sup> which works across all transport options and provides easy timetable, fare and route information.
- ▲ Bristol has conducted some innovative work to reduce freight traffic through the introduction of a freight hub. The hub, set up in 2004, works to consolidate freight movements in the city for businesses and has proved a success with a 75% reduction in delivery vehicle movements for those involved and a saving of 205,000 vehicle km in and around the city centre since the scheme began.<sup>28</sup> Despite this success the hub model only accounts for a very small number of overall freight deliveries in Bristol.

Sources:

<sup>26</sup> [http://www.westofengland.org/media/62744/transport\\_jltp\\_13-08-08\\_jltpmain-ch6.pdf](http://www.westofengland.org/media/62744/transport_jltp_13-08-08_jltpmain-ch6.pdf)

<sup>27</sup> <http://www.triptimes.co.uk/>

<sup>28</sup> <http://www.lga.gov.uk/lga/core/page.do?pagelId=1335145>

- ▲ Proposed planning regulations for new developments include recommendations for accessibility, mixed use and transport. Making Bristol sustainable will require that existing neighbourhoods are 'retrofitted' to meet new standards. Making this kind of change will need active participation from the community and Bristol Partnership because the Council has limited authority to make changes where it doesn't own the land or buildings.

### 3.5 Towards an accessibility and transport policy to prepare Bristol for peak oil

#### 3.5.1 A peak oil transport policy

A transport policy aimed at building resilience to peak oil would aim to:

- ▲ Reduce the need for journeys and therefore transport.
- ▲ Maximise the use of human powered transport modes.
- ▲ Maximise use of mass transit to increase efficiency per unit of fuel.
- ▲ Quickly phase out petroleum based fuels.
- ▲ Reduce the length of freight journeys and utilise low energy freight transport modes.

#### 3.5.2 A selection of activities that could be added or extended to build resilience to peak oil in Bristol's transport system

**A: Increase accessibility work to reduce the need for journeys and reduce their distance to within walking distance. Initiatives could include:**

- ▲ Encourage employers to share office buildings and service centres to allow employees to work at a base closer to home.
- ▲ Decentralise some services, and increase accessible jobs close to home for some employees whilst providing local services for the public.
- ▲ Add distance targets to accessibility targets which are currently measured on

travel time to a destination via public transport. This would give greater transparency as to how resilient accessibility is in the event of oil shocks which could lead to route changes or cancellations. Different targets could be set to reflect typical frequency of access.

- ▲ Work with community groups and the housing sector to develop and publicise a 'walkability index'<sup>29</sup> of distances to key services – this could be similar to the Energy Performance Certificates.
- ▲ Ensure that planning policy protects space for a diverse choice of local retail options

**B: Prioritise sustainable modes of transport through a mixture of hard and soft measures:**

- ▲ Set a long-term funded programme to extend the Cycle City network through infrastructure changes, information and publicity, with ambitious targets to make cycling the transport mode of choice.
- ▲ Improve intermodal transport connections and facilities which improve the usability of the mass transit system. For example, bike racks on buses, space for bikes on trains/rapid transit, secure bike parking facilities at transport interchanges, flexible ticketing to allow switching between modes.
- ▲ Make use of filtered permeability to give advantage to pedestrians, bikes and public transport while selectively restricting car access. This idea has been endorsed by the government for ecotowns.<sup>30</sup>
- ▲ Study information gained from Personal Travel Planning to determine whether there are strong trends which result in a high number of Bristol's short journeys being made by car. If barriers to more sustainable transport choices arise, conduct further research on these to enable more systematic changes.
- ▲ Implement a phased programme of reducing car parking places in the city.

Sources:

29 <http://www.walkscore.com/rankings/>

30 [http://www.tcpa.org.uk/ecotowns/20080325\\_ET\\_WS\\_Transport.pdf](http://www.tcpa.org.uk/ecotowns/20080325_ET_WS_Transport.pdf)



- ▲ Use demonstration projects and temporary infrastructure changes to show the benefits of traffic free streets. Examples projects are Bogota's Ciclovia<sup>31</sup> in which key streets are closed to traffic every Sunday. New York City is implementing an ambitious programme to create less car-centric streets by trying out infrastructure changes with temporary architecture and road markings before making permanent changes. This approach gives people the chance to try something new and experience the benefits.<sup>32</sup>
- C: Improve resilience of transport to peak oil:**
  - ▲ Electrification of some services or using biomethane from municipal organic waste as in Lille<sup>33</sup> and Stockholm<sup>34</sup>. BCC already collects separated organic waste for composting but a new 20 year contract for a new composting facility in Avonmouth<sup>35</sup> currently has no plans for energy generation.
  - ▲ Factor in peak oil resilience when evaluating transport infrastructure investment decisions in order to demonstrate the relative merit of different projects.
  - ▲ Pursue financing options via business taxation of retail and workplace parking (except for disability) for public transport. This enables the introduction of low fares to increase ridership and protect unprofitable routes.
  - ▲ Set a date for electrification of city taxi services.
  - ▲ Use of rivers and canals for commercial transport is being reintroduced in London, Manchester and Liverpool and should be investigated in Bristol. The Department of Transport produced a map in 2008 of key inland waterways for freight.
- ▲ Prioritise development of a sustainable freight delivery system for essential goods. Plan to increase rail freight interchanges with adjacent storage, manufacturing and processing.
- ▲ Vulnerability to travel intensive supply chains could be reduced by supporting a strong local economy in essential goods. This would create and support local jobs while increasing resilience to transport disruption challenges.
- ▲ Encourage businesses to work with their employees to improve resilience to oil shocks. One option for action towards this goal could be achieved by introducing energy budgets for departments which incentivise reductions in overall energy use to, from and in the workplace. Reducing available parking space is another way to drive behaviour change.

### 3.6 Well-being benefits

Many of the above options would help in lessening climate change as well as giving the following additional benefits:

- ▲ Bristol suffers high levels of noise pollution. Reduction of traffic would greatly improve this.<sup>36</sup>
- ▲ Reduced motor vehicle travel would improve air quality. Air quality is a key issue of the JLTP.
- ▲ Reduced motor vehicle traffic and prioritisation would have a positive impact on road safety
- ▲ A recent study in Bristol suggests that low traffic streets may have a link with improved community interaction. Further research could be conducted.<sup>37</sup>
- ▲ More cycling and walking would result in higher levels of physical activity and therefore improved physical/mental wellbeing.

Sources:

31 <http://en.wikipedia.org/wiki/Ciclov%C3%ADa>

32 <http://nycsr.org/nyc/building.php>

33 <http://www.biogasmax.eu/biogas-techniques-biofuel-production/biogas-biofuel.html>

34 <http://www.biogasmax.eu/330-stockholm-an-increasing-number-of-buses-fueled-with-biomethane.html>

35 <http://www.newearthsolutions.co.uk/2008/06/bristol-city-council-award-a-major-waste-contract-to-specialist-composting-and-resource-recovery-firm-new-earth-solutions/>

36 <http://www.bristol.gov.uk/noisemap>

37 <http://www.guardian.co.uk/environment/2008/sep/19/ethicalliving.automotive>



## Fast forward! Future scenario

'That's our house over there, just to the left of those walnut trees. It's great because between the house and my daughter's school there is a traffic free route. There are lots of families living here so once the kids are 6 or 7 they set off together and cycle to school and back. It reminds me a bit of Holland where I grew up. A lot of houses there are built around green spaces and people go everywhere by bike.

Britain is finally catching up and Bristol is at the forefront of this development. You can now reach every part of the city via a cycle-route. And I mean proper traffic free cycle lanes, not just a white line on the road like back in 2009. But of course you can't really compare Bristol with Holland because Holland is as flat as a pancake, so even the elderly travel by bike. Luckily Bristol has a great public transport system. My wife uses it to get to Bristol University where she lectures. There's a bus every three minutes and it takes her less than 15 minutes to make a 7 mile journey. That's because the flow of traffic has improved enormously now that there are fewer cars on the road. After oil peaked, most people gave up owning private vehicles as it just became too expensive. I know the older generation found it hard giving up what they considered 'freedom' - my mother still complains - but who wants to have the cost and responsibility of a car when everything is on your doorstep and easy to get to on foot or by bike.

A few years ago they brought in these buscabs and they're great - my teenage son loves them. You can track where the nearest one going in your direction is on your mobile phone. They take 6-8 passengers, are affordable and will drop you off at your chosen destination. It's what you take if you don't want to do any walking at all - hence the popularity with teenagers. I keep telling my son that ordinary buses are probably quicker, but he's more bothered about not getting his hair messed up.

Willem Kienstra  
Millfield Gardens  
Warmley  
2022

### 3.7 Areas for further research

1. Investigate and make a decision on creating an Integrated Transport Authority to take greater ownership of local transport policy. Newly available national legislation makes this possible.
2. Undertake further research into Bristol's transport choices for trips other than work. Research the barriers to change to more energy efficient transport options. Are any of these dependent on location? Use the information to inform priorities for making changes.
3. Investigate Fuel diversification options to reduce reliance on petroleum fuels.
4. Investigate increased use of rail and water transport for freight.
5. Research financial options for reducing the cost of public transport so it becomes the obvious economic choice for most travel when compared to private cars.





# Part Two:

## 4.0 Food





## 4.0 Food

### 4.1 Summary

#### Food – Key Points

- ▲ Bristol's food system is utterly dependent on cheap oil and gas.
- ▲ 'Cheap' supermarket food relies on access to diverse markets with cheap labour, centralised distribution and 'just in time' delivery models, all of which are threatened by peak oil.
- ▲ Much agricultural land is degraded due to over ploughing and use of synthetic fertilisers and pesticides.
- ▲ Bristol Council has no statutory responsibility around food and no plan around food security. The city is totally reliant on major supermarkets for food supply.
- ▲ Current economics are challenging for local sustainable agriculture but failure to increase this now will lead to food insecurity in the future.

### 4.2 Background

Councils currently have no statutory authority over provision of food, consequently there is no structure or remit for a coordinated food policy. Many council departments do, however, have some responsibility for food in their brief – for example food provision for schools and care homes, domestic food waste removal, food information around healthcare, and provision and management of allotments.

#### 4.2.1. The UK food system- a globalised system

Bristol is part of a globalised food production and distribution system which is highly dependent on oil for industrialised agricultural methods and complex food supply chains<sup>1</sup>. A typical meal may consist of UK chicken (fed on imported grain) with potatoes from Israel, beans from Egypt and carrots from Scotland.

#### Oil dependence in agriculture

Industrialised agriculture relies on oil to drive the machinery which works the land, gas-based fertilisers to make plants grow and oil-based pesticides and fungicides to prevent disease. Consequently, food production is energy inefficient and also dependent on cheap energy. For example, in the industrialised world it takes on average 7-10 calories of fossil fuel to deliver 1 calorie of food energy<sup>2</sup>, while meat has been estimated to have an average energy input-output ratio of 25:1;<sup>3</sup> 25 calories of fossil fuel to provide 1 calorie of meat.

#### Flashback!

##### Cuban 'Special period', 1990s

In the 1990's Cuba experienced a close equivalent of peak oil when the Soviet Union collapsed. The Soviet Union had been Cuba's key ally and economic partner. The resulting loss of imports induced a 20%<sup>4</sup> reduction in the availability of oil in Cuba and an 80% reduction in food, fertilizer, pesticide and other imports. In the immediate aftermath average per capita daily energy intake fell 50%.

Cuba responded to the crisis with a national call to increase food production by restructuring agriculture. The transformation was based on a conversion from a conventional, large scale, high input, mono-crop agricultural system to a smaller scale, organic and semi-organic farming system. Urban agriculture was a key part of this effort and in Havana alone over 8,000 city farms were created. The success of these gardens significantly contributed to the easing of Cuba's food crisis. In 1998 an estimated 541,000 tons of food were produced in Havana for local consumption.<sup>5</sup>

Increased oil prices or oil supply shortages mean rises in the cost of agricultural

Sources:

1 [http://www.chathamhouse.org.uk/files/6485\\_foodbp0107.pdf](http://www.chathamhouse.org.uk/files/6485_foodbp0107.pdf)

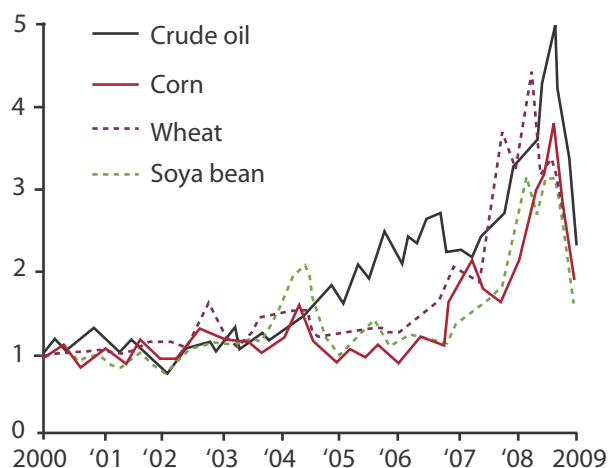
2 Page 21 Eating Fossil Fuels – Oil, Food and the Coming Crisis in Agriculture, Dale Allen Pfeiffer, New Society Publishers, 2006

3 <http://www.neweconomics.org/gen/uploads/55ksx4awtkarwz55oc4tek5526112008122020.pdf>

4 [http://tonto.eia.doe.gov/country/country\\_time\\_series.cfm?fips=CU](http://tonto.eia.doe.gov/country/country_time_series.cfm?fips=CU)

5 <http://www.foodfirst.org/pubs/devreps/dr12.pdf>

chemicals and fuel to keeping machinery running. Currently, agriculture suffers from a lack of expertise in alternative methods, a lack of trained farmers to increase local agriculture (the average age of UK farmers is 60), infertile soils from years of over-ploughing and use of fertilisers and competition for land between food and fuel crops such as ethanol. In 2008 the link between the price of oil and gas and commodity crops like corn, wheat and soy became very apparent (Figure 6).



**Figure 6:** Relative price of crude oil, corn, wheat and soybean on world markets, 2000-2008, Source: Post Carbon Institute<sup>6</sup>

### Migration to cities

Methods used for food production have brought huge changes to the farming industry, most notably in reducing the number of people involved. This has led to a massive migration from the land to the city. In the UK, the percentage of people employed in agriculture has dropped from 40% in 1900 to less than 2% today<sup>7</sup>. Here in the South West agriculture and fishing currently accounts for 2.6% of jobs<sup>8</sup>. The 'surplus' labour has been a factor in enabling increased productivity in other areas of the economy generating higher GDP and growing cities and towns.

### Oil dependence in food transport and distribution

According to a July 2008 government report, transportation of food alone "... accounts for a third of all the 20.6 million tonnes of oil used in the UK food chain each year<sup>9</sup>".

Cheap oil provides cheap transport. The result is that it is often more economical to make use of low cost labour and land by moving food large distances for growing, processing and packaging than to locate supplies close to their target markets.

The energy dependence of this system includes the use of refrigeration to keep products fresh during transportation and pre-sale and the packaging required to make products easy to store, label and scan.

#### Flashback!

##### Impact of September 2000 Fuel Price Protests on UK Critical Infrastructure, September 2000

"Two factors reduced the availability of food for distribution during the fuel crisis. First, disruptions in the transportation sector prevented the shipment of food goods from producers to vendors. Similar to gasoline distributors, supermarkets rely on daily just-in-time deliveries rather than maintaining large stockpiles of goods. This mode of business proved to be highly vulnerable to transportation disruptions as there was very little stock to meet consumer demand when the supply of just-in-time goods was interrupted. Each day of the fuel protests further affected food deliveries, depleting the small reserves kept by supermarkets.

Sources:

6 <http://postcarbon.org/files/PCI-food-and-farming-transition.pdf>

7 [http://www.soilassociation.org/Web/SA/saweb.nsf/cfff6730b881e40e80256a6a002a765c/2332f95504fb0b778025748100330b79/\\$FILE/an\\_inconvenient\\_truth.pdf](http://www.soilassociation.org/Web/SA/saweb.nsf/cfff6730b881e40e80256a6a002a765c/2332f95504fb0b778025748100330b79/$FILE/an_inconvenient_truth.pdf)

8 [http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset\\_id=27935008&](http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset_id=27935008&)

9 [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_matters1.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf)



The second factor influencing shortages was increased demand and panic buying. The uncertainty of how long the fuel protests would disrupt food supplies caused consumers to alter their normal purchasing behaviour and attempt to acquire more goods than usual. The grocery chain Spar noted that its food sales had increased by 300 percent. The sight of empty shelves triggered some consumers to stockpile goods in sufficient volumes to endure a prolonged food supply shortage. Hence, by September 13 panic buying had commenced across Britain, some shops were bare of bread and milk, and a number of supermarkets began rationing food purchases.<sup>10</sup>

#### 4.2.2 Threats to UK food security

It seems inconceivable that the UK could experience food shortages, yet the February 2009 report *Food Futures – Rethinking UK Food Strategy*<sup>11</sup> by the think tank Chatham House states that “Supply network professionals regard a major food crisis in the UK as highly likely.”

The global food market faces growing challenges due to a combination of population explosion, changes in dietary trends towards meat and dairy, volatile energy costs and increasing competition for land due to climate change and soil erosion.

Recent UK government reports have identified the need for a more ‘sustainable’ food system. The January 2008 Cabinet Office Strategy Report *Food: An analysis of the issues* states that “existing patterns of food production are not fit for a low-carbon, more resource-constrained future.”<sup>12</sup> In response, the government recommends a policy of “securing fair prices, choice, access to food and food security through open and

competitive markets,”<sup>13</sup> yet this policy fails to recognise the impact peak oil will have on the economics of food production and supply systems.

In 2008, as oil prices reached record heights, the UK was more severely affected by food inflation than the US, Germany and France due to its high reliance on imported food.<sup>14</sup> UK self-sufficiency for food is around 60%; around 45% of vegetables and 90% of all fruit are imported, and we are also a significant importer of soya-based animal feeds<sup>15</sup> which were particularly impacted by the oil inflation of 2008. In December 2008, a Friends of the Earth report states that, “With commodity price rises, farmers have seen the cost of animal feed and other inputs increase. The price of fertiliser grew by 156% in the last year. The cost of chicken feed has risen by £80/tonne in the same period.”

More sustainable models of agriculture, including UK based production, are challenged by the economics of global production, distribution and economies of scale which support the current UK food retail system. 75% of food in the UK is bought in one of the top four supermarkets,<sup>16</sup> all of which operate similar systems of procurement, distribution and ‘just in time’ delivery systems. A food system with all its eggs in one basket is more vulnerable to shock than a diverse system.

The May 2008 Chatham House report, *Thinking about the future of food*, which considers a peak oil scenario as one of its four future food scenarios, states “The expected impacts of the circumstances presented provide a stark warning that ‘business as usual’ models could, at worst, fail and at best be poor preparation for the coming period. On a more positive note, the challenging transformation in prospect offers exciting

#### Sources:

- 10 <http://www.iwar.org.uk/cip/resources/PSEPC/fuel-price-protests.htm#postbanks28>
- 11 [http://www.chathamhouse.org.uk/files/13248\\_r0109foodfutures.pdf](http://www.chathamhouse.org.uk/files/13248_r0109foodfutures.pdf)
- 12 [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_analysis.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_analysis.pdf)
- 13 [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_matters\\_es.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters_es.pdf)
- 14 [http://online.wsj.com/article/SB122401830281133843.html?mod=googlenews\\_wsj](http://online.wsj.com/article/SB122401830281133843.html?mod=googlenews_wsj)
- 15 [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_matters\\_es.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters_es.pdf)
- 16 P.68 [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_matters1.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf)



opportunities for the UK to develop new competitive strengths.”<sup>17</sup>

### 4.3 Specific vulnerabilities to Bristol's food system

#### 4.3.1 Vulnerability to oil supply stoppages

In the event of a national fuel crisis the National Emergency Plan for Fuel<sup>18</sup> would come into operation – see section 2.5 on Emergency Planning. A priority in this plan is to ensure fuel supply for food distribution. Until the early 1990s Britain held food stocks for emergencies, but this is no longer the case. Following the 2000 fuel crisis the government has worked with major retailers to keep ‘buffer’ reserves despite the fact that maintaining such reserves is in conflict with the ‘just-in-time’ delivery model operated by all leading supermarkets.<sup>19</sup> The plan is classified so details of the provision are not available.

Crisis during times of local or national fuel stoppages could be reduced if people were able to draw on food stocks or supplies of their own. For those who rely on ‘just in time’ purchasing for most of their food even rumours of a stoppage can cause anxiety that leads to panic buying. Much of Bristol's new apartment style housing has little room for storage which encourages more ‘just in time’ purchasing. Those on low incomes are also vulnerable in this regard - DEFRA research from 2008 shows that 98% of the low income population cited ‘not enough money for food’ as their reason for not having enough food in the house.

#### 4.3.2 Vulnerability to rising oil price and oil price volatility

##### Oil price and food

High oil prices inflate food prices due to

increased production and transportation costs. Recent economic incentives for farmers to grow crops for biofuels<sup>20</sup> rather than food has made that link even more acute and according to the World Bank, this contributed to the global food crisis in 2008. Price impacts were felt strongly in the UK where food prices rose approximately 27% between August 2007 and August 2008.<sup>21</sup>

Bristol's food retail system reflects the national system and is reliant on daily deliveries from around the UK, Europe and other parts of the world. A 2007 *Bristol Citywide Retail Study*<sup>22</sup> found that some 50% of main food shopping took place in just 7 main stores. A less car centric city is likely to favour shops which are within walking distance from communities, but the number of such shops have fallen 11% from 2000 to 2005.<sup>23</sup>

##### Food poverty

In 2007, average food expenditure per UK household was only 10.3% of income but low income households in the same period spent 15.5%<sup>24</sup> showing that increasing food prices would create strain for low-income households in Bristol. Food protests or riots are not out of the question in Bristol if people become desperate – see Section 2.2.

