SPICe Briefing
Good for climate, good for health

21 July 2015

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The Climate Change (Scotland) Act 2009 requires a reduction in Scotland’s greenhouse gas emissions by at least 80% by 2050. Policies for reducing emissions can also provide benefits for public health. This briefing explores approaches to emissions reductions in transport, diet and home energy efficiency that offer opportunities to improve health. The areas of health which can benefit from the approaches are wide ranging and relate to heart disease, respiratory illness, bowel cancer and mental health and wellbeing, as well as health risk factors such as inactivity and obesity.

Photos from Flickr.com: Amsterdamized, 2010; Philip Anderson 2012; Simon Williams, 2010
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EXECUTIVE SUMMARY

Scotland has achieved reductions of greenhouse gas emissions in all sectors of society. However, it has missed its last three statutory annual targets. These targets are motivated by acknowledgement from the Scottish Government and the United Nations that global temperature rise should be limited to 2°C in order to avoid the worst effects of climate change. In some sectors, such as transport, emissions have only reduced slightly since 1990. In other sectors, such as agriculture, the rate of emission reduction is assessed as slowing down.

Many approaches for mitigating climate change have the potential to benefit individual health and, through improved public health, can benefit society. Such approaches support not only the Scottish Government’s National Performance Objective for a Greener Scotland but also a Healthier Scotland. This briefing focuses on three policy areas that offer climate and health benefits: active travel, diet and home energy efficiency. The examples show how policies in these areas can help address several issues of importance for the health of people in Scotland including heart disease, bowel cancer, obesity and aspects of mental health. Furthermore, through targeted action they can help improve the health of children and quality of life for the elderly as well as reducing health inequality.

A switch from the use of cars to walking or cycling over short distances not only benefits the health of the traveller but also the wider community. It does this through reducing the significant problem of urban air pollution whilst at the same time reducing greenhouse gas emissions, inactivity and obesity. Being physically active has been found to have a preventative effect on the occurrence of Alzheimer’s disease.

Livestock have a large impact on the environment, particularly by the emission of methane from ruminant animals (e.g. cattle and sheep). Unless industrialised nations move away from animal-based food to more plant-based food, research suggests that limiting global temperature rise to 2°C will become very unlikely. The Scottish Government have published Scottish Dietary Goals. These Goals include a suggested maximum red meat intake but do not currently discuss the environmental implications of meat nor explicitly consider scientific evidence of the risk of bowel cancer. A reduction in animal-product consumption in industrialised nations could improve nutritional balance in line with World Health Organisation guidelines.

The final example is improved home energy efficiency. Boiler efficiency and home insulation have seen significant improvement since 2007 due to UK and Scotland-wide programmes. These have resulted in estimated reductions in residential sector emissions of 19% between 1990 and 2011. Studies have also shown benefits to health as a result of energy efficiency improvements.

There are further examples of emission reduction policies benefitting health, for example the use of renewable energy, or woodland expansion. In addition, a report for the UK Committee on Climate Change found that their UK emission reduction scenario provided a net economic benefit of £85bn.
INTRODUCTION

The aims of climate change policy to reduce emissions are, on the surface, distinct from the policy aims to improve public health. Unsurprisingly therefore, the aims can often be pursued independently. However, there are approaches to reducing emissions which also contribute towards the aims of public health, for example through improving air quality, and reducing physical inactivity or poorly heated homes. This briefing describes some example approaches and outlines to what extent the multiple benefits are considered within Scottish Government policy. The mitigation of climate change through such approaches also contributes to avoiding the negative impacts of future climate change. The potential negative impacts of climate change on Scotland’s public health are described in the SPICe briefing on “Climate change and health in Scotland” (Ebmeier, 2012).

SCOTTISH GREENHOUSE GAS EMISSIONS

The Climate Change (Scotland) Act 2009 set statutory targets of at least a 42% reduction by 2020 and at least an 80% reduction by 2050, compared to 1990 for the main greenhouse gases (GHGs). These targets are motivated by acknowledgement from the Scottish and UK governments and the United Nations that global temperature rise should be limited to 2°C in order to avoid the worst effects of climate change. The Scottish Government is required by the Act to periodically produce a plan setting out specific policies and proposals on how to meet the annual reduction targets. The most recent of these is the Scottish Government’s Low Carbon Scotland – Meeting the Emissions Reduction Targets 2013-2027, The Second Report on Policies and Proposals (RPP2) (Scottish Government 2013a).

Between 1990 and 2013, Scotland’s emissions reduced by 34%, however the annual targets for 2010, 2011, 2012 and 2013 were missed. Figure 1 shows Scotland’s progress in reducing emissions across the main emission sectors1 between 1990 and 2013 (Scottish Government, 2015a). The largest emissions are from the energy sector. Transport and the residential sectors contribute significant quantities of GHG; these two sectors have shown much slower rates of reduction compared to other sectors. The third largest emissions are in the agriculture sector. These are predominantly not fossil fuel burning but instead from the methane emissions from cows and sheep, and nitrous oxide from fertiliser.

Also shown in Figure 1 are the emissions from each sector if all policies and proposals from RPP2 achieve their estimated emission reduction (often referred to as abatement)2. All emission sectors are, to varying extents, making progress towards a low carbon Scotland. Policies and proposals in the residential sector have the potential to increase the rate of abatement towards 2020. Transport has made only small reductions since 1990 and will potentially be the largest emitting sector in 2020. Unless additional policies are implemented agriculture emission reductions between 2012 and 2020 will be, at best, about half of those achieved between 1990 and 2012.