##### Flashback!

###### The Daily Telegraph, 11 August 2008

“Family grocery bills are £1,400 higher than a year ago as the cost of food continues to spiral...According to monthly data published by the price comparison site mySupermarket.co.uk, a family that spent £100 a week on their food shop a year ago is now having to hand over £127 a week - an increase that equates to an extra £1,404.”<sup>25</sup>

Sources:

17 [http://www.chathamhouse.org.uk/files/11622\\_bp0508food.pdf](http://www.chathamhouse.org.uk/files/11622_bp0508food.pdf)

18 [https://www.og.berr.gov.uk/downstream/emergencies/down\\_emerge.htm](https://www.og.berr.gov.uk/downstream/emergencies/down_emerge.htm)

19 <http://www.timesonline.co.uk/tol/news/politics/article4276490.ece>

20 <http://image.guardian.co.uk/sys-files/Environment/documents/2008/07/10/Biofuels.PDF>

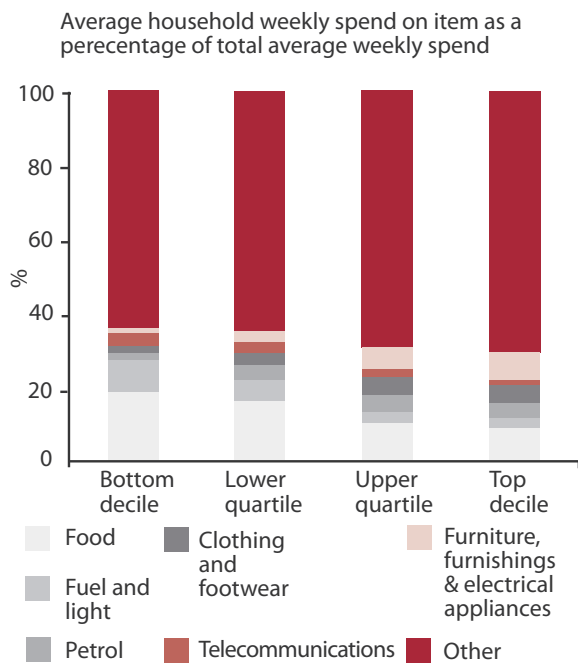
21 <http://www.telegraph.co.uk/finance/economics/2794574/Families-pay-andpound1%2C400-more-a-year-for-their-food-than-12-months-ago.html>

22 <http://www.bristol.gov.uk/ccm/content/Council-Democracy/Statistics-Census-Information/citywide-retail-study.en>

23 <http://www.nfsp.org.uk/uploads/pdfs/High%20Street%20Britain%202015%20report.pdf>

24 <https://statistics.defra.gov.uk/esg/publications/pocketstats/foodpocketstats/FoodPocketbook2008.pdf>

25 <http://www.telegraph.co.uk/finance/economics/2794574/Families-pay-andpound1%2C400-more-a-year-for-their-food-than-12-months-ago.html>



**Figure 7:**  
From *Measuring UK inflation*, Source: DEFRA, September 2008 <sup>26</sup>

### Food price and the economy

The Bristol catering and hospitality industry employs around 25,500 people.<sup>27</sup> Rising sourcing costs would add to pressures caused by economic stress on customers and this double crunch could destroy the sector.

The public sector is also a major provider of food through schools, hospitals and care homes. The NHS alone spends £500 million on meals per year. Rising food prices would have a severe impact on public service budgets.

### Food and spatial planning

The new Bristol Development Framework which is being informed by the Draft Regional Spatial Strategy for the South West does not currently address peak oil as a risk factor, nor does it deal with the question of food security.

It is essential that planning decisions keep sufficient cultivatable land available in and around the city to allow for a low energy local food system. This is already at risk as developers move to buy green belt land around the city from farmers in anticipation of more relaxed planning laws.<sup>28</sup>

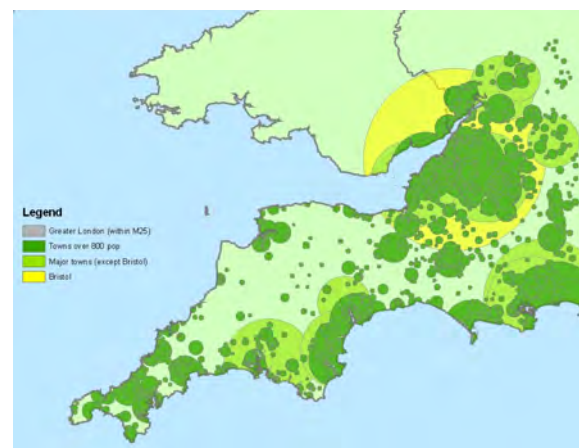
City planning policy also plays a part in food retail options. Bristol's food and convenience shopping is currently very car centric. Cars allow people to transport a large number of items and favour large retail outlets with abundant car parking facilities. The centralisation of convenience shopping has led to a situation where many areas of the city have very few local outlets from which to buy a healthy range of goods. A reduction in car travel is likely to increase demand for local retail space selling a wider variety of produce within walking distance from home or work.

### Regional cooperation

In order to improve its food security, Bristol needs to cooperate with the surrounding region, just as the region relies on Bristol as its economic hub.

Geofutures in Bath have undertaken some initial mapping of the UK food print<sup>29</sup> to inform planning work around food production. The model uses a calculation from a report by Simon Fairlie called *Can Britain Feed itself?*<sup>30</sup> In his 'Livestock Permaculture' agricultural model, 1 hectare of combined agricultural and forestry land supplies 4.4 people which is a much less land intensive model than the current UK diet.

The map in figure 8 shows the food print of



**Figure 8:**  
Bristol's food print, based on Simon Fairlie's 'livestock permaculture' agricultural model, Source: Geofutures

Sources:

- 26 [http://www.statistics.gov.uk/elmr/09\\_08/downloads/ELMR\\_Sep08\\_Marks.pdf](http://www.statistics.gov.uk/elmr/09_08/downloads/ELMR_Sep08_Marks.pdf)
- 27 [http://en.wikipedia.org/wiki/Economy\\_of\\_Bristol](http://en.wikipedia.org/wiki/Economy_of_Bristol)
- 28 <http://www.thisisbristol.co.uk/homepage/Bristol-amateur-rugby-club-turns-2-75m-offer/article-872816-detail/article.html>
- 29 <http://www.geofutures.com/2009/07/food-fooprints-re-localising-uk-food-supply/>
- 30 [http://www.ukwatch.net/article/can\\_britain\\_feed\\_itself](http://www.ukwatch.net/article/can_britain_feed_itself)

English towns within the larger Bristol food print, though it does not account for differing productivity of land, or how much food could be produced within the city, or for population growth. Bristol already cuts well into Wales before even adding Welsh towns.

### Food waste

Cheap oil allows for a huge amount of food and packaging waste to be built into the system. According to one report, Sainsbury's alone creates 80,000 tonnes of waste a year<sup>31</sup> whilst UK household food waste accounts for £10bn of purchases per year (2008 WRAP) of which 70% is avoidable food waste.<sup>32</sup> Although Bristol Council has successfully implemented food waste collection, it is estimated that 35% of grey bin waste is still organic. Higher costs will force people to think again about practices that lead to this waste.

## 4.4 Existing actions and measures for food and their effectiveness in preparing Bristol for peak oil

Current food policy is not geared towards resilience to peak oil. There are, however, some individual organisations taking steps to investigate more sustainable practices and organisations working to promote affordable healthy food options.

### 4.4.1 A selection of existing activities which could be extended to build resilience to peak oil

▲ Community gardens such as Hartcliffe Health and Environmental Action Group (HEEAG),<sup>33</sup> Horfield Community Orchard and the community smallholding initiated by Transition BS<sup>34</sup> allow people to share responsibilities and knowledge whilst giving them the opportunity to grow some of their own food.

- ▲ Community Supported Agriculture connects customers with a particular farm by sharing in the costs, responsibilities and harvest. In some models it is possible for a small number of participants to work in exchange for food.
- ▲ Growing food in the city shortens the supply chain for fruit and vegetables to walkable distance. Allotment tenancies in Bristol have risen from 53% to 83% since 2000, with long waiting lists on many sites and more derelict sites being brought back into use.
- ▲ The Soil Association's *Food For Life*<sup>35</sup> initiative builds in a percentage of local food supply as well as seasonal food for schools. Implementation of this scheme across the Bristol public sector would build local resilience to supply shocks and rising import costs, whilst contributing to the growth of reliable local food production for the future.
- ▲ Bristol Council has already identified the need to work with communities to improve knowledge of the principles of healthy eating. People without cooking skills have more limited choice when buying food as they are less likely to purchase bulk primary ingredients that can be used to create cheap, healthy meals. It is estimated that illness related to poor diet currently costs the NHS £6bn a year.<sup>36</sup> In the 2007 Bristol Quality of Life survey, 48-50% of respondents categorised themselves as overweight or obese. Increases in dietary illness would put additional strain on budgets.
- ▲ Bristol City Council won the National Food Champion award for its work around linking food with health. Increased access to training and information about food would allow vulnerable communities to build their own resilience to dietary issues.

Sources:

31 <http://www.independent.co.uk/news/business/news/sainsburyrsquos-pioneers-food-recycling-process-1067220.html>

32 <https://statistics.defra.gov.uk/esg/publications/pocketstats/foodpocketstats/FoodPocketbook2008.pdf>

33 <http://www.hheag.org.uk/>

34 [http://www.transitionbs3.co.uk/?page\\_id=38](http://www.transitionbs3.co.uk/?page_id=38)

35 <http://www.foodforlife.org.uk/about-us/soil-association>

36 <http://news.bbc.co.uk/1/hi/health/4436232.stm>



- ▲ Bristol has a strong permaculture community through the Bristol Permaculture Group. Permaculture methods were used successfully in Cuba to grow food in the face of shortages of oil and synthetic fertilisers.
- ▲ The Bristol GROFUN<sup>37</sup> (Growing Real Organic Food in Urban Neighbourhoods) initiative extends the community allotment idea to people's gardens by employing an exchange system of labour and produce.
- ▲ Unavoidable organic waste from the food system, green spaces and agriculture can be used to create biomethane and compost. BCC already composts household food waste as part of its organic waste collection scheme. Sainsbury's is operating a biomethane project.<sup>38</sup>
- ▲ South West Rural is considering opportunities and challenges around a local food economy and has run workshops to encourage networking.<sup>39</sup>

### Flashback!

#### Western Morning News, 22 September 2008

"AS SUPERMARKET vegetable prices soar, people across the country are finding more creative ways to feed themselves and their families. National supplier Sutton Seeds has noticed a shift in sales to correspond with this trend. Five years ago, 60% of its sales were flower seeds compared to 40% vegetable seeds. Now, 70% of sales are of vegetable seed varieties."<sup>40</sup>

## 4.5 Food policy, actions and measures which would prepare Bristol for peak oil

### 4.5.1 Key elements of a sustainable food system for Bristol

Policy ensuring greater food security and affordability in Bristol<sup>41</sup> in the event of peak oil would include the following elements:

- ▲ More local production and consumption of those foods which can be grown in the local region
- ▲ Protection of local agricultural land for farming
- ▲ Increased access to growing spaces for people to be able to grow some of their own food
- ▲ Development of low energy food production, processing techniques and food distribution systems
- ▲ Promotion of foods with low fuel requirements (more seasonal foods, less meat)
- ▲ Creation of food storage for emergency situations
- ▲ Food retail solutions that don't rely on private cars

### 4.5.2 A selection of further actions to improve resilience to peak oil in Bristol's food system

- ▲ A cross-organisational group including Bristol Food Hub, Forum for the Future, Transition Bristol and Bordeaux Quay have drafted a Sustainable Food Strategy for Bristol with consultation from organisations and individuals across the city. Rolling out the strategy could place Bristol at the forefront of sustainable food<sup>42</sup>.

#### Sources:

37 <http://www.grofun.org.uk/>

38 <http://www.independent.co.uk/news/business/news/sainsburyrsquos-pioneers-food-recycling-process-1067220.html>

39 <http://www.nationalrural.org/page.aspx?id=87df3c21-bcfc-4823-8fca-ae397cf6bf09>

40 <http://www.thisiswesternmorningnews.co.uk/livingcornwall/Boom-home-grown-veg/article-343265-detail/article.html>

41 "...all people at all times have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" <http://www.fao.org/docrep/003/w3613e/w3613e00.HTM>

42 <http://www.bristolgreencapital.org/members/seminars/sustainable-food-strategy-bristol-consultation-2-dates>

- ▲ Promote and support schemes and set targets to increase the amount of food produced in the city. Bristol could adopt a vision to better London's Capital Growth<sup>43</sup> project by transforming itself into a garden city with a strong food production culture. This would not only bring immense future benefits for peak oil resilience but also community involvement, biodiversity and climate change adaption.
- ▲ Work with regional partners in England and Wales to create a strong regional food production, processing and distribution systems. Projects promoting such work exist through Eat Somerset.<sup>44</sup> Forum for the Future is investigating setting up both a physical food hub and a virtual farmers market.
- ▲ Extend Bristol's climate change adaption work and emergency response planning to include peak oil. Planning will build resilience to supply shocks and create longer-term adaptation; more gardens and green roofs and walls in the city would help with water run-off and urban heat island effects.
- ▲ Undertake a study to determine how much potential space there is for food production within the city. Include plans for land which could be reclaimed (e.g. car parks) as local food production grows in priority. Join with other authorities to support Geofutures food mapping to build a more detailed land profile, so creating valuable information to inform future planning decisions.
- ▲ Work with adjoining local authorities to protect quality agricultural land in the region from other planning decisions.
- ▲ Require public service food contractors to specify emergency plans and business continuity planning for peak oil.
- ▲ Evaluate public access to food and how transport changes would change supply models, for example a return to consolidated delivery services for heavy items such as milk.
- ▲ Consider models for the support of vulnerable communities for when sudden price rises in food and fuel outpace benefit adjustments.
- ▲ Provide education and resources to assist people in urban areas in building their own level of resilience to oil shortages or events like floods. Sustainable food is often seen as a lifestyle choice rather than a requirement for survival. Support will be required not only for the preparation of food, but also for growing and practical storage.
- ▲ Extend education and partner with organisations<sup>45</sup> to cut food waste to reduce the impact of rising prices on household budgets.
- ▲ Bristol has the opportunity to put itself at the forefront of a sustainable food cities movement as well as building a strong food economy for the South West. Bristol is home to The Soil Association, two universities and strong food organisations. With the existing agriculture in the South West, we could lead the way in transforming how cities provide their food and show that building multi-layered solutions to feed an urban population is a modern concept and the way of the future.
- ▲ In an oil constrained world, some economic sectors could experience decline leading to unemployment. The food production and retail sector, however, will provide opportunities for work as it is likely to be much more people intensive. The *High Street Britain 2015*<sup>46</sup> reported that in 2004 the big four supermarkets employed 800,000 people with a turnover of £76 billion, whereas independent sectors with a turnover of £21 billion employed 500,000 employees.

## Sources:

43 <http://www.capitalgrowth.org/>44 <http://www.sustainweb.org/page.php?id=40>45 <http://www.lovefoodhatewaste.com/>46 <http://www.nfsp.org.uk/uploads/pdfs/High%20Street%20Britain%202015%20report.pdf>



## 4.6 Well-being benefits

Many of the options above would also assist in climate change mitigation and adaptation policy as well as delivering the following benefits:

- ▲ There are health benefits to be gained from a new approach to food. According to the government *Food Matters* report "It is now clear that diet is one of the leading causes of ill-health in our society, with our current patterns of food consumption leading to thousands of early deaths each year."<sup>47</sup>
- ▲ More community involvement in shared gardens could have a positive impact on social structures and the resilience of neighbourhoods as a whole.
- ▲ Producing more food in the city and locally could decrease freight traffic and congestion.
- ▲ Engaging people directly in producing food could help prevent food poverty in vulnerable population sectors.
- ▲ Trees and plants act as natural filters to help combat air pollution.
- ▲ Vegetation can assist in cooling buildings; climate change is likely to increase local summer temperatures.

### Fast forward! Future scenario

'You see the girl with the ponytail on the climbing frame - that's my granddaughter. We come here a lot. You wouldn't believe it but this used to be a supermarket car park and back in 2009 we used to shop here. Just after my daughter was born, my husband came home one night and says they're digging it up to put in a community orchard! I didn't believe him. But they did, and they started growing fruit and vegetables and the people living in the surrounding flats got a chance to do some work in exchange for food. A lot of people took it up you know, because times were pretty tough for a while. These apple trees were planted back then. I remember how spindly they were at the time. I certainly didn't believe they were going to feed anybody. And look at them now!

They put the playground in later because it's such a beautiful place to be - I've come here with both my daughter and granddaughter and the local schools use it too.

The other good thing about all this food growing in the city is that nothing is very far away nowadays. I find it hard to walk far since my operation so it's great that I can get most of my food from the market garden around the corner. And for other stuff I use the bicycle delivery service that some of the larger shops have.'

Kazia Lawrence  
St George Community Orchard  
2035

## 4.7 Areas for further research

1. Assess what land is available within the city for food growing, including land which could be reclaimed.
2. Research the amount of garden/allotment/community garden space needed per capita to produce at least 50% of required fruit and vegetables.
3. Research ways of creating employment opportunities in Bristol and the region through local production and decentralisation of retail.
4. Research the impact of food inflation and the globalised/industrialised food system on vulnerable households in Bristol and investigate ways to provide relief.
5. Research which genuinely sustainable agricultural models exist in the region and teach a new generation of farmers these methods.
6. Map the City's current supply chain - where food is coming from and who main suppliers and distributors are.
7. Conduct feasibility studies for an alternative food infrastructure, e.g. a physical food hub for local producers and local retailers.

Source:

46 [http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food\\_matters1.pdf](http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/food/food_matters1.pdf)



# Part Two:

## 5.0 Healthcare



## 5.0 Healthcare

### 5.1 Summary

#### Health – Key Points

- ▲ Oil is a primary raw material for many drugs and medical supplies.
- ▲ The health system is oil dependent with respect to transport for patients, staff, deliveries and services.
- ▲ Existing and future work on accessibility is vital to reducing vulnerability to transport disruption.
- ▲ NHS suppliers are not currently required to provide business continuity plans around fuel supply shortages.
- ▲ Rising oil costs would seriously impact health services budgets.
- ▲ A level of resilience is built into the NHS in that most people in Bristol live within a mile of a GP.
- ▲ The NHS is used to responding to emergencies and has procedures for changing priorities to deal with crisis.

### 5.2 Background

#### 5.2.1 Bristol's healthcare delivery

Bristol's healthcare system relies on a complex delivery pattern across 5 institutions. University Hospitals Bristol NHS Foundation Trust is one of the largest acute NHS trusts in the UK. It employs nearly 7,500 staff and provides healthcare services to people across the South West and further afield<sup>1</sup>. It is also the major NHS teaching and research centre for the South West of England.

#### 5.2.2 Direct oil dependency

Modern health services are reliant on oil for ambulances, transport for outreach workers, patients, visitors and deliveries. Oil is a key component in the production of huge numbers of single use and reusable items, such as surgical gloves syringes, respiratory kits and protective packaging. A significant

number of medicines are petroleum-based,<sup>2</sup> while sophisticated equipment such as scanners and ultrasound machines have large amounts of oil-based plastic components.

#### 5.2.3 Inbuilt resilience

The UK National Health Service has a degree of resilience to peak oil built in to its set-up. The NHS is used to responding to changing situations as a result of emergencies and political change. In the event of fuel supply shortages priorities would be adjusted to ensure provision of essential services. In addition the NHS still includes a strong base of General Practitioners embedded in communities. Most people in Bristol live within a mile of a GP. This provides a robust network of local primary facilities.

#### 5.2.4 Growing awareness

There is already some awareness in the NHS about the challenges of providing a sustainable service for the future. The January 2009 NHS Sustainable Development Unit report *Saving Carbon Improving Health* states "Investing in the energy efficiency and resilience of the estate is particularly important in view of the current supply climate, escalating fuel costs and the potential impact of 'peak oil'. Switching to low carbon forms of energy, such as renewables helps to guarantee supply and reduce the carbon footprint of the estate."<sup>3</sup>

### 5.3 Bristol's health service – specific vulnerabilities

#### 5.3.1 Vulnerability to oil supply stoppages

In a National fuel emergency, priority access to road fuel for essential community healthcare services is planned for. In the event of a local shortage the situation for Bristol would be managed by a multi-agency Strategic Coordinating Group, based on the membership of the Local Resilience Forum. See Section 2.5.

Sources:

- 1 <http://www.uhbristol.nhs.uk/files/nhs-ubht/UH%20Bristol%20Annual%20Report%202007-08.pdf>
- 2 <http://mysite.verizon.net/vze495hz/id19.html>
- 3 [http://www.sdu.nhs.uk/page.php?area\\_id=2](http://www.sdu.nhs.uk/page.php?area_id=2)



The ability to keep services running would, however, depend heavily on the ability of staff to reach work. Emergency guidelines for fuel provision do not include planning for 'home to work' journeys.<sup>4</sup> Business continuity plans for healthcare organisations must identify alternative means of transportation for staff, such as car sharing, the use of public transport and arrangements for working from home where possible. Recent data collection for office based staff at NHS Bristol Community Health showed that less than 20% of staff lived within a 30 minute walk of the office, so reliance on functioning public transport is high.

### Flashback!

**BBC, 12 September 2000**

"According to the Department of Health, hospital services across Britain are already coming under "massive pressure"...Officials have warned that if the fuel shortages continue lives could be put in peril...

One of the biggest problems facing NHS hospitals is ensuring that staff are able to turn up to work...One of the greatest threats to the smooth running of the NHS is if supplies of essential medicines and products begin to dry up...

If suppliers of blood and other products are unable to carry out deliveries, hospitals across Britain will stockpile blood for emergency use, again cancelling routine operations...

Even the effects of disruption to ancillary services such as cleaning and catering can be pronounced...If laundry companies cannot pick up or drop off fresh linen, the pressure is on to restrict the amount of non-urgent work..."<sup>5</sup>

GP surgeries are also vulnerable to staff access issues. Failure to keep local services going may lead to people needing emergency hospital services which would put further strain on the system. Community pharmacies are not covered by emergency arrangements for priority access to road fuel supplies. It is also a requirement for a pharmacist to be on the premises in order to be permitted to open so ability of the pharmacist to get to their place of work is another important factor for risk management.

Every NHS organisation relies on a network of critical contractors and suppliers for delivery of laundry, cleaning, medical supplies, catering, clinical waste disposal and security. National emergency arrangements do include provision for priority access to road fuel for these identified service providers but it is equally as important that these organisations develop their own business continuity arrangements to ensure their resilience during acute fuel shortages.

### Flashback!

**The Guardian, September 15 2000**

"Hidden costs of the blockade continued to bite elsewhere, however, particularly in cutting visits by relatives to sick and dying relatives. West Yorkshire hospice chaplain Rev Daphne Green said, "The grief caused hasn't perhaps been fully realised. We had a funeral where relatives couldn't attend because they had no petrol and it was very upsetting.""<sup>6</sup>

Although no longer a primary fuel, oil is used in Bristol hospitals for running backup power generators which are required when local electricity supplies are interrupted. Fuel-oil is also used as a backup for heating systems with gas as the primary fuel. Hospital trusts therefore need to maintain bunkered fuel stocks as part of their resilience.

#### Sources:

4 [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_089955](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_089955)

5 <http://news.bbc.co.uk/1/hi/health/921898.stm>

6 <http://www.guardian.co.uk/uk/2000/sep/15/oil.business7>



### 5.3.2 Vulnerability to rising oil price and oil price volatility

The effect of a steep rise in oil price on Bristol's Health Services would be most immediately felt in relation to the cost of transport of staff and supplies. Hospitals rely on daily deliveries of supplies such as blood and clean bed linen. Keeping health facilities running also relies on staff being mobile – Bristol Community Health, for example, has approximately 1,250 mobile staff – nurses who care for people at home, health visitors, school nurses, physiotherapists etc. All rely on cars for home visits every day.

According to an NHS Bristol contact, contract monitoring data showed that in Bristol alone, non-urgent patient transport provided directly by the NHS amounts to some 200,000 journeys and is worth approximately £5m per annum at 2008 prices. The Great Western Ambulance Service made 315,399 patient journeys in 2007/8 and ambulances run on oil-based fuels.<sup>7</sup>

Health service budgets are vulnerable in a number of areas and long-term high fuel prices and/or reduced supplies would have a significant impact on petroleum-based medicines and medical equipment. The NHS spends approximately £20 billion a year on supplies. A mere 5% increase in these costs would require an extra £1bn, which may lead to a reduction in services. Fuel is also needed for heating, cooling and running equipment. Across the NHS, buildings consume £410 million/year.

### Flashback!

#### NHS Employers DDRB evidence September 2008

"It is important to consider the impact of both current and future inflation levels on affordability of any recommendation. Fuel price increases in particular are imposing unexpected costs on NHS organisations both in terms of running their businesses and in relation to the delivery of goods and services to them. This also led to significant increases to car allowances paid to staff for the first time in seven years."<sup>8</sup>

## 5.3 Existing health policy, actions and measures and their effectiveness in preparing for peak oil

### 5.4.1 Current aims and objectives of Bristol Health Services Plan

The Bristol Health Services Plan<sup>9</sup> is reconfiguring and modernising local services based on the following objectives:

- ▲ Provide care closer to patients' homes.
- ▲ Provide effective local health services by harmonising primary care, social care and local hospital services.
- ▲ Develop specialist services and networks for a wider group.
- ▲ Provide a vibrant learning and education culture.
- ▲ Improve the efficiency, productivity and value for money of services.
- ▲ Enable local services to respond to national initiatives such as Creating a Patient-led NHS.
- ▲ Provide a model of care that is robust and able to withstand and inform organisational change.

This policy is not driven by peak oil but the first two objectives will build greater resilience if the threats from peak oil are recognised and

#### Sources:

<sup>7</sup> <http://www.gwas.nhs.uk/iOthPubs/Annual%20Report%2020072008.pdf>

<sup>8</sup> <http://www.nhsemployers.org/pay-conditions/pay-conditions-4313.cfm>

<sup>9</sup> [http://www.avon.nhs.uk/bhsp/documents/2005\\_Reports/051201\\_BHSP\\_Model\\_of\\_Care\\_Summary\\_Dec05.pdf](http://www.avon.nhs.uk/bhsp/documents/2005_Reports/051201_BHSP_Model_of_Care_Summary_Dec05.pdf)

#### 5.4.2 A selection of activities which could be extended to build resilience to peak oil in Bristol's health system

- ▲ The National Emergency Plan for Fuel<sup>10</sup> provides a framework for ensuring priority access to fuel for critical services during a national emergency.
- ▲ Local NHS organisations have worked with other Category 1 responder organisations across the Avon and Somerset Local Resilience Forum to produce local plans and procedures to implement the National Emergency Plan for Fuel.
- ▲ Bunkering or buying advance supplies of fuel provides medium-term mitigation to oil supply outages and price increases while longer term changes are implemented.
- ▲ Bristol NHS has a stated objective to provide "Less care in major specialist centres, more care closer to people's homes." Cutting journey distances for patients and staff will reduce dependence on fuel. The New Southmead Hospital is part of the delivery of this programme.<sup>11</sup>
- ▲ Increased public information about healthy lifestyle choices around diet, exercise and safety can help in reducing the need for treatment.

### 5.5 Health policy, actions and measures and to prepare Bristol for peak oil

#### 5.5.1 Drivers for a peak oil health policy

A health policy aimed at building resilience to peak oil would aim to:

- ▲ Urgently reduce overall energy usage.
- ▲ Focus on accessibility for patients, staff and service suppliers.
- ▲ Quickly phase out petroleum based vehicles.
- ▲ Decrease dependence on oil-based equipment, drugs and food and source essential supplies locally where possible.
- ▲ Increase focus on preventative healthcare.

#### 5.5.2 Additional activities which could be extended to build resilience to peak oil in Bristol's health system

- ▲ The NHS Guidance on Planning for Disruption to Road Fuel Supply, October 2008<sup>12</sup> is a document providing guidance on Business Continuity Planning for Healthcare providers. It stipulates the need for working with service providers to ensure increased resilience for emergency services in the event of a fuel crisis.
- ▲ The checklist section in the above document provides a useful starting point for healthcare providers to analyse their ongoing fuel dependence and work on reduction measures. These would also reduce the carbon footprint of NHS institutions.
- ▲ Bristol City Council Civil Contingencies Unit is working on identifying journey synergies between essential service providers during a fuel emergency. This could be extended to assess whether the synergies uncovered can also reduce oil dependence by adopting them as part of a business as usual scenario. There could also be opportunity to shorten overall travel distances by reorganising the schedules of outreach staff.
- ▲ Bristol NHS trusts will need to assess options for alternative transport fuels and the infrastructure to support them.
- ▲ Ensuring that GPs and health visitors have access to alternative transports appropriate to their travel distances, for example electric bicycles, would increase accessibility.
- ▲ Adoption of the targets and full life-cycle planning strategies put forward in the *Saving Carbon Improving Health*<sup>13</sup> report and collaboration with schemes like the Health Service Sector Campaign for Greener Healthcare<sup>14</sup> could establish overlap with climate change mitigation.

#### Sources:

10 [https://www.og.berr.gov.uk/downstream/emergencies/down\\_emerge.htm](https://www.og.berr.gov.uk/downstream/emergencies/down_emerge.htm)

11 [http://www.guide2bristol.com/news/50/Brand\\_new\\_Super\\_Hospital\\_one\\_step\\_closer/16\\_January\\_2009](http://www.guide2bristol.com/news/50/Brand_new_Super_Hospital_one_step_closer/16_January_2009)

12 [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_089955](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_089955)

13 [http://www.sdu.nhs.uk/page.php?area\\_id=2](http://www.sdu.nhs.uk/page.php?area_id=2)

14 <http://www.greenerhealthcare.org/home.html>



- ▲ The NHS carbon reduction strategy lists steps in its recommendations that, if implemented, would decrease dependence on oil-based equipment and drugs:
  - “Pharmaceuticals: Examine usage/wastage of pharmaceuticals; work with key manufacturers on lowering emissions; study the carbon intensities (kgCO<sub>2</sub>/£) by world region for generic and R&D medicines; investigate less drug intensive models of care.
  - Medical equipment: Investigate the breakdown of consumption by category – for example assessing the carbon impact of use of single use items and their alternatives.”

## 5.6 Well-being benefits

Many of the above options would also assist in climate change mitigation and adaptation policy as well as delivering additional benefits such as those below:

- ▲ Reduction in traffic would bring health benefits with regard to air quality and also reduce the number of traffic accidents.
- ▲ There is potential for improved health through increased physical activity from walking and cycling.
- ▲ Some studies show that more trees and green space can have positive effects on mental health.<sup>15</sup>

### Fast forward! Future scenario

‘Good morning. If you come this way I will take you through to the café. Over there is the kitchen garden where our local volunteers help out and through that orange door is the community space where courses and events take place. Ever since the economic crash we’ve had to make best use of every bit of space available, so the health centre is used evenings and weekends by the local people and all the land around it is used for horticulture, wildlife and recreation. Yes, it was an extremely challenging time when the recession and the oil crunch first hit. We were forced to look at every element of the healthcare system - not just by its cost, but also by its carbon impact and its vulnerability to oil shortage - and big adjustments had to be made.

In 2008 our drugs bill was soaring and a lot of it was so-called ‘lifestyle’ drugs – for high blood pressure, cardiovascular risk factors, anxiety, obesity and so on. There was this view that preventing illness was all about taking medicine, rather than about how you lived, and more pharmaceuticals and more cars and more roads were all seen as good for the economy even if they were bad for health. It’s hard to believe it looking back, but if you were fit enough to get out of bed and into your car that was normal, and for some people breakfast was often a bottle of fizzy pop and a chocolate bar. Nowadays we still deliver all the essential care, and diagnosis and cure for urgent problems, but people have had to face up to the need to really look after themselves. The fact is that once oil supply peaked there was no choice but to walk and cycle more, grow some of your own food, and to eat food made from fresh ingredients. This has had a dramatic effect on the nation’s health.

We also employ more staff now, our pharmacists actually dispense from stock instead of everything coming pre-packaged, and we do our own sterilising because we had to stop using all that disposable single-use equipment for everything. We have electric bicycles for staff that do a lot of home visits, and an electric car for if there is heavy equipment to take.

Peak oil has meant prioritising the things that matter most. We continue to do bone marrow transplants and cancer radiotherapy, but we’ve dramatically cut down on the way we use diagnostics and drugs. Yes it’s been difficult in some ways, but it’s remarkable to see how ordinary people have risen to the challenges.’

Dr. Chandra Padmahara  
Fishponds Health Centre

2035



## 5.6 Areas for further research

1. Investigate the feasibility of moving out-patient procedures to GP surgeries with doctors rather than patients travelling as necessary.
2. Investigate opportunities for reducing travel distances for health visitors and carers.
3. Investigate options for moving away from petroleum based transport fuels.
4. Research the vulnerability of services due to staff travel issues in the event of an oil crisis.
5. Investigate the feasibility of shared flexible use buildings as mobile information and service centres.
6. Investigate the likely impact of rising oil prices on key supplies and research more resource efficient options.
7. Investigate options for increasing preventative healthcare through information, vaccination and check-ups.



# Part Two:

## 6.0 Public services





## 6.0 Public services

### 6.1 Summary

#### Public services – Key Points

- ▲ Public service budgets will come under increasing strain due to higher running costs. This, combined with possible budget cuts due to high borrowing now will impact on services.
- ▲ Current 20 year planning policy is built on a mixture of trend-based forecasting and economic growth. Peak oil will challenge this and lead to changes in budgets and lifestyle assumptions.
- ▲ Growing economic hardship is likely to cause additional demand on public, social and emergency services.
- ▲ There are likely to be accessibility problems for both employees and the public, especially where services are centralised or employees commute to work.

### 6.2 Background

Bristol City Council either coordinates or provides the majority of Bristol's public services. It is one of the city's major employers and overall, public services in Bristol account for 30% of employment.<sup>1</sup>

Other key public services in the city include the Emergency Services – Police, Fire and Ambulance, the NHS (see Section 5 on Healthcare) and services run by departments of national government such as Jobcentre Plus.

The key services at least partially dispensed or managed by the Council are public transport services, community care, education and learning, city planning and waste management services. The Council is also a major landlord with approximately 29,000 properties.

Public services would be impacted by peak oil both directly through increased transport and fuel costs and indirectly through economic strain which could lead to budget cuts and

increased demand for services from growing numbers of people either struggling financially or unemployed.

### 6.3 Specific vulnerabilities to Public services in Bristol

#### 6.3.1 Vulnerability to oil supply stoppages

##### Emergency services

The emergency services, NHS and Bristol City Council are among the Category 1 responders for the area who would receive fuel or access to supplies for essential services in the event of a national fuel emergency - see Section 2.5. Cancellation of services that are not considered essential is likely to put extra strain on essential services, especially if outages are frequent or prolonged.

##### Bristol City Council

BCC has identified around 500 staff who would need to be mobile in order to deliver critical services during a fuel crisis as part of Local Resilience Forum fuel emergency planning. The extent to which staff are either able to reach work or work remotely in an emergency will be an important factor in the potential vulnerability of services. According to the 2007 BCC staff survey, the primary mode of transport to work is the car for just over 50% which could prove a problem if no other options are available.

##### Other services

The public's ability to cope with an emergency will be directly affected by accessibility to 'non-essential' services and facilities. Schools, for example, may have to close if public transport is affected by fuel shortages as they can only stay open if a sufficient number of staff members can get to school on a given day.

Source:

1 [http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset\\_id=27935008&](http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset_id=27935008&)

**Flashback!****BBC News, 14 September 2000**

“The fuel shortage which has led to a south Wales council shutting most of its secondary schools could afflict primary schools too before things improve.

Four primary schools in the Bristol area are also now closed, and two in Birmingham.”<sup>2</sup>

Areas of Bristol lacking easily accessible free service centres for support services such as the Department of Work and Pensions, Tax offices or Council Service Points would be vulnerable.<sup>3</sup> One way to provide services without a local office is to use phone-based systems. This solution does, however, exclude some vulnerable people as some services rely on both a high level of English and access to a landline in order to make use of freephone numbers.

### 6.3.2 Vulnerability to rising oil price and oil price volatility

#### **Oil price inflation and the vulnerable**

Steeply rising oil and food prices would hit those on low incomes first as cuts to personal spending would hit essential items rather than luxuries or ‘nice to have’ items and services. Bristol is on average a prosperous city though not all its inhabitants share in this prosperity. Both the *2008 State of the City evaluation report*<sup>4</sup> and the *Deprivation in Bristol 2007*<sup>5</sup> report acknowledge that the city has a number of areas of multiple deprivation. This shows that a significant number of Bristol citizens are potentially vulnerable to oil price inflation, though there have been no local studies on the issue. Benefit payments are only inflation adjusted annually so in the case of rapid fuel or food inflation the cost of essentials would lead to stress and possible dysfunction in some areas of the city.

#### **Oil price volatility, pressure on public services**

Rapid escalation in fuel prices and the knock on effects in the wider economy could lead to an increase in the number of people seeking support services. According to a Bristol welfare advisor, current official data already underestimates the issue of deprivation due to challenges in reaching people to advise them of available benefits. Public services are already anticipating increased pressure on services due to climate change adaptation. A report by the Meteorological office for the Department of Works & Pensions points out the risk of increased demand for crisis loans in response to extreme weather.<sup>6</sup> The combination of the impact of peak oil combined with climate change is likely to put significant stress on services unless adaptation can be undertaken in advance.

While reliance on oil for heating in public buildings has been much reduced by Bristol Council in the last decade there are still a small number of buildings which would be impacted by increases in the cost of heating oil. As heating systems come up for replacement they are being replaced with gas furnaces unless gas hook-ups are not available. As noted in Appendix 3, there is also a future risk to gas supply.

#### **Oil price volatility and public service budgets**

In time, rising and volatile oil prices will impact on the budgets of public services providers and their contractors due to their reliance on oil-based transport. In the short-term, fixed price contracts or advance fuel purchases can provide some protection but the BCC vehicle fleet is nearly 90% oil dependent and there are plans to increase this with the phase out of LNG (Liquefied Natural Gas) vehicles.

Sources:

2 <http://news.bbc.co.uk/1/hi/education/924625.stm>

3 <http://www.bristol.gov.uk/ccm/content/Council-Democracy/access-to-bristol/a2b-visit-us.en>

4 [http://www.bristolpartnership.org/resources/documents/State\\_of\\_the\\_City\\_-\\_evaluation\\_report\\_version\\_1.pdf](http://www.bristolpartnership.org/resources/documents/State_of_the_City_-_evaluation_report_version_1.pdf)

5 <http://www.bristol.gov.uk/ccm/content/Council-Democracy/Statistics-Census-Information/file-storage-items/deprivation-in-bristol-2007-report.en>

6 <http://www.dwp.gov.uk/sus-dev/adapting-to-climate-change.pdf>

Outsourced services such as rubbish collection, road gritting and road maintenance are also reliant on oil. The police have a fleet of 660 cars and motorbikes running on petrol and diesel. Other areas of strain would come indirectly, via increased cost of heating fuel and food provision, as well as a likely increase in demand for support services based on economic hardship.

### Flashback!

#### Local Government Association Press Release, 03 July 2008

"The rising costs of oil, petrol and diesel have increased the cost to councils of providing local services by £239m in the last 2 years, according to new research undertaken by the Local Government Association published today.

The research has found that in 2006/2007, councils spent £541 million on fuel costs to run vehicles such as their rubbish bin fleets, gritters and meals on wheels vans. In this financial year (April 2008 – March 2009), it is expected that should prices stay at the same level as they are currently, then it will cost £780 million to provide the services."<sup>7</sup>

The head of the UK Audit Commission, Steve Bundred, has already warned that the current high levels of public borrowing in response to the credit crunch mean that public services should prepare for substantial expenditure cuts.<sup>8</sup>

#### Oil price inflation and crime

Oil price rises in 2008 resulted in increased fuel related crime such as fuel theft in the South West. High fuel and food prices in the future may lead to increased crime and dysfunction.<sup>9</sup>

#### Spatial planning strategy

The spatial planning strategy of the city and the region play a vital role in determining how

Bristol will function in the future and how resilient communities will be to energy security challenges like peak oil and to climate change.

Current Bristol planning strategies, which are guided by central government, do not factor in peak oil as an issue or a risk. Planning for the next 20 years will be determined by the *Bristol Development Framework* (BDF) document, which is currently in review stages, so this is a major vulnerability. A growing number of experts are predicting an oil crunch within the next decade which would create limits to planned policy as well as changed priorities for land use.

The BDF draft includes plans to develop the city to accommodate higher demand for housing and employment, both as a result of a projected increase in population and social trends towards smaller households. Housing numbers are calculated by local estimates based on trends and government policy aimed at centring growth on large towns and cities. The government is calling for 36,500 new dwellings for Bristol by 2026.

There are a number of sustainability criteria built into the draft BDF preferred options;<sup>10</sup> new housing developments will need to meet the latest environmental build criteria, minimise waste and ensure accessibility through retention of commercial space in the city, mixed use, and public transport link ups. Recommended density of development is currently 65 dph (dwellings per hectare). The amount of housing called for by the government means that it is likely that some of it would be built on land which is currently either greenbelt or urban open land. The joint local authorities of Bristol and the surrounding counties have agreed that brownfield sites should be brought into development before greenbelt sites. However, as greenbelt sites are often more desirable to

#### Sources:

- 7 <http://www.lga.gov.uk/lga/core/page.do?pageid=772673>
- 8 <http://news.bbc.co.uk/1/hi/business/7916356.stm>
- 9 <http://www.thisisbristol.co.uk/news/Rising-pump-prices-fuel-crime-surge/article-229806-detail/article.html>
- 10 <http://www.bristol.gov.uk/ccm/content/preview/Environment-Planning/Planning/planning-policy/bristol-development-framework/core-strategy-preferred-options-paper.en>,  
<http://www.bristol.gov.uk/ccm/content/Environment-Planning/Planning/planning-policy-documents/bristol-development-framework/core-strategy-preferred-options-review-paper.en>



developers, pressure to meet housing targets could lead to this agreement being waived.

An oil supply crunch would have a significant impact on plans for new developments. The BDF is built on the assumption of continued economic growth at above average UK levels. Even in the event of recovery from the present recession, peak oil will challenge this assumption and put strain on development as construction companies struggle with rises in the cost of raw materials and commodities. Local authorities face budget deficits and problems in oil supply and inflation due to oil prices is also likely to have significant impact on personal budgets and priorities. Areas that may experience change include social housing, gardens/allotments, types of employment, average acceptable commute distances, the need for parking, the average number of people per dwelling and the use of community spaces.

A parks and green space strategy<sup>11</sup> has recently been adopted for the city. The plan highlights the need to protect biodiversity and improve the quality of green spaces for residents. It also touches on the use of biomass for energy production from green spaces in and around the city. In order to raise some of the funding for the green space programme the Council is planning to sell some 'low value' marginal land. Changes in priority for land use brought by peak oil are not yet integrated into this strategy.

Bristol includes several areas which are prone to flooding. BCC is currently gathering evidence for adaptation requirements for climate change. A 2006 supplement to the UK Planning Policy Statement deals with this as a key priority.<sup>12</sup> Peak oil could impact both the affordability and feasibility of major infrastructure requirements for additional flood defences as construction costs increase.

Planning policy has the authority to ensure that new buildings and developments are

resilient to peak oil and ready for climate change. However, creating resilience across the whole city will require the same kind of accessibility and retrofitting work to be done in existing neighbourhoods. A key issue here is that there is no one organisation which has either the responsibility or authority to create these changes quickly. Most land and buildings in the city are not owned by the Council and therefore only need to meet new planning regulations if changes are being made.

## 6.4 Existing actions and measures in the Public services and their effectiveness in preparing Bristol for peak oil

### 6.4.1 Current status of Bristol public services with regard to peak oil

Apart from emergency planning for temporary fuel supply stoppages, none of the public services is specifically preparing for peak oil or including it as a risk factor when determining policy. Some actions and policies being taken or proposed as a result of climate change adaption or mitigation can build some resilience to the effects of peak oil but it is unlikely that they would be enough to prevent serious consequences.

### 6.4.2 A selection of existing activities which could be extended to build resilience to peak oil

- ▲ BCC is engaging in work across its services in order to decrease CO<sub>2</sub> emissions. This work focuses on more efficient use of fuel and power use and improved accessibility to services.
- ▲ By encouraging recycling, BCC has helped reduce the volume of household waste by approximately 5%; a trend which should ultimately reduce the collection and transport burden. A new contract to process organic waste in Avonmouth rather than in Dorset will further reduce travel distances.<sup>13</sup>

#### Sources:

11 [http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset\\_id=23438018](http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset_id=23438018)

12 <http://www.communities.gov.uk/documents/planningandbuilding/pdf/153119.pdf>

13 <http://www.newearthssolutions.co.uk/2008/06/bristol-city-council-award-a-major-waste-contract-to-specialist-composting-and-resource-recovery-firm-new-earth-solutions/>

- ▲ The Preferred Options for new developments in Bristol contain a number of sustainability criteria relating to accessibility and zero carbon standards for 'eco-neighbourhoods'.
- ▲ Neighbourhood partnerships have been created across the city to help communities shape the future on local issues.<sup>14</sup> This is an opportunity to get people involved in issues around planning, energy, waste and employment in their community.
- ▲ The council has a number of schemes to reduce domestic power use and address fuel poverty. These include a major programme of work to make significant improvements to Council Housing and grants for home-owners. Air source heat pumps are being investigated for Council homes with no access to gas.
- ▲ Current fuel emergency strategy including fuel bunkering provides protection against the impact of short-term oil stoppages.

See also related measures in Section 3 on Transport and Section 4 on Food.

## 6.5 Specific vulnerabilities to Public services in Bristol

### 6.5.1 Drivers for a peak oil transport policy

The ability of the public sector to provide services in an oil crunch will depend on a variety of factors including:

- ▲ Resilience of mobile services to oil supply stoppages and/or increased fuel costs.
- ▲ Accessibility of services to the public.
- ▲ Ability of public servants to get to work.
- ▲ Ability to keep schools, day care, courts, community services and prisons etc. running.
- ▲ The number of people needing health and social care services.

### 6.5.2 Additional activities which could be extended to build resilience to peak oil

- ▲ Planning needs address the following: protection of sufficient land for food production and local facilities; locally

generated heating/cooling and power for new builds; decisions regarding land adjacent to future transport links, e.g. rail freight facilities; protection of woodlands from development with a view to a greater need for local biomass.

- ▲ Include peak oil resilience indicators in BCC climate change adaption planning to ensure that measures apply to both and therefore move towards a genuinely sustainable city.
- ▲ All BCC key spending decisions currently undergo an eco audit which includes CO<sub>2</sub> emissions considerations. Adding peak oil indicators to this looking at fuel use and showing the impact of escalating prices on project costs, as well as efficiency, would lead to planning decisions more resilient to peak oil.
- ▲ Ensure that planning policy takes peak oil into account for changes in existing neighbourhoods and buildings as well as new builds. Making changes in existing neighbourhoods will need strong community involvement.
- ▲ Use a combination of efficiency planning and improved accessibility to work within and across organisations to reduce the number of journeys necessary to provide public services.
- ▲ Using large amounts of fuel to collect and remove domestic waste is fuel inefficient and costly. Stepping up strategies to decrease packaging waste through information, taxation or lobbying would be financially beneficial. Clean recycling options, which avoid thermal combustion, would open up the possibility of dealing with remaining waste in the city and reduce the need for transport. Anaerobic digestion of organic waste would provide bio methane for fuel.
- ▲ Bulk advance purchase of fuel would limit immediate exposure to escalating fuel prices while long-term measures are being implemented.

Source:

14 <http://www.thisisbristol.co.uk/nov52008/Bristol-council-devolves-power-neighbourhoodsarticle-453150-details/article.html>



- ▲ Develop emergency planning to include contingency plans for public services and vulnerable people in the event of sharp rises in oil prices. It may, for example, be necessary to have emergency housing planning provisions if economic conditions cause a shortfall in particular housing categories.
- ▲ Extend public information to include advice for building resilience to peak oil, energy inflation and insecurity. Many actions could also help in building resilience to climate change.
- ▲ More community police officers on foot or cycling would increase interaction with people and be resilient to fuel disruptions.
- ▲ Creating a 'flexible use' approach to buildings may make it possible to provide more services close to the public. The same building could serve different purposes on different days.
- ▲ Increased fuel costs may lead to the need for increased access to community

centres or similar services that allow people to reduce home heating costs by spending time in communal spaces.

See also related measures in section 3 on Transport and section 4 on Food.

## 6.6 Well-being benefits

Many of the above options would also assist in climate change mitigation and adaption policy as well as delivering the additional benefits below:

- ▲ Improved local accessibility to services removes the stress caused by expense and inconvenience.
- ▲ Policies which support community involvement help reduce isolation for vulnerable people, such as the elderly. The government estimates that exclusion is often linked with poor health, depression and behavioural issues.<sup>15</sup>
- ▲ Greater community involvement in local decision making would lead to stronger neighbourhoods.

### Fast forward! Future scenario

'Recycling has costs in terms of energy and environmental impact and lot of energy is used in transport and processing of materials. That might have worked in a 'cheap oil' economy but once we realized that peak oil was coming we had to start rethinking our approach to waste.

So around 2013 we shifted our emphasis from recycling to repair and re-use and where recycling was the only option we looked at increasing efficiency and reducing transport miles.

This led to the introduction of a new waste management strategy which gave, amongst other things, incentives to encourage the revival of a 'repair, rent and re-use' culture. Businesses that offered repair or rental services were given a 25% discount on their business rates. That was a pretty significant boost in a post recession economy and it helped stimulate the revival of local business. Now nearly every neighbourhood high street has a place where you can get clothes and shoes mended, and your electrical appliances, white goods and furniture repaired. In 2016 we brought in repair cards so customers who had paid for three repairs got a fourth repair free.

That same year we introduced an education plan which became part of the curriculum in 2018. One of the issues included was the re-localisation of food waste processing. As most schools and community centres had their own vegetable gardens it made sense to start teaching school staff and householders how to build and look after a compost heap. The council still offers pickups of food waste but they never have to travel further than a couple of miles to the nearest market garden composting facility. These facilities not only produce compost for food production, but also the biogas which powers all public transport vehicles.'

Liam Harvey  
Bristol Waste Management  
2030

Sources:

<sup>15</sup> <http://www.cypnow.co.uk/news/761602/>,

[http://www.cabinetoffice.gov.uk/social\\_exclusion\\_task\\_force/news/2007/070618\\_steps.aspx](http://www.cabinetoffice.gov.uk/social_exclusion_task_force/news/2007/070618_steps.aspx)



## 6.7 Areas for further research

1. Develop a set of resilience indicators for the city which can be used as measurement targets for preparing for peak oil.
2. Investigate the options for low energy service provision (for example waste management).
3. Research vulnerability of services in an oil stoppage due to staff travel issues.
4. Research ways of reducing future flood risk which minimise the need for construction of oil-based infrastructure.
5. Investigate opportunities for reducing travel distances for health visitors, carers, police officers and other public service providers.
6. Investigate the feasibility of shared flexible use buildings to provide mobile information and service centres.
7. Investigate possibilities for alleviating housing shortfalls through more efficient use of existing stock through incentives or planning laws.

# Part Two:

## 7.0 Key economic sectors



## 7.0 Key economic sectors

### 7.1 Summary

#### Key economic sectors – Key Points

- ▲ Economic planning for Bristol and the South West does not include risk planning for peak oil or energy security issues.
- ▲ High raw material and transport costs and constrained consumer spending will radically change what is economic as a result of peak oil. Viable business in the future will inherently be low energy and resource efficient.
- ▲ High oil prices are likely to favour a more localised economy for essential goods and services.
- ▲ Attention is currently focused on the existing economic crisis and largely seeking solutions to return to business as usual which will be vulnerable to further disruption as peak oil impacts.

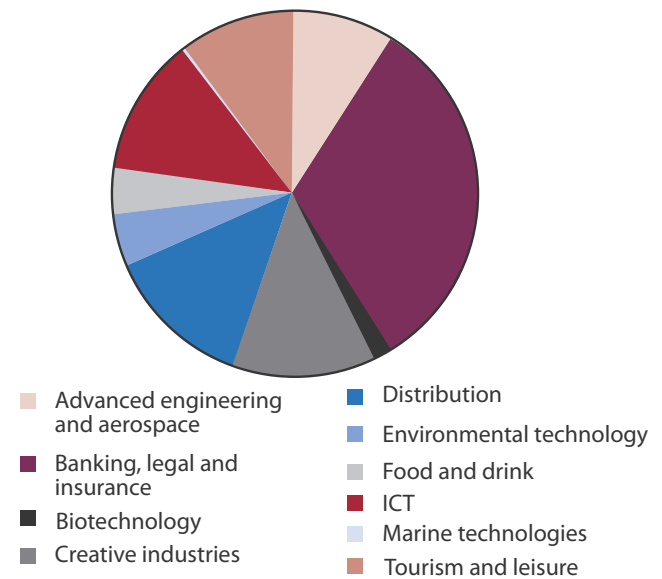
### 7.2 Background

#### 7.2.1 Bristol's economy

Bristol and the West of England region have a mixed economy in which around 59 different sectors each employ 1000 or more people<sup>1</sup>. Of the 500,000 people employed in the area approximately two thirds are employed in greater Bristol. Over the last 25 years, Bristol has successfully transformed its economy and reinvigorated the city after a slump in the late 1980s-early 90s. Bristol's business community has been a driver in this process working in partnership with Bristol City Council and the community sector both in the city and also across the region.

The strengths of the current Bristol economy are its access to a large and skilled labour market, its role as a regional centre, the availability of relatively low cost sites and premises within reach of London and its amenities and attractive environment.

While local issues are important, Bristol is also part of a globalised economy. Major global employers such as Hewlett Packard, Astra Zeneca, Rolls Royce and Airbus have operations in Bristol.



**Figure 9:** West of England Key Sector, Source: ABI 2006

#### 7.2.2 Challenges to Bristol's economy

The credit crunch is a concern for the region. The financial sector is under stress across the Europe and the US, the public sector may face spending cuts and it is a challenging time for the aerospace industry. According to the Centre for Cities report *Into Recession: Vulnerability and resilience in Leeds, Brighton & Bristol*<sup>2</sup>, at a UK growth of -1.1%, Bristol could face job losses of 7500 between 2000-2011 and if growth falls to -2.5% it could be as many as 20,600.

Peak oil and energy security are not named threats in local strategic plans and reports even though planning is for a 20 year period to 2026. Though energy security as an issue is absent, carbon reduction and the need to ensure 'sustainable growth' are mentioned frequently in the SWRDA *Progress Report 2007/8*<sup>3</sup>, the *South West RDA What's Next 2008-11*<sup>4</sup> and in the Bristol Partnership's *State of the City evaluation report*<sup>5</sup>. Businesses

Sources:

- 1 <http://www.westofengland.org/media/65072/annual%20economic%20review%202007%20-%20ammended.pdf>
- 2 <http://www.centreforcities.org/assets/files/Into%20Recession.pdf>
- 3 <http://download.southwestrda.org.uk/res/general/RES-Progress-Report-2007-8.pdf>
- 4 [http://download.southwestrda.org.uk/file.asp?File=/corporate-plan/general/Corp\\_Plan\\_Summary\[3\].pdf](http://download.southwestrda.org.uk/file.asp?File=/corporate-plan/general/Corp_Plan_Summary[3].pdf)
- 5 [http://www.bristolpartnership.org/resources/documents/State\\_of\\_the\\_City\\_-\\_evaluation\\_report\\_version\\_1.pdf](http://www.bristolpartnership.org/resources/documents/State_of_the_City_-_evaluation_report_version_1.pdf)



respondents to the peak oil questionnaire sent out for this report all saw a need for a significant change in energy use within 5 years.

#### SWRDA Progress Report 2007/8, Regional Economic Strategy for South West England

"Clearly, the South West economy does not operate in a vacuum and over the course of the last year the national and global context for RES delivery has changed significantly. Soaring oil prices, the downturn in the housing market, and the associated credit crunch are all having a direct impact on the economic health of the region." - Jane Henderson, Chief Executive, South West RDA.<sup>6</sup>

### 7.3 Specific vulnerabilities to Bristol's key economic sectors

#### 7.3.1 Vulnerability to oil supply stoppages

In the event of frequent supply stoppages the cost to business would be damaging. It is estimated that the 2000 fuel stoppage cost the UK economy £1bn.

#### Flashback!

##### The Guardian, 16 September 2008

"Businesses across Britain are this weekend assessing the financial impact of the week-long petrol drought, and it is predicted that the overall cost could top £1bn.

Lost orders, overtime demands, stranded staff, bank charges and production cutbacks hit the beleaguered companies to the tune of £250m a day as the pumps ran dry."<sup>7</sup>

#### Office-based service industries

In the event of a supply stoppage many businesses would be able to continue to function with only a mild impact to service. Many employees in Bristol's large financial,

biotech, media and consulting sectors, would be able to work from home, at least for a limited period. Some meetings and appointments would be cancelled or postponed and deliveries missed, but many tasks could be continued virtually.

#### Retail

Other than the food sector, which is covered in detail in section 4.0, the effect on businesses would likely vary with both winners and losers. Travel disruption could affect staff mobility, but also customer mobility meaning that 'walkable' shops would likely increase business share. The retail sector would be vulnerable to supply chain difficulties caused by lack of fuel for haulage.

#### Manufacturing and construction

The manufacturing and construction sectors where on-site work is required are more vulnerable to supply disruptions and travel difficulties for employees. The impact would vary across disciplines, with work such as computer design being relatively unaffected.

#### 7.3.2 Vulnerability to rising oil price and oil price volatility

##### Manufacturing and distribution

The speed with which rising oil prices would affect business varies according to sector. For sectors such as the chemical industry in Avonmouth,<sup>8</sup> where oil or related commodities are key inputs, the effect will be direct. Rising cost of raw materials will have to be absorbed or passed on to customers.

In a protracted global oil crunch with ongoing high prices, industries and business models that rely heavily on oil-based fuels would be highly vulnerable; projected air travel growth would not occur as economic pressures would not be compatible with cheap airfares.

#### Sources:

6 <http://download.southwestrda.org.uk/res/general/RES-Progress-Report-2007-8.pdf>

7 <http://www.guardian.co.uk/uk/2000/sep/16/oil.business3>

8 <http://www.westbusiness.co.uk/news/bristol/88-jobs-at-risk--as-chemical--company-to--close-av.aspx>

**Flashback!****The Daily Telegraph, 17 June 2008**

"... producers and manufacturers have seen their raw material costs, which include oil and energy, climb by almost 30% over the past year. Rising costs mean businesses have to make choices about how to ensure their profits do not fall dramatically...But the problem with the high value of oil is that it affects customers directly too... "Oil prices do two things for companies. First of all they raise their own costs, but secondly, because they squeeze the real income of their customers, you also get weaker demand..."<sup>9</sup>

**Construction**

The construction sector in Bristol employed 7.2% of the workforce in 2006/7 and is vulnerable to the impact that high oil prices will have on commodities such as metals and concrete. Prices for key materials such as steel rose along with the price of oil in 2008.<sup>10</sup>

**Retail and Services**

An ongoing oil crisis would present retailers with multiple challenges. A reduction in car use would challenge the business model of retail parks. Long distance supply chains and increasing volatility in prices of raw materials would affect profit margins, requiring either a reduction in margin, or passing on increases to customers. The clothing industry faces similar problems to food production as natural fibres like cotton are currently intensively produced using fuel intensive agricultural methods. Many synthetic fabrics have petroleum and gas-based raw materials.

The retail sector and customer facing service industries in particular will quickly begin to feel the effects of changes in customer spending, leading either to a reduction or increase in market share. As costs rise on basics like transport, fuel and food, spending on 'unessential' items will decrease.

Sources:

9 <http://www.telegraph.co.uk/finance/newsbysector/energy/2791857/Milk%2C-beer%2C-soap-why-the-price-of-oil-directly-affects-everything.html>

10 <http://www.cnplus.co.uk/materials-prices-rocket-on-back-of-high-energy-costs/1888772.article>

11 <http://www.thisislondon.co.uk/standard/article-23493937-details/Higher+costs+at+the+pumps+are+driving+motorists+off+the+roads/article.do>

**Food, hospitality and tourism**

The food services sector is highly vulnerable to peak oil due to the pressures on global food production (detailed in section 4), and the economic pressures described above. A rise in oil price will also impact international tourism, domestic disposable income and business hospitality spend.

**Commuting**

Bristol is highly dependent on commuters from the surrounding areas for its qualified workforce. A severe rise in fuel costs could affect employees' ability to afford to commute. While Bristol's Universities are highly rated, results from schools are currently below UK averages so businesses in some part rely on attracting skills from outside the city. Many Bristol businesses view employee transport as their main risk from high oil prices.

**Flashback!****The Evening Standard 12 June 2008**

"Drivers are starting to cut back on the amount of fuel they use because of the soaring cost of petrol...Meanwhile a survey found that one in six commuters said the cost of driving to work had made them consider quitting their job and looking for work closer to home."<sup>11</sup>

**Challenged business models & Recession**

Many businesses are built on a model of redundancy and replacement. Success is based on high volumes of sales of goods and low cost manufacture using globalised labour markets. The model extends across the industries and includes products that range from phones, computers, TVs and printers, to clothes, home furnishings, books, tools, bikes and cars. If raw materials and energy resources are expensive and customers' budgets for 'non essentials' is limited, the fundamentals that make this model economic will be challenged.



Jeff Rubin and Benjamin Tal, CIBC World Markets Inc, 27th May 2008

"Globalization is reversible. Higher energy prices are impacting transport costs at an unprecedented rate. So much so, that the cost of moving goods, not the cost of tariffs, is the largest barrier to global trade today. In fact, in tariff-equivalent terms, the explosion in global transport costs has effectively offset all the trade liberalization efforts of the last three decades. Not only does this suggest a major slowdown in the growth of world trade, but also a fundamental realignment in trade patterns."<sup>12</sup>

Oil price shocks have a recessionary effect on the economy and changes in spending patterns across business and consumers have impacts across the board. There is a danger that the current recession and relatively low oil prices will favour businesses and retail outlets which are actually more vulnerable to the effects of peak oil in the long term due to their reliance on fuel inefficient production and distribution practices.

Current economic planning is based on existing trends. The draft report *West of England Sub Regional Economic Assessment* states that "The Regional Economic Strategy and the draft Regional Spatial Strategy provide for the continuing rapid growth of the local economy in accord with recent experience. The former proposes provision for an additional 122,000 jobs, comprising 92,000 for the Bristol area, 20,200 for the Bath area and 10,000 for the Weston-super-Mare area. Employment projections underlying these job growth provisions indicate that most of this growth potential is accounted for by the prospect of expansion in business services, education and health, and retailing." Energy constraints which are not at all accounted for will present challenges to these assumptions.

## 7.4 Existing actions and measures in Bristol economic sectors and their effectiveness in preparing for peak oil.

Some Bristol businesses have recognised peak oil as a threat and most see a need for a reduction in energy usage in the immediate future, though Bristol's regional economic organisations have yet to include detailed risk planning into future plans. The impact of peak oil is likely to lead to major changes in the economy and employment sectors. Both flexibility and innovation will be important in responding effectively to new opportunities.

### 7.4.1 A selection of existing activities which could be extended to build some resilience to peak oil in Bristol's economy

- ▲ A key business priority for Bristol is the improvement of the transport network and reduction of congestion. SWRDA has supplied funding support to Bristol transport improvements. Resilience will improve where these initiatives are directed towards moving people and freight away from road based transport.
- ▲ Programmes are in place to advise businesses on resource efficiency; the Envision initiative, for example, has been set up to help businesses in the region become more efficient and environment-friendly.
- ▲ The RDA strategy demonstrates a commitment to sunrise industries which will provide future employment in the region. The strong engineering bias of Bristol places it in a strong position with regard to renewable technologies. The *Regional Economic Strategy for the South West of England 2003-2010* suggests that the renewable energy sector could create 12,000 new jobs and generate an extra £260 million for the region's economy over a ten year period."<sup>13</sup>

Sources:

12 [http://research.cibcwm.com/economic\\_public/download/smay08.pdf](http://research.cibcwm.com/economic_public/download/smay08.pdf)

13 [http://www.regensw.co.uk/downloads/RegenSW\\_84.pdf](http://www.regensw.co.uk/downloads/RegenSW_84.pdf)



- ▲ Many businesses in the region already have plans for energy reduction in response to carbon reduction targets. Forum for the Future is launching the West of England Carbon Challenge to assist more businesses in reducing their carbon footprint.
- ▲ Bristol business organisations are working with the public sector to improve skills in the local work force through a number of programmes which include the School's Enterprise Network to promote enterprise in the region's schools. Creating opportunities for disadvantaged communities is being done through the New Deal programme, the Pathways to Work initiative, and Local Employment Partnerships.
- ▲ Many businesses now allow or promote working from home or 'home-shoring' which reduces commuting.

## 7.5 Policy, actions and measures and which would further prepare Bristol's economy for peak oil.

### 7.5.1 A selection of additional activities which could be extended to build resilience to peak oil

- ▲ Make energy security/affordability a key part of risk analysis in all areas of business planning.
- ▲ Link current energy saving initiatives for sustainable business with more awareness raising and understanding of energy security so these become something which is integral to business.
- ▲ Look at further ways to reduce daily travel and increase accessibility to work and flexible working to help employees reduce their fuel dependence. Shared office space for complementary organisations could make it feasible to have more than one regional location and may help employees reduce their travel.
- ▲ Bristol could create a vision to be a leader in creating new business models for a sustainable future by actively encouraging creative ideas for businesses which reduce resource consumption. This could be done through competitions or via colleges.
- ▲ Encourage investment in and proliferation of low-tech as well as hi-tech energy conservation solutions to provide more sustainable jobs. Awards and publicity could be given to innovative ideas.
- ▲ Build local partnerships which recycle waste materials from one business into raw materials for another, for example the recovery of waste oil<sup>14</sup>. Waste recovery and the growth of waste markets is identified as a critical area in *South West RDA What's Next 2008-11*.
- ▲ Undertake an assessment of which Bristol sectors are most vulnerable to peak oil and match the skills of those sectors with growth areas like renewables, energy storage, retrofitting and food production.
- ▲ The rising cost of globalisation could create more opportunity for a strong local economy which produces items that are currently imported. More expensive raw materials may lead to an increase in demand for repairable and upgradeable products leading to new and different employment opportunities.
- ▲ The creation of a local currency to run alongside the existing system is a positive way to encourage recycling of money within the local economy. Examples exist in Totnes and Lewes in the UK, Magdeburg in Germany and Great Barrington, MA.<sup>15</sup>

#### Sources:

14 [http://www.chemrec.co.uk/contacts/brochure\\_2.asp#future](http://www.chemrec.co.uk/contacts/brochure_2.asp#future)

15 <http://totnes.transitionnetwork.org/node/1350>, <http://www.thelewespond.org/>, <http://news.bbc.co.uk/1/hi/world/europe/6333063.stm>, [http://www.berkshares.org/directory/dir\\_list1.htm](http://www.berkshares.org/directory/dir_list1.htm)

## 7.6 Well-being benefits

Many of the above options would also assist in climate change mitigation and adaptation policy as well as delivering the following additional benefits:

- ▲ Less commute time for employees would reduce travel stress and increase productive time.
- ▲ Opportunity for innovation and creativity
- ▲ Opportunity for a diverse local economy with a broad range of opportunities which may provide new openings to people who are currently excluded.

### Fast forward! Future scenario

'When the price of oil went up things got a bit hairy for a while because nobody knew how to do anything useful anymore. Well, that's not strictly speaking true. But the era of cheap imports was rapidly coming to an end and people began to realise that we couldn't leave it to some foreign workforce to produce our clothes, furniture, tools and household goods anymore. We needed to relearn how to make things ourselves. A number of us saw this coming and had started looking to the older generations for advice on how to make things using traditional techniques and local materials. This was the start of a great re-skilling of the labour force in this country. The 'Not Dead Yet' project employed elderly people to teach youngsters practical skills such as sewing, food growing and building with local materials. It killed two birds with one stone as many elderly people were facing hardship after the collapse of the banks in 2009.

As part of this I got talking to my grandmother who was born in 1939. She told me about her mother who told her that in World War I they used to make soldiers' uniforms out of nettles. I got very excited about this idea, as I had always been interested in fabrics, and decided to research it further. I became an apprentice and learnt traditional techniques for producing cloth from nettles, hemp and flax and then adapted them to suit our contemporary life styles - combining different materials and dying techniques. Once the business got going I was able to offer small business loans to the people we had re-skilled through NDY to start their own companies. These cottage industries have really taken off and now supply a quarter of Bristol with clothing, tools and furniture, and there are NDY projects all across the country.

My husband? He runs a computer business with a few friends. He specialises in video conferencing so people can still do business over long distances. He is quite in demand as it works well for a lot of the design companies that use him. But then that's pretty much how things were going before the oil shock. I tease him sometimes and tell him he should keep up with the times and invent a new basket weaving technique; IT is so turn of the century!

Amanda Giles

Small world – specialists in hemp, nettle and linen fabrics

Clifton Wood

2030

## 7.7 Areas for further research

1. Research businesses models that are sustainable to the constraints of peak oil.
2. Research economic sectors that will be in demand in an oil constrained future and match these with the existing skill base in the city.
3. Investigate which current sectors of the economy are most vulnerable to peak oil and plan for redeployment of existing skills or re-skilling.
4. Research local currencies as an opportunity to support a local economy.
5. Research schemes to increase cooperation between businesses to include shared office space, power generation and recycling of waste products within the region.
6. Investigate financing options and models for a zero growth economy.





# Part Two:

## 8.0 Power and utilities



## 8.0 Power and utilities

### 8.1 Summary

#### Power & utilities – Key Points

- ▲ Reliance on oil for electricity generation is for extra power during periods of peak demand.
- ▲ Fuel prices for coal, gas and electricity are linked to oil prices and are likely to increase with peak oil.
- ▲ The UK faces challenges around future electricity and gas supply.
- ▲ Impending fuel constraints and the need for CO<sub>2</sub> reduction require reductions in energy consumption and investment and planning into sustainable sources of heat and power.
- ▲ Bristol does not have a strategic energy plan.
- ▲ Water and sewage services are major energy users.

### 8.2 Background

#### 8.2.1 Power

UK power generation is driven mainly by gas and coal with some renewables and nuclear power. Oil makes up only around 1% of the fuel mix; its main role is during times of peak

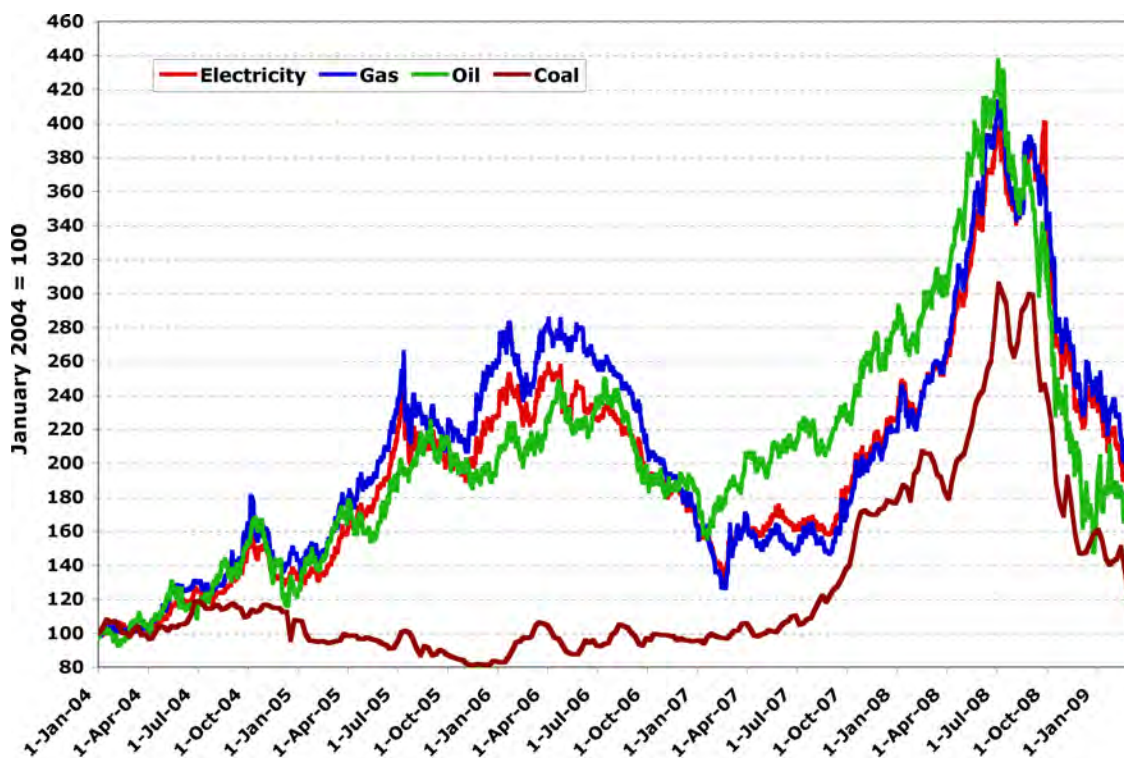
demand because oil turbines can be turned on quickly to manage the peaks.

The vulnerability to Bristol's power supply from peak oil is largely indirect. There is a strong link between the price of oil and that of other fuels and rising oil prices and supply constraints will have a knock on effect onto other fuels.

The UK already faces challenges with regard to gas supply and electricity generation (see Appendix 3), as well as an imperative to reduce CO<sub>2</sub> emissions from fossil fuels. Attempts to transition transport from oil could lead to extra demand for alternative sources of power, as could an increase in domestic manufacturing.

#### 8.2.2 Heating and cooling

The greater Bristol area is primarily reliant on gas and electricity for heat. Rural areas surrounding Bristol still have some reliance on oil fired heating systems. BCC has almost eliminated its reliance on oil for heating by replacing oil boilers with more efficient gas boilers and more recently with biomass boilers. Oil now accounts for only 7% of the energy for buildings, down from 17% in 2000/1. Some public buildings in Bristol are



**Figure 10:** Relative prices of electricity, gas, oil and coal 2004-January 2009, Source: John Hall Associates, Spectron, ICE and McCloskey

still heated using oil, but this is being phased out.

Vulnerability to Bristol's heating provision comes primarily from our high dependence on gas, the future supply of which is also insecure. Climate change is likely to lead to a higher demand for cooling but may reduce overall demand for heating.

### 8.2.3 Water

Water companies are major energy users to pump and treat water and sewage. High energy cost is listed as a key risk in The Bristol Water Annual Report 2008: "the company is a major energy user; power costs are constantly growing mainly due to crude oil cost increases. Total energy costs for the period ended at March 2008 increased by 12% compared to the year before."<sup>1</sup>

Water companies also use chemicals for purification. Bristol Water's report *The Future of Water*<sup>2</sup> states that 10MW of power a day is used to treat and supply a third of a million tonnes of water and high energy cost is listed as a key risk in Bristol Water's 2008 Annual report<sup>3</sup>.

### 8.2.4 General

The UK energy system is deregulated and built around an infrastructure fuelled by cheap fossil fuels.<sup>4</sup> This has led to a competitive market, but also results in a system which focuses on the economic viability of individual power stations and companies, rather than overall efficiency of energy usage and supply – heat from power stations, for example, is largely wasted as it is not commercially advantageous for power companies to build the infrastructure to use it.

Energy and utility companies earn money based on charging customers for units of energy. Whilst in this scenario it is in the customer's interest to reduce energy usage,

there is no strong incentive towards energy efficiency for providers.

There is currently no strategic energy planning at local and city levels on building maximum efficiency into requirements for heat, power, water and motorised transport, or to make use of opportunities for decentralised generation.<sup>5</sup>

## 8.3 Specific vulnerabilities

### 8.3.1 Oil supply stoppage

There would be minimal impact to utilities in the event of a short supply stoppage though some maintenance may be delayed due to transport difficulties. Long or frequent stoppages and global disruptions are likely to strain other fuel supplies.

### 8.3.2 Oil price rise

#### Fuel poverty

The price of gas and coal and electricity is linked to oil; if oil prices increase so will the cost of other energy sources which will have an impact on all sectors. Many UK households are already in fuel poverty and the government estimates that a 1% rise in energy bills would result in an additional 40,000 homes experiencing fuel poverty<sup>6</sup>.

#### Flashback!

##### Bristol Evening Post, 09 September 2008

"ALMOST 25,000 people in the Bristol area are having to pay out more than 10 per cent of their income on fuel bills, the Government has revealed. It means 4,100 families in Bath and North East Somerset, 10,200 in Bristol, 4,700 in North Somerset and 5,700 in South Gloucestershire live in fuel poverty, Energy Minister Malcolm Wicks has admitted."<sup>7</sup>

Sources:

1 <http://www.bristolwater.co.uk/pdf/aboutUs/companyReports/bwAnnualReport08.pdf>

2 <http://www.bristolwater.co.uk/pdf/environment/environmentWaterInTheFuture.pdf>

3 <http://www.bristolwater.co.uk/pdf/aboutUs/companyReports/bwAnnualReport08.pdf>

4 [http://www.saveonyourbills.co.uk/business/common/uk\\_energy\\_market.jsp](http://www.saveonyourbills.co.uk/business/common/uk_energy_market.jsp)

5 [http://www.dekb.co.uk/home/index.php?option=com\\_content&view=category&id=82&Itemid=93](http://www.dekb.co.uk/home/index.php?option=com_content&view=category&id=82&Itemid=93)

6 <http://www.berr.gov.uk/files/file16807.pdf>

7 <http://www.thisisbristol.co.uk/news/true-price-soaring-fuel-bills/article-314381-detail/article.html>



### Rising electricity demand

The economic imperative to use alternative fuels for transport, increased usage of IT communication and online data storage<sup>8</sup> and the rising population is likely to further increase electricity demand. Without prioritisation and energy efficiency this could put power supplies at risk. BCC states that "Despite an energy efficiency drive in recent years, electricity consumption is rising, particularly in schools, where there has been a growth in the use of computers."

### Rising transport and maintenance costs

Although not high users of oil directly, power and water companies use oil for transport. Transport is required for deliveries of fuel to power stations and removal of waste, as well as for maintenance vehicles.

### Rising cost of new power additions

Volatile oil prices will have serious economic implications for all new infrastructure developments<sup>9</sup> as costs for raw materials and construction are impacted. Mining for coal, metal ores, limestone for cement and concrete are all dependent on oil powered vehicles.

## 8.4 Existing actions and measures around utilities and their effectiveness in preparing for peak oil.

Current measures for energy reduction are focused on meeting GHG reduction targets. This is an important approach but doesn't take into account the economic and supply impacts that peak oil could have even on cleaner forms of energy generation. Efficiency and behavioural changes that reduce the overall amount of energy consumed will be the best way of reducing these impacts.

### 8.4.1 A selection of existing actions which could be extended to support energy security in Bristol

- ▲ BCC has a goal to demonstrate best practice with regard to energy conservation and CO<sub>2</sub> reduction. Many schemes are underway, including:
  - Installation of biomass boilers in schools and public buildings which use wood waste fuel collected from the council's parks.
  - A major programme of insulation and energy efficiency measures in council buildings.
  - Installation of a number of small combined heat and power plants in housing blocks.
  - BCC has gained approval to build two wind turbines in Avonmouth to work towards meeting renewable energy targets for the region<sup>10</sup>.
- ▲ Much of Bristol's housing is poorly insulated with CO<sub>2</sub> emissions twice those of dwellings built to today's building standards. A number of grants are available and listed on the BCC website. BCC has also launched Home Action Zones to focus on getting results in specific areas of the city. Forum for the Future has identified a need to accelerate retrofitting of existing housing stock and is developing a program to make this accessible with minimum cost at point of delivery. The target is to insulate 1000 homes by the end of 2011.
- ▲ Regen SW<sup>11</sup> has produced a report on the possibilities for renewable power in the South West. BCC has commissioned a study on the possibilities for Bristol<sup>12</sup>.
- ▲ Wessex Water is making use of biogas from sewage to power sewage plants via CHP and has plans to install wind turbines with a view to making the plant a net energy supplier.

Sources:

8 <http://www.guardian.co.uk/technology/2009/may/03/internet-carbon-footprint>

9 <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldconaf/195/8061003.htm>

10 <http://www.bristol.gov.uk/ccm/content/Business/avonmouth-wind-turbines-proposal.en>

11 [http://www.regensw.co.uk/downloads/RegenSW\\_84.pdf](http://www.regensw.co.uk/downloads/RegenSW_84.pdf)

12 <http://www.bristol.gov.uk/ccm/content/Environment-Planning/Planning/file-storage-items/planning-policy-fsi/bdf-bristol-development-framework/sustainable-energy-report---june-2009.en>

- ▲ BCC has commissioned a report from the Centre for Sustainable Energy (CSE) on the potential for sustainable heat and power delivery in Bristol.<sup>13</sup>

## 8.5 Policy, actions and measures which would further prepare Bristol's utilities for peak oil.

### 8.5.1 A selection of further opportunities to improve Bristol's energy security

- ▲ Adopt a strategic approach to increasing energy savings by use of full lifecycle planning and cooperation across organisations. This requires an assessment of the reasons for energy usage as well as an effort to meet needs more efficiently.
  - An example of lifecycle planning is included in Bristol Water's *The Future of Water* report. The report refers to the growing need to use chemical purification techniques on catchment water due to high levels of nitrates from agriculture. If viewed as a cycle, agricultural production methods which reduce the need for synthetic fertilisers and the associated nitrate run-off would reduce oil dependence not only on farms, but also at water purification plants.
- ▲ Set up a team to create an energy reduction strategy for the city. Plans could include specific targets for the sustainable supply of heating, cooling and power. Schemes could include low energy measures like passive solar and shade, all available energy generation possibilities from macro to micro, and ways to design out waste. Back-ups for vital services and lobbying strategies to drive national energy policy can also be included. There is no silver bullet solution to replace fossil fuels, so a strategy which balances sustainable power generation capacity with demand reduction would provide a workable approach. Examples of possible projects are combined heat and power, energy from organic waste, or energy from sewage as used in the Oslo city bus model.<sup>14</sup>
- ▲ Expand work with community groups and schools to raise awareness about the need to save energy; this is essential in gaining public support for more disruptive changes. Community projects such as the Knowle Carbon Makeover<sup>15</sup> project demonstrate the potential effectiveness of this approach. Informing people about energy security issues and the implications of the fact that the UK is no longer energy independent will help them realise that this is a paradigm shift.
- ▲ Provide ways to make micro-generation of renewable energy more accessible to the public – an example of this is the RE-generate scheme being piloted in Kirklee's which provides interest free loans against the property.<sup>16</sup>
- ▲ Increase information and education on how energy intensive our water system is. This would assist with CO<sub>2</sub> reduction and save water. Water bills are likely to rise<sup>17</sup> in the coming years, so there is an opportunity here to work with users to reduce consumption through use of grey water recycling systems.
- ▲ Raise awareness with businesses about energy security issues and use existing schemes like capital allowances to improve efficiency.
- ▲ Increase accountability of organisations and departments through provision of budget models for carbon and fuel usage.

#### Sources:

13 [http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset\\_id=30492172](http://www.bristol.gov.uk/ccm/cms-service/stream/asset/?asset_id=30492172)

14 [http://www.vann-og-avloppetaten.oslo.kommune.no/english/\\_international\\_water\\_association/](http://www.vann-og-avloppetaten.oslo.kommune.no/english/_international_water_association/)

15 <http://www.biggreenswitch.co.uk/node/13885>

16 [http://www.assemblywales.org/gethome/sc\\_3\\_-24-08\\_\\_p7\\_annex\\_\\_information\\_from\\_renewable\\_energy\\_association\\_on\\_re-charge.pdf.pdf](http://www.assemblywales.org/gethome/sc_3_-24-08__p7_annex__information_from_renewable_energy_association_on_re-charge.pdf.pdf)

17 [http://business.timesonline.co.uk/tol/business/industry\\_sectors/utilities/article6055195.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/utilities/article6055195.ece)



## 8.6 Well-being benefits

- ▲ Reducing energy usage will decrease GHGs and pollution.
- ▲ Reducing water usage and increasing grey water recycling will reduce drought risk.
- ▲ A major programme of home insulation improvements and efficient heat networks will decrease fuel poverty.
- ▲ Increasing locally generated power will guard against global fuel price swings and build resilience to power cuts and supply stoppages.

### Fast forward! Future scenario

'I finished my degree in mechanical engineering in 2005 and then spent 5 years studying and working in Denmark. I went there to learn about combined heat and power (CHP) systems which they had been using since the 1970s. While we were letting the heat that came from powering our homes, factories and hospitals disappear into the atmosphere, the Danish were harnessing this 'waste' to cover more than half of their electricity and heating needs.

I was so inspired that I wanted to do something positive in my home town back in the UK. So I got together with some like-minded friends from University and we managed to convince a local developer to let us install and run a CHP system in a block of ten flats. This supplied electricity and heat to the flats and twenty new terraced houses. That was great but we wanted to go further, so we had the task of trying to sell our energy to people already living and working in established homes and offices in the area.

At first it was hard to convince people to switch to our system as the economy was still running on cheap fossil fuels, but as the impact of peak oil started to bite and gas supplies from the North Sea collapsed, oil and gas prices went up and up and our option started to make more economic sense. Then the local authority came on board and started offering incentives to low income households to allow them to connect to local green energy and business really took off. Because we were successful others copied our approach and we were always happy to share our know-how. Now we supply 20,000 homes with heat and power and, with our help, CHP – using a variety of fuels including biomass, waste and biogas – has become standard across two thirds of Bristol homes and businesses. Our business isn't some great money spinner – at least not in the way the energy business would have been back in 2000 – but that wasn't what it was about to start with. I feel proud that we initiated something timely and worthwhile. It was a risk worth taking.

I think one of the things we have returned to in the last twenty odd years is the old adage 'waste not, want not', whether that be food, energy or water. We certainly wouldn't dream of flushing our toilets with clean drinking water like we used to or throw away the heat generated in powering our homes.'

Emma Taylor  
Director - Southville Power  
2030

## 8.7 Areas for further research

1. Research the potential for providing heat and cooling locally (assuming insulation measures are taken first).
2. Investigate payment options for utilities to put greater emphasis on improving energy efficiency.



# Part Two:

## 9.0 Summary

It comes as no surprise that Bristol has a high degree of vulnerability to an oil crunch and this is also true for much of the rest of the world. There is, however, a huge amount that can be done at city level in order to build resilience to the coming changes. A paradigm shift is needed to move from currently accepted oil-dependent and energy inefficient operational models to a new sustainable path.

In determining to take action locally we must also take into account that Bristol is not an island and that adaptation will work best if conducted in partnership with surrounding communities. Bristol's multi-cultural make up can be seen as an asset in strengthening a strong local culture which, in turn, seeks national and global links in order to exchange ideas and find solutions to local problems.

Large scale change can look difficult and daunting and challenging economic conditions create an environment where it appears more difficult to plan for the long-term. In truth though, we make great changes as a society all the time. The internet, for example, has radically altered almost every aspect of our lives in less than twenty years. Climate change and resource depletion will undoubtedly change our way of life in the coming decades; if we choose not to act now we will meet these changes unprepared and will be vulnerable to economic collapse and social unrest. If, however, we engage with the issues and make planned adaptation it should be within our power and ability to build a more sustainable city for the future.

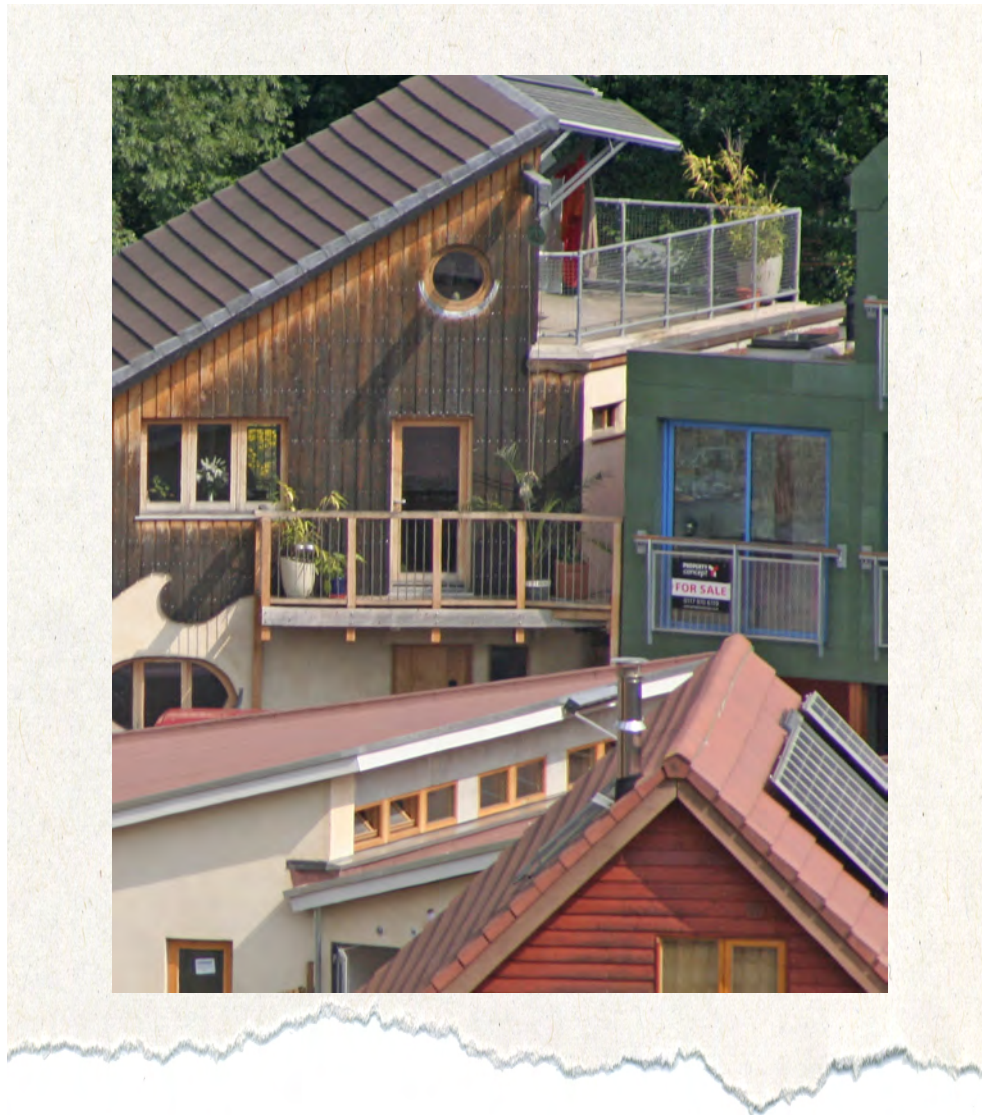
"All conservatism is based upon the idea that if you leave things alone you leave them as they are. But you do not. If you leave a thing alone, you leave it to a torrent of change."

**G.K. Chesterton, 1874-1936, Orthodoxy.**



# Part Three:

## Options for action





## Introduction

This section offers concrete options for action which could be taken now in order to reduce Bristol's vulnerability to peak oil. The options given are in response to the vulnerabilities identified in Part 2 and draw on both the 'Existing Actions and Measures in Bristol' and the 'Policy, Actions and Measures which would further prepare Bristol' lists in each section.

Options are informed by the following set of parameters:

- ▲ This report deals only with currently available alternatives in planning for energy security. It may be tempting to build in solutions based on as yet unproven or commercially unavailable technologies and fuels. It is unclear, though, which alternative technologies will be viable within the short timeframe we are likely to have for taking action.
- ▲ Substantial and urgent reductions in overall energy consumption must be part of any plan to reduce oil dependence as there is no fuel which can simply substitute for current demand. The report recommends considering energy security and sustainability overall to avoid simply ramping up use of other unsustainable or polluting energy sources. Reducing energy consumption and waste are areas where local policy and initiatives can be most effective.
- ▲ The report recognises the threat of climate change and therefore recommends that any and all actions taken in response to peak oil should complement stringent climate change mitigation and adaptation policies.

## Options for action

### 1. Acknowledgement:

Publicly acknowledge peak oil as a threat. Pass a resolution to take actions now to lessen the impacts which peak oil would cause.

### 2. Leadership:

Set up a cross sector team, with a budget, to take the work forward. This could be owned by the Bristol Partnership with oversight on team selection and monitoring of progress by the Green Capital Momentum Group.

### 3. Engaged Communities:

Emphasise the role which communities have to play in Bristol's future. Support community engagement activities and provide education and assistance on building resilience and reducing reliance on public services.

### 4. Focus on accessibility:

Drive actions and policies which reduce the need to travel for essential services and needs. Support cycling and walking and development of a sustainable and effective public transport system.

### 5. Food security:

Drive actions and policies which improve food security by supporting local food growing and production. Develop sustainable agricultural practices.

### 6. A robust economy:

Support and develop a local business environment which can thrive in a low carbon, low waste economy. Ensure that jobs and opportunities are available across the city to avoid creating conditions for social breakdown.

## Ideas for consideration by the cross-sector peak oil team

**Note:** Priority 1 is the highest priority.

### Setting targets

Option	Priority level:
Devise and implement a plan to reduce oil consumption in Bristol by 50% by 2020. Set overall reduction targets for energy use to ensure that oil use is not just offset to other fuels or sources.	1
Create a set of peak oil resilience indicators to assist in planning actions and measuring success.	1
Use peak oil resilience indicators to add criteria to the eco audit for key BCC projects.	2
Integrate peak oil resilience indicators into climate change adaptation planning to ensure genuinely sustainable solutions.	2
Implement a system of energy budgets for organisations and departments – could be part of or complementary to GHG auditing.	3

### Emergency mitigation

Option	Priority level:
Increase resilience to oil supply stoppages by doubling bunkered fuel supplies.	1
Work with and support community groups to inform the public and build resilience to emergency situations caused by peak oil and climate change.	1
Devise and implement fuel emergency policy to account for simultaneous oil and gas or oil and electricity outages based on research of key vulnerabilities for different lengths of outage.	2

Option	Priority level:
Undertake a transition away from petroleum dependent emergency planning.	2
Plan for the impact of rapid fuel and food shortages/price increases on the vulnerable. Include short and medium term planning.	2
Provide information and support for organisations and businesses to address emergency continuity planning for oil shocks and climate change.	2

### City planning

Option	Priority level:
Develop peak oil risk assessment criteria for incorporation into planning policy. Revise future demand scenarios and build in different fuel cost scenarios to address rises in construction costs and future running costs.	1
Set community energy and heat generation stipulations for new domestic, retail and commercial planning consents.	1
Ensure that planning policy protects good quality agricultural land and woodland around the city and in the region from development.	1
Add minimum garden or allotment space requirements to planning requirements for new housing based on research into what will be needed per capita to produce new city food targets. Look at ways to add space via balconies, roof gardens etc.	1
Add stringent walking and cycling accessibility targets to new housing planning requirements.	1

Option	Priority level:
Stipulate maximum parking provisions for new residential builds of 1 parking space per dwelling on soft core, which can easily be adapted to garden. Have paid parking permit schemes in place from the outset for new residential builds.	1
Stipulate stringent grey water harvesting for all new builds.	1
Work with communities on planning programmes to adapt existing neighbourhoods to meet peak oil resilience criteria.	2

### Transport & mobility

Option	Priority level:
Prioritise transport projects which will most quickly meet access and mobility goals without use of petroleum fuels. Review and restructure current spending plans, cancelling projects which do not fulfil these criteria.	1
Set transport policy to prioritise walking, cycling and sustainable public transport over cars by increasing the percentage of yearly funding for these areas. Undertake a planned phased programme of change in both infrastructure and traffic regulation. Include soft measures to cut car use 50% by 2015.	1
Secure a programme of funding for cycling for the 10 years beyond 2011 with a target to increase regular cyclists to 70%.	1
Work with communities to extend the 20mph pilot schemes.	1
Diversify fuel for essential services, public transport and taxis.	1

Option	Priority level:
Prioritise development of a sustainable freight delivery system for essential goods to reduce road transportation by 50% by 2020. Plan for a city rail to road and river interchange hub with adjacent storage, manufacturing and processing facilities	1
Improve the usability of public transport by simplification of fares, ticketing and transfer hubs, as well as improvement of journey planning information.	1
Work with public service providers and other cities and organisations to purchase advance fuel contracts at low prices to mitigate against short to medium term price rises.	1
Pursue the creation of an Integrated Transport Authority to take greater control of local transport decisions.	1
Set accessibility and track targets which are based on actual distance, rather than time taken to travel via public transport.	2
Implement a program to designate a network of existing low traffic streets as cycle and walking use only (except for access for emergency vehicles and home access). Create crossings where these traverse the rest of the road network.	2
Increase ridership of public transport through financing options which allow for low fares - e.g. via taxation of business and retail parking.	2
Implement a phased programme of reduction in car parking places in the city.	2



## Building community resilience and protecting the vulnerable

Option	Priority level:
Support community initiatives which build resilience through funding and publicity, in a similar initiative to the Scottish Climate Challenge fund <sup>1</sup> .	1
Support voluntary and community support initiatives which provide training, information and support by providing rent-free meeting spaces or premises.	1
Set standards and implement public service risk planning for addressing the effects of quickly rising unemployment, and fuel and food poverty.	2
Introduce a programme to encourage people to own or have access to a bike. Work with businesses and voluntary organisations to provide affordable bikes and accessories such as child seats and trailers. Would need to work parallel with improving secure lock-up facilities.	2

## Building a sustainable food system

Option	Priority level:
Work with neighbouring authorities to ring-fence good quality agricultural land in the region.	1
Work with neighbouring authorities to implement policies and initiatives which support local farmers and allow them to transition to sustainable farming systems.	1

Option	Priority level:
Facilitate transport, trading facilities and initiatives which enable local producers and retailers to get food to market. This would include the creation of local processing facilities for meat and dairy.	1
Set targets to source 50% of all public sector food locally by 2012.	1
Support research and experimentation with non-petroleum based agricultural systems.	1
Research business models for farming, food processing, storage and retail which support a relocalised food economy.	1
Change planning policy to facilitate the creation of more urban farms and food gardens.	2
Support a review of the city to map out potential land areas for growing food.	2
Set a target for Bristol to provide 50% of its fruit and vegetables from within the city by 2020. Targets could also be set for eggs and other foods.	2
Launch a programme to bring awareness of the importance of sustainable food into the mainstream, ensuring that it is not sidelined as a middle class lifestyle choice.	2
Support and promote education around growing, storing and preparing food.	2
Develop training courses in sustainable farming and business to equip a new generation of farmers.	2

Source:

<sup>1</sup> <http://www.scotland.gov.uk/News/Releases/2008/06/03101154>

## Building a sustainable economy

Option	Priority level:
Provide information and support to business to implement energy security and peak oil risk planning.	1
Implement programmes to encourage the establishment of low energy business models.	1
Promote and support an economy of locally produced and traded goods and services through rent and rate holidays and a local currency.	1
Concentrate support and investment on economic and employment sectors which will support a sustainable future such as renewable energy, food production and processing, textile production and manufacture, sustainable transport manufacture and repair, low energy construction and manufacture which makes use of adaptation, repair and reuse.	1
Build links between businesses to recycle waste materials.	1
Increase cooperation across public services and business to allow for shared mixed use office buildings and service centres to maximise efficiency of energy usage and reduce employee travel.	2
Undertake a review of the Bristol economic sectors most vulnerable to peak oil and match the skills of these sectors with required skills for a sustainable economy.	2
Investigate the creation of a local currency, alongside the pound, to cycle money within the city.	2

## Power & utilities

Option	Priority level:
Establish a strategic citywide energy security body to create a sustainable heating and cooling plan for the city. Pursue local power generation options, including integration of opportunities around decentralised energy.	1
Increase work on insulation of homes and buildings.	1
Implement a renewable energy loan scheme like Kirklees Council's RE-charge.	1
Pursue installation of solar hot water systems for public buildings – prioritise those with high water use like hospitals.	1
Increase information about the energy cost of the water system. Stipulate a stringent water conservation policy for new builds. Promote water conservation and grey water harvesting for existing housing stock.	1
Work with a local energy/and or water company to investigate utility payment options which necessitate a greater focus on efficiency.	2

## Further options

Option	Priority level:
Implement a housing policy to facilitate more efficient use of current building stock through financial incentives and planning laws.	2
Work with community groups and the housing sector to develop a 'walkability index' of distances to key services – could be similar to the Energy Performance Certificates.	3

## Lobbying

Option	Priority level:
Work with neighbouring authorities to address energy security issues across the South West region.	1
Lobby government for electrification of national rail connections to the region.	1
Work with other core cities (Birmingham, Leeds, Liverpool, Manchester, Newcastle, Nottingham, Sheffield) to increase national resilience to peak oil.	2
Lobby government to introduce payment mechanisms for utilities that reward energy and water efficiency.	2

## Limiting factors and blocks to action

- ▲ Cost of making changes.
- ▲ Lack of urgency due to current low energy prices and recession.
- ▲ Lack of urgency due to economic recovery and belief that business as usual will be possible.
- ▲ Risk around infrastructure changes – construction prices will be vulnerable to peak oil.
- ▲ Lack of urgency due to belief in the miraculous appearance of a techno-fix solution.
- ▲ Lack of urgency due to the difficulty of providing political leadership to make major changes.
- ▲ Vested interests in business as usual model.
- ▲ Barriers to making local change due to existing national policy.



## Key terms

### **EOR**

Enhanced oil recovery – methods for increasing the amount of oil which can be extracted from an oilfield. For example, gas injection

### **EROEI**

Energy returned on energy invested – the ratio between the amount of usable energy acquired from a source versus the amount of energy expended to obtain that resource.

### **Food Print**

A very basic representation of the land required around a town to feed its population.

### **GHG**

Greenhouse gases – for example CO<sub>2</sub>, and methane

### **'Homeshoring'**

Working from home via remote broadband connection.

### **LNG**

Liquid Natural Gas. This is natural gas which has been cooled to be stored as a liquid

### **LRF**

Local Resilience Forum – The purpose of the LRF process is to ensure effective delivery of those duties under the Civil Contingencies Act 2004, that need to be developed in a multi-agency environment.

### **NGLs**

Hydrocarbons in natural gas which are collected as liquids through procession – for example, butane and propane

# Appendix 1

## An introduction to peak oil

### Geological peak oil

According to geologists the world's oil reserves were created millions of years ago and took millions of years to form. It was only in the last century that people realized oil's potential as a fuel and for other uses and revolutionised the way we live with it. Since then the world has been surveyed with increasingly sophisticated technology to find new supplies of oil to meet our growing need for it.

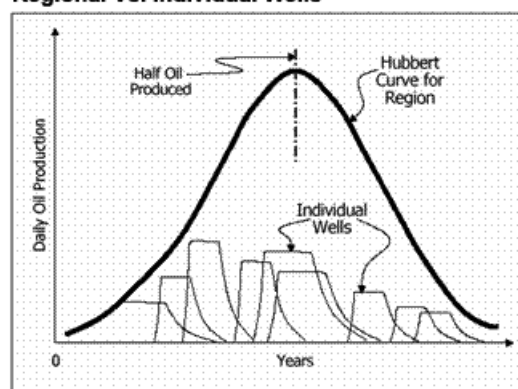
The easiest and cheapest oil wells to exploit are the land bound wells from which the world still produces much of its oil. An oilfield with extractable reserves of over 5 billion barrels is designated as a 'supergiant'. The last of these was discovered in 1968<sup>1</sup>. Currently, more than a quarter of the world's oil production comes from the 20 fields which are the current highest producers, all but three of which were discovered by the end of the 1960s. By 2007 however, output was below its historic peak<sup>2</sup> in 16 of these 20 fields.

Production of an oil field follows a pattern in which production increases, reaches a peak and then declines. The same has been shown to be true of the oil production of geographic regions and also countries and will also happen to global production. Peak oil describes the point at which the amount of oil produced globally in a single year reaches its absolute maximum. From this point onwards, oil will still be produced but at a lesser volume. After peaking, oil production will ultimately go into decline. Peak oil does not mean that oil has run out but rather that the maximum production rate has been reached. Production in a particular oilfield or region will continue after peak for as long it is

economically viable but will produce less and less oil.

In the 1950's a geoscientist M. King Hubbert<sup>3</sup> devised a methodology to predict and describe the curve of oil production. He went on to predict in 1956 that the whole of US oil production would follow a similar curve and thus peak in between 1965 and 1970 - it in fact peaked in 1970<sup>4</sup>. Hubbert projected that global oil would peak in 1995, which was not the case. Since then his methodologies have been refined by others to account for actual demand during the period as well as improved extraction technologies and latest reserve and discovery data.

**HUBBERT CURVE**  
Regional Vs. Individual Wells



**Figure 11:**  
Hubbert curve - source: ASPO Italia

Given that it is a fact that oil fields do eventually reach a decline in production there are three key factors to understand which determine the amount of oil that is available for the future. These factors are the status of existing global reserves; the rate of discovery of new resources; and the anticipated flow rates of the combined reserves and discoveries in comparison to the rate of decline in existing fields.

#### Sources:

- 1 [http://www.netl.doe.gov/publications/others/pdf/Oil\\_Peaking\\_NETL.pdf](http://www.netl.doe.gov/publications/others/pdf/Oil_Peaking_NETL.pdf)
- 2 Page 225-226 International Energy Agency World Energy Outlook 2008
- 3 [http://en.wikipedia.org/wiki/M.\\_King\\_Hubbert](http://en.wikipedia.org/wiki/M._King_Hubbert)
- 4 <http://www.eia.doe.gov/emeu/aer/txt/stb0501.xls>

### Global reserves

Energy reserves are defined by the US Energy Information Administration as “Estimated quantities of energy sources that, on the basis of geologic evidence that supports projections from proved reserves, can reasonably be expected to exist and be recoverable under existing economic and operating conditions.”<sup>5</sup>

Oil companies are required to list their reserves with the US Securities & Exchange Commission. The value of an oil company is significantly based on these reserve figures.

A complicating factor in determining accurate numbers for total global reserves is a lack of transparency in the stated reserve numbers of the OPEC countries. In the mid eighties, the Oil of the Petroleum Exporting Countries (OPEC) began using their member’s oil reserve figures when determining production quotas. In the same timeframe, various members of the group revised their stated reserve figures by significant amounts. Saudi Arabia for example increased its stated reserves by a massive 88 billion barrels<sup>6</sup>. From that time to the present year, these countries continue to quote essentially the same reserve numbers despite having pumped millions of barrels in the interim<sup>7</sup>. It is estimated that global oil

reserves could therefore be overstated by as much as 1.2 trillion barrels<sup>8</sup>.

Oil reserve figures do not take into account any differences in the accessibility or recoverability of different types of reserves. In essence the same weight is given to onshore existing oil wells as is given to tar sands. The speed of recovery, or flow rate, is however crucial in calculating the potential daily future production rate from these reserves (see below).

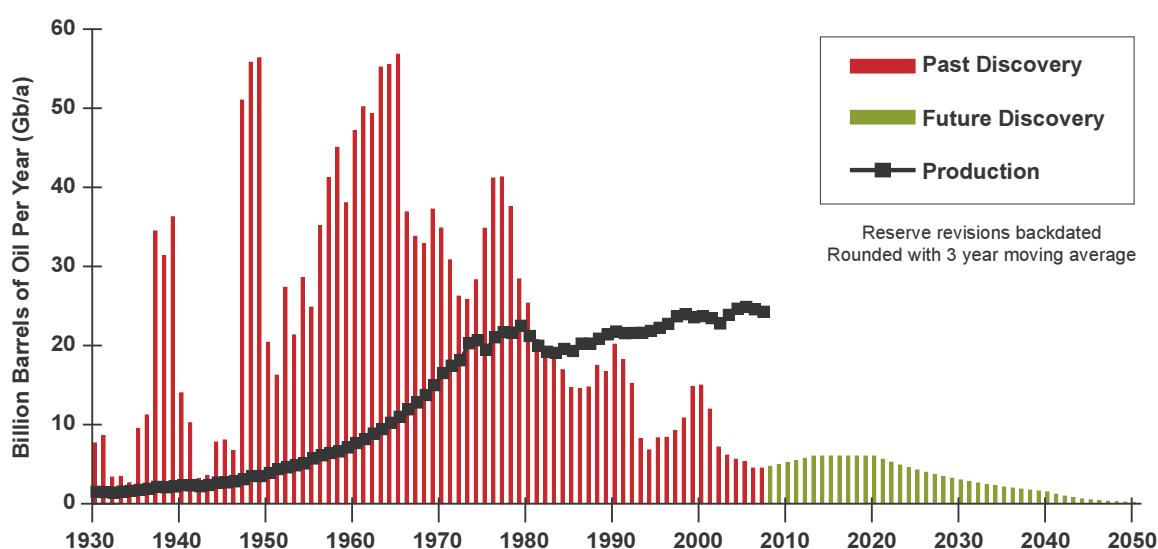
### Current rates of discovery

The rate of discovery of new oil reserves over the last 2 decades has been approximately 15 billion barrels per year<sup>9</sup>. At current rates of discovery the world is finding in the region of 1 barrel of oil for every 3 that it uses.

Since Hubbert many others have worked on methodologies to predict the future of global oil production. One of the best known of these is Colin Campbell, founder of the Association for the Study of Peak Oil.

Campbell’s method takes the amount of oil discovered to date along with estimated future discovery. A further indicator is then added to show actual production to date.

Other organisations have used different strategies to provide their predictions of oil



**Figure 12:**  
The growing gap – Source: Colin Campbell, *Oil Crisis*<sup>10</sup>

#### Sources:

- 6 P161 *The Last Oil Shock-A Survival Guide to the Imminent Extinction of Petroleum Man* – David Strahan, John Murray
- 7 [http://tonto.eia.doe.gov/country/country\\_time\\_series.cfm?fips=SA](http://tonto.eia.doe.gov/country/country_time_series.cfm?fips=SA)
- 8 [http://www.arup.com/\\_assets/\\_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf](http://www.arup.com/_assets/_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf)
- 9 P 20 [http://www.arup.com/\\_assets/\\_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf](http://www.arup.com/_assets/_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf)
- 10 Colin Campbell, *Oil Crisis*, 2005, Multi-Science Publishing, Figure 15-2

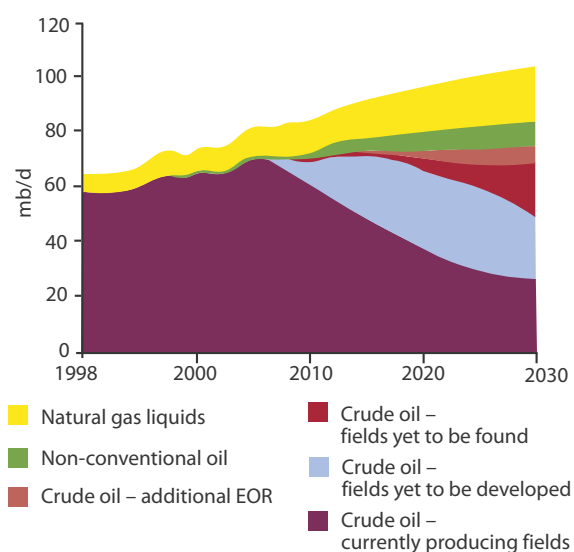


supply. The most widely quoted of these are those of the International Energy Agency (IEA), the US Energy Information Administration (EIA) and Cambridge Energy Research Associates (CERA). The UK government is a member of the IEA along with 27 other nations and uses IEA data to guide policy.

The IEA releases an annual World Energy Outlook report. In 2008 the IEA took a new approach in which they conducted a bottom-up assessment of 800 of the world's existing fields, and overlaid new assumptions about future production. The IEA accepts in its figures the upwardly revised OPEC reserve numbers of the 1980's, which Campbell does not. The bottom up assessment showed global depletion rates of 6.7% (the assumption from the 2007 report had been 3.7%). In the 2007 and 2008 reports the IEA warned that an oil supply crunch in the 2015 timeframe cannot be ruled out. Importantly, even their analysis (see figure 13) essentially has future crude production as flat even taking into account fields yet to be found.

Production reaches 104 mb/d in 2030, requiring 64 mb/d of gross capacity additions –six times the current capacity of Saudi Arabia –to meet demand growth & counter decline.

©OECD/IEA-2008



### The importance of flow rates in anticipating future production

The flow rate of a project describes the recovery rate of oil over a given period – for example, the number of barrels that are produced in a day. This is extremely important since it is the sum of this global flow rate (rather than potential reserves) that is available for use.

Flow rates vary widely for different types of oil reserves and also vary over the lifetime of project. Unconventional oil reserves like tar sands have slower flow rates than conventional sources. So, for example, the Ghawar oil field with estimated reserves of 5 billion barrels of recoverable reserves produced approx 5.1 million barrels per day. The Canadian tar sands despite having estimated reserves of 152<sup>11</sup> billion barrels currently produce approx 1.6 million barrels/day. To make up the annual decline rate of existing oilfields (which is estimated by the International Energy Agency as 2-4 million daily barrels/year), with oil from the tar sands would mean an increase in production which is currently unfeasible, economically unviable and environmentally unimaginable.

In estimating future production it is important to note that it is not only the existence of potential reserves which matters, but that the depletion in flow rates from older fields must be matched by those from the newly discovered resources simply in order to maintain actual daily production rates.

**Figure 13:** The IEA world oil production reference scenario shows a significant amount of world supply growth depending on oil fields yet to be developed or discovered  
Source: IEA World Energy Outlook 2008

Source:

11 BP Statistical review of world energy full review 2008 - [www.bp.com/statisticalreview](http://www.bp.com/statisticalreview)

**Geographical and geopolitical peak oil**

The world currently uses around 85 million barrels/day of oil. This guaranteed market of a high value product means that the existence of oil in a particular country is not merely a matter of geography but one of politics.

**Current top oil producers and consumers, 2008 numbers, Source: BP Statistical Review 2009**

Top 10 oil producing nations	Million Barrels/day	Top 10 oil consuming nations	Million Barrels/day
Saudi Arabia	10.8	USA	19.4
Russia	9.9	China	8.0
USA	6.7	Japan	4.8
Iran	4.3	India	2.9
China	3.8	Russia	2.8
Canada	3.2	Germany	2.5
Mexico	3.2	Brazil	2.4
UAE	3.0	Canada	2.3
Kuwait	2.8	S.Korea	2.4
Venezuela	2.5	Saudi Arabia	2.2
		UK	1.7

Some of the growing causes of political tension around oil arise from the fact that the nations which have developed the biggest per capita thirst for oil are regions where oil production is already in decline and so depend on imports from the large oil producing regions. In the meantime many of the populations in areas with high oil production are increasing their own dependence. Also, as populations and living standards rise in the developing world, the

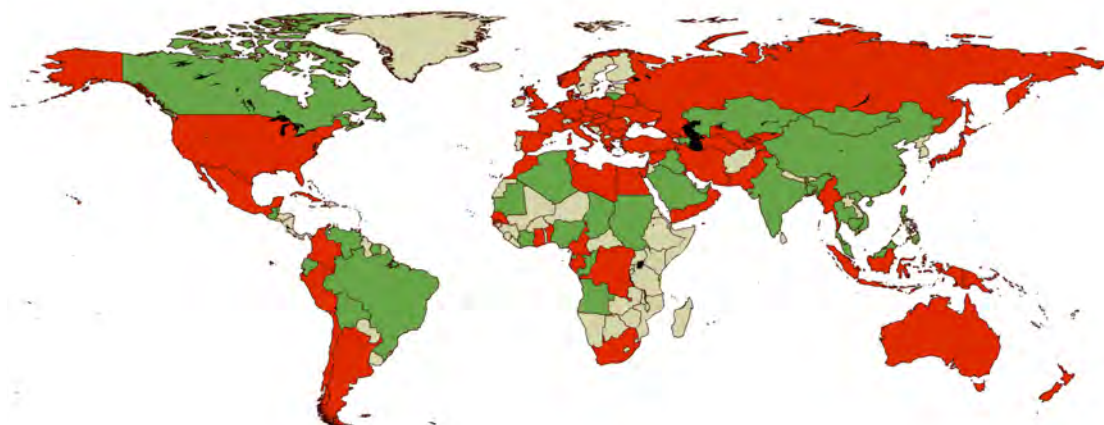
number of nations which need to import oil and are thus out 'shopping' for their share, is increasing.

The geography of oil reserves, along with the depletion status of existing fields means that global distribution of this vital resource is unequal. The effect of this is that some nations may experience a peaking of their oil supply for economic or geopolitical reasons whether an overall global geological peak has been reached or not.

**The UK North Sea oil reserves**

The UK has enjoyed its own significant endowment of oil and gas reserves. The North Sea oil fields were discovered in the 1970's and have provided revenue of more than £1 trillion<sup>13</sup> for successive UK governments. Exploitation has been efficient and rapid. North Sea oil fields have followed the typical production curve and are now in terminal decline. Between 2004 and 2006 the UK became a net importer of both oil and gas, and at a predicted decline rate of 7% (which the government hopes to mitigate to 5% with additional investment) imports will need to increase by the same rate unless demand decreases.

**Figure 14:** Post peak oil producing countries. Of the world's 98 oil producing countries, production has already peaked in more than 60  
Source: [www.thelastoilshock.com](http://www.thelastoilshock.com).<sup>12</sup> Analysis by [www.energyfiles.com](http://www.energyfiles.com)



Sources:

12 <http://www.davidstrahan.com/map.html>

13 [http://www.hmrc.gov.uk/stats/corporate\\_tax/table11\\_11.pdf](http://www.hmrc.gov.uk/stats/corporate_tax/table11_11.pdf)

## Oil and conflict

There are a number of countries which are experiencing conflict related to their oil reserves at this time.

The Iraq war is considered by many to be an oil war, indeed Alan Greenspan, former Head of the US Federal Reserve, has written that the "Iraq war was largely about oil"<sup>14</sup>. Even since the war in Iraq, oil pipelines and wells have often been under attack from insurgents due to their economic and political significance<sup>15</sup>.

In 2009 Nigeria has seen repeated successful attacks by the Movement for the Emancipation of the Niger Delta (MEND) group on oil pipelines and even off-shore rigs with a damaging result to Nigeria's export market<sup>16</sup>.

A growing problem for global oil deliveries has been piracy off of Somalia where oil tankers have been taken hostage for ransom<sup>17</sup>.

## Economic peak oil

### Economic limits

The most fundamental economic factor limiting oil production is the point at which the effort required to extract it exceeds the value of the energy it produces. In other words, if it takes more energy to extract a barrel of oil than that barrel gives you back, there is no gain from extracting it. The ratio which refers to this balance between energy returned on energy invested to obtain it is referred to as EROEI. A fuel with an EROEI above 1 is an energy source, one with a value of 1 or lower is an energy sink.

Before the above scenario occurs, it is more likely that production of a particular field will hit a financial limit. This financial break point is variable, in that higher oil prices can make it worthwhile for energy companies to bring more expensive technologies and extraction techniques to bear on old oil fields which are

already in terminal decline. Low oil prices have the opposite effect. Thus expensive projects are delayed or cancelled when the oil price drops below a certain level.

### Economic power

Over the past decades there has been a shift in power away from the international oil companies or Supermajors, to nationally owned concerns. The 70's saw the ascendancy of the Organisation of Petroleum Exporting Countries (OPEC)<sup>18</sup> which used its power as the swing producer of oil to control prices and gain political capital. Although the power of OPEC itself has waned since the discovery of North Sea oil, finds in the Gulf of Mexico and the opening up of the Russian market, this has not restored the power of the Supermajors. Increasingly countries which have struck oil choose to keep local control rather than invite in the major oil companies. Or, where they do seek assistance, the terms ensure that a large portion of the ownership and profits stay at home. This situation has seen the production figures of the top 5 oil companies collectively decline since 2004<sup>19</sup>. The effect of this trend is to increase the reliance of the importing nations, like the US and Europe, on the national oil companies of the Gulf countries, Russia, Mexico, Brazil and others.

The leaders of the national oil producing countries have their own competing priorities which drive their policy. The domestic demand of the top oil producing countries is increasing and needs to be met in order to assist leaders maintain power. Leaders also need to consider the future and whether oil in the ground may be more valuable than increased production now. To quote Saudi Arabia's King "I keep no secret from you that when there were some new finds, I told them, 'no, leave it in the ground, with grace from god, our children need it'".

#### Sources:

14 <http://articles.latimes.com/2007/sep/17/nation/na-oil17>, The Age of Turbulence: Adventures in a New World, Alan Greenspan, Published by Penguin Press

15 <http://www.nytimes.com/2008/11/04/world/middleeast/04iraq.html>,  
<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/06/21/MN0N11CM12.DTL>,  
[http://business.timesonline.co.uk/tol/business/industry\\_sectors/natural\\_resources/article3631769.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/natural_resources/article3631769.ece)

16 <http://www.bloomberg.com/apps/news?pid=20601207&sid=adQbtQskJB6I&refer=energy>

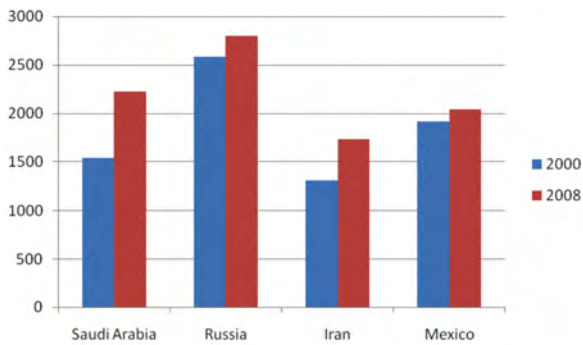
17 <http://www.bloomberg.com/apps/news?pid=20601207&sid=agiEv3gi6hN8&refer=energy>

18 <http://www.opec.org/aboutus/history/history.htm>

19 P. 12 [http://www.arup.com/\\_assets/\\_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf](http://www.arup.com/_assets/_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf)



For importing nations there is therefore an additional factor to take into account with regard to the peaking of oil supply. This is, at what point the amount of oil which is available on the open market (as opposed to the sum of what is produced globally) no longer meets the demand of importing nations.



**Figure 15:** Oil demand in key producer countries. Source data: *BP Statistical Review 2009*

### The oil price

Oil as a commodity is tightly linked to market trading and speculation, however the significant price swings have tended to be linked to 'real' events supply and demand events. For example<sup>20</sup>:

- ▲ 1973/4 spike – OPEC oil embargo
- ▲ 1979-81 spike – fall of Shah of Iran, followed by the Iran-Iraq war
- ▲ 1990/91 spike – First Gulf war
- ▲ 2003 spike – Iraq war

In 2008 the oil price rose to a peak of \$147/barrel. The reasons for this are still being promulgated and discussed, but in essence the following viewpoints are emerging.

There are those who put the entire episode down to aggressive speculators driving up the price to make money as well as using it to hedge against the falling dollar.

Another strand of thought is that the run on oil prices was entirely justified by supply/demand dynamics. Global production has remained fairly static from 2004 onwards showing an increase of approximately 1.5% from 2004-2007, although production

declined year on year from 2006-2007. Global demand in that timeframe has been increasing at around 3.5%<sup>21</sup>. Since supply was not increasing the situation led to a market that was extremely sensitive to any supply side risks, which could result in shortages – for example an attack on a Nigerian pipeline, or a hurricane in the Gulf of Mexico.

The third view is that the upward direction of the oil price was caused by the supply/demand dynamic, but that the price was then driven higher than could be justified by a combination of the weak dollar and market speculation.

From that \$147 peak the oil price had an equally spectacular fall. There is broad agreement that at \$147 the oil price was exerting a strong negative impact on the global economy which was also in crisis due to the growing credit crunch. High prices and lack of credit began to have an impact on demand. As warnings were issued of recession in the US, Europe and Asia the price began to fall along with demand. At the time of writing the price has come back to around \$70/barrel.

A conclusion that can be drawn from 2008 and also from previous oil shocks is that the oil price is linked to the economy in such a way that if the price reaches a certain level, the result is an economic recession. The severity of the current recession does however additionally have roots in financial practices.

### The oil price and investment

While low oil prices might be welcome in the short-term for the economy they are also a significant and dangerous risk for the future. Low oil prices encourage inefficient usage of oil, at the same time as they discourage investment in exploration and infrastructure. Given that the average lead time from discovery to initial production on a new project is six and a half years<sup>22</sup>, a lack of investment now will hit supply in the next decade.

Sources:

20 <http://www.eia.doe.gov/emeu/cabs/AOMC/Overview.html>

21 BP Statistical review of world energy full review 2008 - [www.bp.com/statisticalreview](http://www.bp.com/statisticalreview)

22 P.11 [http://www.arup.com/\\_assets/\\_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf](http://www.arup.com/_assets/_download/4D6FF5E5-19BB-316E-408B503DFB26ADDB.pdf)

For this reason many commentators predict that the coming years will see a rollercoaster effect on the oil price. An economic recovery would result in demand rises. These would hit supply limits from depletion and lack of investment in new production, causing the price to go up. When the price reaches a certain point demand will drop and cause recession thus causing the price to fall again. The low price will hamper investment, and the cycle will continue. There could potentially be an oil crunch even without a global economic recovery if decline rates are not offset by new production or demand reduction.

As the cost of production to exploit remaining reserves increases many oil industry insiders have spoken out about the need for a higher price to support investment. King Abdullah of Saudi Arabia, Qatar's Energy Minister Abdullah Bin Hamad Al Attiyah, Christophe de Margerie, CEO of Total, and Hugo Chavez, President of Venezuela have all stated that a price in the region of \$70-100/barrel is required.

### Summary

Certain facets of the peak oil theory are relatively undisputed. Oil is finite, as are all global reserves. A peak of production will occur at some point. After the peak there will be a decline in production.

What is still disputed is the timeline of the peak, at what flow rate it will occur (how many million barrels/day), and after that, how steep the decline in production will be and how quickly it will take effect.

# Appendix 2

## Alternative fuels

### Biofuels

These are fuels which are created from contemporary organic material, as opposed to fossil fuels which were created from the organic material of previous millennia.

### Bio alcohols and biodiesel

These types of biofuel can be used in current vehicle stock and have seen huge growth in the last decade. Current UK fuels are mandated to contain at least 2.5% biofuels.

In 2008 an internal study for the World Bank<sup>1</sup> attributed much of the 2008 global rise in food costs to the growth in biofuel production. The UK government commissioned Gallagher report also questioned the effectiveness of biofuels in reducing GHG emissions.

Current trends are in development of biofuels from waste products like corn and wheat stalks, as well as grasses like camelina.

### Biogas

Biogas is created by the anaerobic digestion of organic matter. It is typically created from agricultural waste, and food waste. It can be used in vehicles which have been adapted to run on it. If treated, biogas can be mixed with the natural gas supply, or used to generate electricity.

Biogas is considered GHG negative since the waste would otherwise release methane directly into the atmosphere. It also produces fertilizer as a bi-product.

Biogas is being used significantly for transport in Sweden<sup>2</sup>. There are also examples of commercial projects in the UK including one

in Bristol where Sainsburys is running HGVs on its Bristol to Dartmouth distribution route<sup>3</sup>.

Using all UK food and agricultural waste would only replace 16% of total transport fuel demand, however, since only 5% of transport demand is for public transport, it could make a significant impact there<sup>4</sup>.

### Algal fuel

In 2008 the world's largest algal biofuel project began in the UK. Oils extracted from algae could be used to run vehicles and there is much interest in the aviation industry in this fuel<sup>5</sup>.

Algae consumes CO<sub>2</sub> when growing, emitting it again when burned, and can thus be described as carbon neutral.

Algal fuel is not yet commercially available with significant production hurdles to be overcome<sup>7</sup>, and is as yet is expensive to produce.

There are varying reports as to the likely efficiency of algae, although it is consistently predicted to exceed that of traditional biofuel crops. Algae production need not compete with food crops. Based on 20 years of research, Ami Ben-Amotz of the Institute of Oceanography in Haifa, Israel, estimates that a yield of 36 tonnes/hectare per year could be produced (other estimates are higher but not yet proven at scale). This would suggest that to replace global aviation fuel (approx 5 million barrels of jet fuel per day) with algae would take an area roughly the size of Ireland providing that other technical hurdles could be overcome<sup>7</sup>.

#### Sources:

1 [http://www.odac-info.org/sites/odac.postcarbon.org/files/World\\_Bank\\_Biofuels.pdf](http://www.odac-info.org/sites/odac.postcarbon.org/files/World_Bank_Biofuels.pdf)

2 <http://www.biogasmax.eu/biogas-biofuel-stockholm/biogas-biofuel.html>

3 <http://www.ft.com/cms/s/0/d5c0e146-bd72-11dd-bba1-0000779fd18c.html>

4 National Society for Clean Air and Environmental Protection, 'Biogas as a road transport fuel', June 2006,

5 <http://www.environmental-protection.org.uk/transport/biomethane-transport-forum/>

6 [http://www.shell.com/home/content/innovation/about\\_us/news\\_publications/shell\\_world\\_stories/2008/algae/](http://www.shell.com/home/content/innovation/about_us/news_publications/shell_world_stories/2008/algae/)

7 <http://www.davidstrahan.com/blog/?p=170>



## Biomass

Biomass is any organic matter. From a fuels perspective it is either the feedstock to create the above fuels, or it is a fuel in itself. Typically what is described as biomass as a fuel is either wood (logs, chips, pellets), or waste.

Use of biomass is growing for generation of electricity and for Combined Heat and Power projects. It is considered close to carbon neutral. The Centre for Sustainable Energy (CSE) is working in the South West to integrate biomass into Renewable Energy initiatives. CSE has undertaken feasibility studies for Bristol Council which involve using waste wood chip from local sites<sup>8</sup>.

## Hydrogen

Hydrogen is viewed by some as a potential replacement for the petrol transport system. A key benefit is the fact that the waste product from hydrogen power is water.

Honda is close to production of a limited edition commercial hydrogen powered vehicle, but broader commercialization of the technology remains at least a decade away.

The advent of the hydrogen economy continues to be hampered by the cost of producing the hydrogen, and the logistics of storing it (especially in a vehicle).

Hydrogen is not a fuel in itself; rather it is a store of energy like a battery. Since it does not exist in nature it needs to be produced. The most common method of hydrogen production uses fossil fuels, thus hydrogen itself is an energy sink.

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Source:

8 <http://www.cse.org.uk/cgi-bin/projects.cgi?local&&41>

# Appendix 3

## UK natural gas, coal and electricity

### Natural Gas

The UK has developed a high dependence on natural gas since the 70s due to its availability from the North Sea fields. Natural gas is used in the UK for 60% of domestic and 23% of industrial fuel needs<sup>1</sup>. Natural gas is the predominant fuel for domestic heating; it is also commonly used for cooking and already powers 43% of UK electricity<sup>2</sup>.

However, for a number of reasons the UK faces many of the same issues for gas as it does for oil. In 2004 the UK became a net importer of gas as depletion of the North Sea fields took effect. As a result by 2007 the country was dependent on imports for 20% of gas requirements<sup>3</sup> and the government expects this to rise to 80% by 2020<sup>4</sup>. Much of the imported gas currently comes from Norway, however Norwegian gas is also in decline which will make future UK gas imports more reliant on Russia and on the Liquid Natural Gas market.

The three dominant countries which together account for 56% of the world's known reserves are Russia, Iran and Qatar. Distance and politics mean that none of these is an ideal partner for the UK. The impacts of political dispute on gas supply have already been felt in the last few years, most recently in January 2009<sup>5</sup>, as clashes between Ukraine and Russia resulted in interruptions of supply to European countries. In addition, in October of 2008 when gas prices were high, Russia, Iran and Qatar met to increase cooperation causing concern that they may attempt to manipulate the market<sup>6</sup>.

The UK's relatively recent gas dependence means that it doesn't have long-term fixed contracts with importers which might protect it from some of the volatility of the market, a situation which is exacerbated by a lack of gas storage capacity. European spot gas prices are linked to oil and LNG tends to go to the highest bidder. Given that the gas market is much more regional than oil, this is an important consideration for the UK. Recent technological improvements in the recovery of unconventional gas (gas trapped in rock or coal beds) which has been successful in the US may provide more options, but extraction costs are likely to be higher than for natural gas.

### Coal

Coal is used to power 34% of UK electricity<sup>7</sup>. Its use has been cited by NASA scientist James Hansen as the most significant man-made contributor to GHGs.

There is currently significant expectation that it will be possible to overcome the emissions problem by developing a process called carbon capture and storage (CCS) in which the CO<sub>2</sub> released by burning coal is transported to sites (such as oil wells) where the carbon can be stored underground. This process is not yet commercially available and it is estimated that, if obstacles are overcome, it is at least 15 to 20 years away from viability. The process, if it becomes available, is also energy intensive and expensive.

#### Sources:

- 1 p21 Digest of UK energy statistics 2008 <http://stats.berr.gov.uk/energystats/dukes08.pdf>
- 2 P121 Digest of UK energy statistics 2008 <http://stats.berr.gov.uk/energystats/dukes08.pdf>
- 3 P99 Digest of UK energy statistics 2008 <http://stats.berr.gov.uk/energystats/dukes08.pdf>
- 4 P116 <http://www.berr.gov.uk/files/file39568.pdf>
- 5 <http://www.guardian.co.uk/world/2009/jan/11/russia-ukraine-gas-supplies-dispute>
- 6 <http://www.guardian.co.uk/business/2008/oct/22/gas-russia-gazprom-iran-qatar>,  
<http://business.timesonline.co.uk/tol/business/columnists/article4988242.ece>
- 7 P121 Digest of UK energy statistics 2008 <http://stats.berr.gov.uk/energystats/dukes08.pdf>

Demand for coal increased 4.9% per year from 2000-2006. Stated global reserves for coal are 847 billion tones, however coal prices have risen along with oil and gas prices in the last years. The IEA states that "Coal-supply costs have also risen dramatically, due to sharp increases in the cost of materials, equipment, diesel, labour and shipping... Rising oil prices have had a particular impact on open-cast mining, as widely practiced in Australia, Colombia, Indonesia, India, South Africa, Venezuela and the United States. Diesel fuel is essential for open-cast mining, particularly operations that rely heavily on mechanical shovels for extraction and trucks for coal haulage."

Coal is a finite resource and will reach a peak of production in the future. A report in 2007 by the Energy Watch Group<sup>8</sup> of Germany found that data about global coal reserves is highly unreliable. Their estimate is that global coal production will peak between 2025 and 2030. US coal reserves are regularly estimated to be enough for almost 200 years, however the US Geological survey is currently carrying out a study to reassess the viability of this number. An initial pilot study in Appalachia demonstrated that "*Of the original coal resource in the ground (100 percent), only about 5 percent may eventually be marketed because of losses resulting primarily from mining operations, societal and technological restrictions, and economic factors.*"<sup>9</sup>

Coal can be liquefied for use as a transport fuel using the Fischer-Tropsch process. This process produces double the amount of CO<sub>2</sub> as the conventional fuel cycle of a petrol based transport system.

### Electricity

Electricity is an energy carrier which can be produced with fossil fuels or renewable sources like hydro electric, wind power or solar power. Electricity can be used to reduce dependence on oil, especially in transport. There are many examples of electrified public transport though in the UK making such a change would require significant investment in infrastructure.

Up to 2005 UK electricity demand climbed steadily followed by a modest drop in demand between 2005 and 2007. The Government expects demand to start rising again in future years. On the supply side 30% of the current total generation capacity (nuclear and coal plants) is scheduled to close by 2020. This is mostly due either to reaching the end of their planned lifetimes or being too polluting to continue under new EU environmental legislation.

As a result power generation from nuclear power, which currently represents 14% of electricity production, is due to fall dramatically between 2010 and 2020. Power generation from existing coal power stations is scheduled to fall in the same period as power stations are closed in line with tightening emissions regulations. The government estimates that these closures will result in the loss of 20GW of power by 2015. E.ON and EdF however put the figure between 26W and 32GW.<sup>10</sup>

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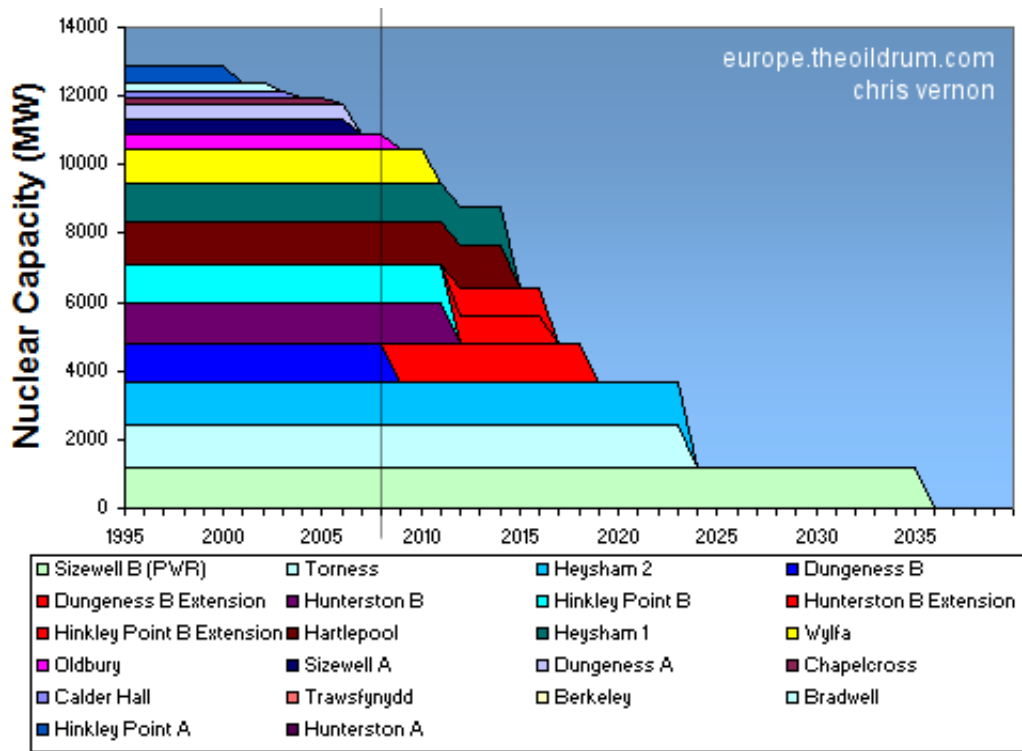
#### Sources:

8 [http://www.energywatchgroup.org/fileadmin/global/pdf/EWG\\_Report\\_Coal\\_10-07-2007ms.pdf](http://www.energywatchgroup.org/fileadmin/global/pdf/EWG_Report_Coal_10-07-2007ms.pdf)

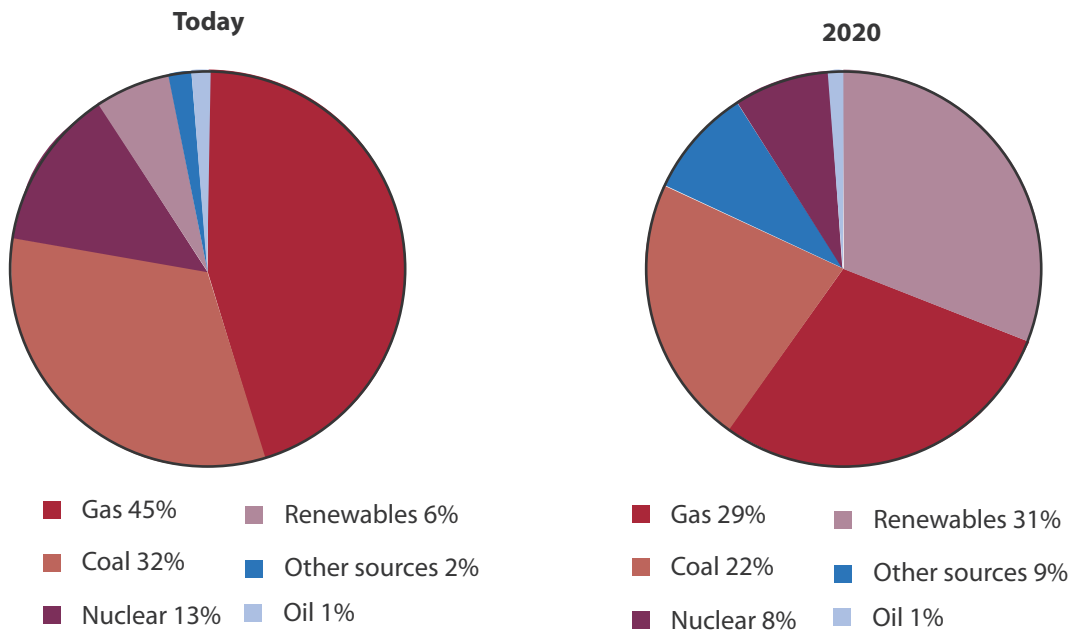
9 <http://energy.usgs.gov/factsheets/coalavailability/coal.html>

10 <http://www.ref.org.uk/Files/ref.elec.prices.22.05.08.pdf>





**Figure 18:**  
The UK Nuclear Cliff, Source: Chris Vernon – Europe.theoildrum.com<sup>11</sup>



**Figure 19:**  
Electricity Generation Mix, Projections to 2020, Source: Source, *The UK Low Carbon Transition Plan – National strategy for climate and energy*, 2009.<sup>12</sup>

Government strategy is to make up most of the deficit with renewables and biomass by 2020 but to use natural gas as a bridge during the ramp up, adding further vulnerability to

gas import issues. New nuclear is being planned to replace some of the retired fleet, but would not come on line for at least a decade. Plans for new coal are controversial for environmental reasons though the government has given the go ahead for a carbon capture and storage pilot.

Sources:

<sup>11</sup> <http://europe.theoildrum.com/node/3486>

<sup>12</sup> Department of Energy & Climate Change, *The UK Low Carbon Transition Plan - National strategy for climate and energy*, 2009.

## Renewables

Renewables - solar, wind, tidal energy and others - made up 5% of electricity generation in 2007. The government target is to implement 35% renewable electricity by 2020. In March 2009 a government supported report proposed £4.7bn of investment in upgrades to the National Grid to accommodate the increased renewables by 2020 including underwater cabling for offshore installation<sup>13</sup>. Annex 2 of the UK Industry Peak Oil Taskforce report *The Oil Crunch* sets out a plan for 50% renewables generation by 2020. The Centre for Alternative Technology puts forward a 100% renewables plan in its *ZeroCarbon Britain*<sup>14</sup> report. Both methodologies assume significant demand contraction.

A key challenge of renewables is their intermittency – the wind does not always blow, nor does the sun always shine which

means balancing power supply either via batteries, other fuels, or a grid. One possible solution for this which is gaining support is to combine a wide range of renewables through a supergrid<sup>15</sup>. The hope is that a large grid would balance out time zones, when the sun doesn't shine, and could make use of concentrated solar installations in southern countries, or even in space. As with carbon capture and storage, the concept has not yet been demonstrated at scale and will require massive investment.

The electricity challenge is an aspect of energy vulnerability that is a high priority on the current political agenda<sup>16</sup>. The rate of progress in addressing the issue gives an insight into the difficulties faced in making fundamental infrastructure changes.

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### Sources:

13 <http://www.berr.gov.uk/files/file50333.pdf>

14 <http://www.zerocarbonbritain.com/>

15 <http://www.newscientist.com/article/mg20126990.500-from-ac-to-dc-going-green-with-supergrids.html?full=true>

16 <http://www.telegraph.co.uk/news/uknews/3521406/Gas-prices-could-be-very-very-frightening-in-future-MPs-told.html>,  
<http://www.epolitix.com/latestnews/article-detail/newsarticle/john-hutton-speech-in-full/>,  
<http://www.epolitix.com/latestnews/article-detail/newsarticle/alan-duncan-speech-in-full/>

# Appendix 4

## Who else is considering the issue of peak oil?

### United Kingdom

#### The Local Government Association

Published a report *Volatile times - transport, climate change and the price of oil*<sup>1</sup> in December 2008

#### Welsh National Assembly Government

Published a report on Peak Oil in July 2008.

#### UK Industry Taskforce on Peak Oil and Energy Security

Published a report *The Oil Crunch: Securing the UK's energy future* in November 2008. The taskforce is a group of British companies including Arup, Virgin, First, Scottish and Southern Energy, Stagecoach Group, Yahoo!, Foster & Partners and Solarcentury.

#### Nottingham City Council

Passed a peak oil motion<sup>2</sup> on 9 December 2008

#### Transition Towns Movement

A grass roots movement building community solutions to peak oil and climate change

#### Somerset County Council

Endorsed a motion in July 2008 supporting Transition Towns including a point which "agrees to undertake a review of its budgets and services to achieve a reduction in dependence on fuel oil and produce an energy descent action plan in line with the principles of the Transition Initiative." Key members of the Council recently attended a training session.

#### Leicester County Council

Endorsed a similar motion to Somerset Council in December 2008 supporting the work of Transition Towns<sup>3</sup>.

#### The All Party Parliamentary Group on Peak Oil and Gas (APPGOPO)

A group of MPs raising awareness of the issue at the parliamentary level. Released a report in August 2009 on Tradable Energy Quotas (TEQs).

#### The Oil Depletion Analysis Centre (ODAC)

Released a report for Local Authorities, *Preparing for Peak Oil: Local Authorities and the Energy Crisis*.<sup>4</sup>

#### South West Draft Regional Spatial Strategy for the South West

The document contains an acknowledgement of peak oil – "Technological Development driven by scarcity of oil and other resources may provide solutions to carbon based resource use in production and transport."<sup>5</sup>

### Europe

#### Swedish government

In 2005 Sweden announced that it would break its oil dependence by 2020<sup>6</sup>. There is uncertainty around the policy since the election of a new government in 2006.

#### Irish Government

Conducted a baseline review in 2006 of the country's vulnerability in the face of an oil peak production scenario and policies required to prepare for this.<sup>7</sup>

#### Sources:

- 1 <http://www.lga.gov.uk/lga/core/page.do?pagelid=1335145>
- 2 <http://209.85.229.132/search?q=cache:7TZKEvSERdwJ:open.nottinghamcity.gov.uk/comm/download3.asp%3FdItype%3Dinline%26filename%3D36153/081208.doc+nottingham%2Bcouncil%2Bpeak%2Boil&cd=12&hl=en&ct=clnk&gl=uk>
- 3 <http://politics.leics.gov.uk/ieListDocuments.aspx?CId=134&MIId=2103&Ver=4>
- 4 [http://www.odac-info.org/sites/odac.postcarbon.org/files/Preparing\\_for\\_Peak\\_Oil.pdf](http://www.odac-info.org/sites/odac.postcarbon.org/files/Preparing_for_Peak_Oil.pdf)
- 5 p.17 Ref <http://southwest-ra.gov.uk/media/SWRA/RSS%20Documents/Final%20Draft/draftsrssfull.pdf>
- 6 <http://www.sweden.gov.se/sb/d/2031/a/67096>
- 7 <http://www.forfas.ie/publication/search.jsp?ft=/publications/2006/Title,769,en.php>



**US & Canada**

Selected US and Canadian towns and cities responding to peak oil:

**Portland, Oregon**

In May 2007 the council adopted a resolution (Appendix 5) in response to a report from a peak oil task force commissioned by the city<sup>8</sup>. It establishes the goal of reducing fossil fuel use by half, and directing city bureaus to incorporate the goal into both internal operations and programs and policies addressing planning guidelines, building energy use and transportation systems. Peak oil is one of the key challenges addressed in the cities draft *Climate Change Action plan 2009*<sup>9</sup> and is listed in the ongoing Portland Comprehensive Plan development which will inform future policy<sup>10</sup>.

**Oakland, California**

Passed a resolution in October 2006 creating a Task Force "to develop an action plan for Oakland to become oil independent by 2020." The Oil Independent Oakland Task Force completed its City Council mandate in December 2007. In 2008, the Action Plan<sup>11</sup> was presented to the Oakland Planning Commission, and both the Public Works and the Community and Economic Development Committees of City Council. Although no action was taken regarding the Action Plan, its contents and recommendations will be considered during the current process to create a city Energy and Climate Action Plan by the end of 2009.

**San Francisco, California**

First major US city to pass a resolution recognising the issue of peak oil, April 2006. Established a Peak Oil Preparedness Task Force January 2008. Task force report released March 2009.

**Spokane, Washington**

The first US city to address climate change and

energy uncertainty together, Spokane launched a sustainability strategic planning effort February 2008<sup>12</sup>.

**Hamilton, Ontario**

Commissioned report to consider how future energy constraints might affect the city government's long-range planning, energy use and provision of public services.

**Bloomington, Indiana**

Passed resolution July 2006 acknowledging the challenge of peak oil, supporting adoption of a global depletion protocol, and urging federal and state action on peak oil. City Council created a Peak Oil Task Force December 2007.

**Westerly, Rhode Island**

Passed resolution forming a peak oil task force March 2008.

**Franklin Town, New York**

Passed resolution December 2005 creating a Citizens' Commission to examine the issues raised by declining energy supplies and rising energy costs. Possibly the first US jurisdiction to address peak oil.

**Burnaby, British Columbia**

After a screening of the film "The End of Suburbia", the Mayor and the Chair of Burnaby's Transportation Committee asked staff to produce a report on peak oil.

**Australia****Queensland Government**

The Environmental Protection Agency, Queensland Government released a report *Towards Oil Resilience Community Information Paper*<sup>13</sup> in September 2008.

**Parliament of South Australia**

The Parliament of South Australia released a report, *The Impact of Peak Oil on South Australia*<sup>14</sup> in November 2008.

## Sources:

8 <http://www.portlandonline.com/osd/index.cfm?c=42894>

9 <http://www.portlandonline.com/osd/index.cfm?c=49989&a=240682>

10 <http://www.portlandonline.com/portlandplan/index.cfm?c=47107&a=191249>

11 <http://www.oaklandnet.com/Oil/default.html>

12 <http://www.greenspokane.org/BackgroundProcessDeliberationA.pdf>

13 [http://www.epa.qld.gov.au/publications/p02620aa.pdf/Towards\\_Oil\\_Resilience\\_Community\\_Information\\_Paper.pdf](http://www.epa.qld.gov.au/publications/p02620aa.pdf/Towards_Oil_Resilience_Community_Information_Paper.pdf)

14 <http://www.parliament.sa.gov.au/Committees/Select/LC/51/PeakOil/Report/TheImpactofPeakOilonSouthAustralia.htm>

# Appendix 5

## Portland, Oregon peak oil resolution

RESOLUTION No. SUBSTITUTE 36488

Establish a goal to reduce oil and natural gas use in Portland by 50 percent in 25 years and take related actions to implement recommendations of the Peak Oil Task Force (Resolution)

WHEREAS, global reserves of oil and natural gas are finite and sufficient substitutes are unlikely to be available in the immediate future; and

WHEREAS, U.S. oil and natural gas production have peaked and are now in decline, ensuring our nation's continued and growing dependence on oil and natural gas imported from politically unstable regions; and

WHEREAS, a growing body of energy industry experts believe that the world has already arrived at, or will soon arrive at, the peak of global oil production, which will be followed by an inevitable decline in available supply thereafter; and

WHEREAS, global demand for oil and natural gas continue to increase; and

WHEREAS, the City of Portland and its citizens and businesses depend on oil and natural gas for their economic welfare and their most critical activities, including transportation and food supply; and

WHEREAS, a large majority of money spent on fossil fuels leaves Oregon and provides no local economic benefit, while many of the solutions to lessening dependence on fossil fuels result in local jobs and substantial economic benefits; and

WHEREAS, reducing use of oil and natural gas also reduces emissions of carbon dioxide, the primary cause of global warming; and

WHEREAS, City Council adopted Resolution 36407 establishing a citizen Peak Oil Task Force and directing the task force to develop recommendations to City Council on

strategies the City can take to mitigate the impacts of declining energy supplies; and

WHEREAS, the Peak Oil Task Force has presented eleven recommendations to City Council that propose reducing oil and natural gas use by 50 percent over 25 years; educating the public; accelerating implementation of land use and transportation policies that reduce oil use; expanding energy efficiency programs; supporting sustainable economic development; strengthening social and economic support systems; and preparing for energy emergencies; and

WHEREAS, the city's ability to reorganize its transportation system to meet this goal with the requisite investments in walking, bicycling, carpool, and transit infrastructure and programs will require new, additional financial resources; and

WHEREAS, many of the actions that will reduce Portland's exposure to oil and natural gas will take many years to implement fully, and it is therefore essential to initiate change immediately;

NOW, THEREFORE, BE IT RESOLVED, that the City of Portland has a goal to reduce oil and natural gas use in Portland by 50 percent by 2030; and

BE IT FURTHER RESOLVED, that the Director of the Office of Sustainable Development shall issue a report annually on oil and natural gas use in Portland; and

BE IT FURTHER RESOLVED, that all bureau sustainability plans, developed through the Sustainable City Government Partnership, shall identify and carry out strategies for reducing oil and natural gas use in internal bureau operations; and

BE IT FURTHER RESOLVED, that the Planning and Development Bureau Directors shall propose to City Council an action plan to implement the recommendations in the Peak Oil Task Force report that includes funding needs; and

BE IT FURTHER RESOLVED, that Commissioner Adams will offer an implementation plan regarding transportation-related issues responsive to the Peak Oil Task Force recommendation within one year; and

BE IT FURTHER RESOLVED, that the Director of the Office of Sustainable Development shall, in consultation with the Planning and Development Bureau Directors, develop policy options this calendar year to improve building environmental performance, including reducing oil and natural gas use and carbon dioxide emissions; and

BE IT FURTHER RESOLVED, that the Director of the Office of Sustainable Development shall work in coordination with Commissioner Sten and Saltzman's offices to revise the Local Action Plan on Global Warming in response to the most recent scientific findings about climate change and to incorporate the recommendations of the Peak Oil Task Force; and

BE IT FURTHER RESOLVED, that the conclusions and recommendations of the Peak Oil Task Force be considered in the City Strategic Plan and updates to the Comprehensive Plan; and

BE IT FURTHER RESOLVED, that the Planning Commission and Sustainable Development Commission shall monitor implementation of the recommendations of the Peak Oil Task Force.

Adopted by the Council, March 07, 2007  
 Commissioner Dan Saltman

GARY BLACKMER  
 Auditor of the City of Portland  
 By: /S/ Susan Parsons  
 Deputy

Prepared by: Brendan Finn  
 March 1, 2007

BACKING SHEET INFORMATION

AGENDA NO. S-206-2007

ORDINANCE/RESOLUTION/COUNCIL DOCUMENT NO. SUBSTITUTE 36488

COMMISSIONERS VOTED AS FOLLOWS:

	YEAS	NAYS
ADAMS	===	===
LEONARD	X	
SALTZMAN	X	
STEN	X	
POTTER	X	





[www.bristolgreencapital.org](http://www.bristolgreencapital.org)