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1 The sectors are: “Electricity generation”, “Transport”, “Agriculture and related land use”, “Industry, business and public sector”, “Residential” and “Waste”.

2 Based on EU ETS 20%. Some emissions abatement is achieved through the EU emissions trading scheme (ETS). The current target is a 20% reduction in 2020.
Figure 1: Scotland’s emissions by sector for 1990, 2013 and estimated for 2020

(2020 estimates based on policies and proposals as set out in RPP2)

PUBLIC HEALTH CHALLENGES

Scotland’s National Performance Framework identifies a healthier Scotland as a key strategic objective. Achievement of this involves work towards several national outcomes which include a focus on children, the elderly, health inequalities and living in well-designed, sustainable places. These themes of related national outcomes are integral to improving Scottish health as well as linking with several common aims of a sustainable, low-emissions society.

Physical activity, diet and housing conditions can all impact on the health of the individual. Increasing levels of physical activity and improving diets and housing conditions can help address some of the biggest public health challenges in Scotland including cancer, cardiovascular disease and mental health disorders. Furthermore, they are closely linked with the related ambitions of the Scottish Government to improve quality of life, especially for the elderly and children, and to address the causes of inequality.

According to the NHS Cancer in Scotland report (2014), there were 15,764 deaths in Scotland during 2013 from cancer. Bowel (colorectal) cancer is the third most common form of cancer and has shown increases amongst women in the last decade. While some of the increased incidence could be attributed to the introduction of the bowel screening programme poor diet and physical inactivity are seen as risk factors (NHS, 2014). The Scottish Government’s 2013 National Health Survey (2014i) presents data on cardiovascular disease and related risk factors of which poor diet and physical inactivity are major contributors. Cardiovascular disease is the most common cause of death in Scotland after cancer and caused 22% of deaths during 2012.

The National Health Survey also reports on mental wellbeing. It found that in 2012/2013 almost one in ten adults experience at least moderately severe depression and similar numbers experience anxiety. A detailed review of Mental Health in Scotland and current policy is available in a SPICe briefing (Nowell, 2014). It highlights that one in four people in Scotland will experience a diagnosable mental health problem each year. Suicide rates have decreased since 2000/2002 though are still much higher than much of Western Europe (Nowell, 2014).
TRANSPORT, CLIMATE CHANGE AND HEALTH

Transport choices can have positive or negative effects on health through changes in air pollution, physical activity and mental wellbeing. Some modes of transport such as fossil-fuelled cars increase air pollution thereby negatively impacting on health. Increased active travel (walking and cycling) reduces air pollution as well as providing an opportunity for physical activity, which in turn can benefit mental wellbeing. The impact on GHG emissions is mutually beneficial, with active travel resulting in none of the emissions associated with cars. Therefore, to replace short car journeys with active travel can benefit health and climate.

The Scottish Government has identified many of the multiple benefits of active travel through the National Performance Framework indicator to “increase the proportion of journeys to work made by public or active transport”.

EVIDENCE

Benefits for climate

Emissions from cars accounted for 10% of all emissions from Scotland in 2012 (Scottish Government, 2015). Short journeys create the most emissions per mile driven. In 2013, over a quarter of all journeys in Scotland were made by car or van, had no passengers and were less than 5km. In comparison, bikes made only 1% of journeys under 5km (Transport Scotland, 2014 table TD2a). Emissions can be reduced through changes in choice of transport mode for short journeys.

Benefits for health

As well as carbon dioxide (CO₂), transportation emits Nitrogen Oxides (NOₓ) and quantities of particulate matter less than 10µm (PM10), with the majority of these emissions from road traffic (Scottish Government, 2015b). Emissions of NOₓ and PM10 not only impact on the climate but urban air quality where they contribute to a range of health problems including strokes, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma (World Health Organisation, 2013, 2014). The definition of PM10 includes particles smaller than 2.5µm (PM2.5). A Public Health England study (2014) of health impacts of air pollution across the UK found that there were over 2000 attributable Scottish deaths during 2010 to PM2.5 alone.

The World Health Organisation (WHO) (2009) places physical inactivity as the fourth highest risk factor cause of death. This has been supported by a recent study of Europe which found that inactivity may cause twice as many attributable deaths as obesity (Ekeland, 2015). Physical activity is also fundamental to weight control and tackling obesity. Obesity itself was recently estimated to cost NHS Scotland up to £600 million a year (Castle, 2015). The NHS advises that adults, 19-64 years old should do 150 minutes every week of moderate-intensity aerobic activity such as

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3 PM10 is particulate matter of diameter less than or equal to 10 micrometers (microns). Particulate matter from road transport consists largely of particles of carbon (soot) released from vehicle exhausts as a result of fossil fuel combustion.
fast walking or cycling. If then, travel by car was replaced by active travel, improved air quality and health benefits from physical activity would be the likely outcome.

Physical activity can benefit mental health and wellbeing in many ways and this is a developing research area. The Mental Health Foundation report (2013) brings together evidence into the positive impact of physical activity on mental wellbeing. Benefits include improvement to sleep, increased social interaction, positive impacts on mood, stress, self-esteem, depression and anxiety. Of particular interest to Scotland’s aging population is that moderate physical activity can have a protective effect against dementia and cognitive decline, a conclusion further supported by a study into worldwide risk factors of Alzheimer’s disease, a major component of dementia (Norton, 2014).

A shift from car use to active travel does have the potential for negative, as well as positive, impacts. Nine cyclists and 57 pedestrians were killed in Scotland during 2012. A SPICe briefing on Walking and Cycling summarises details of the circumstances in which these deaths occurred (Rehfisch, 2014). The briefing also presents research that has shown that the benefits of cycling can outweigh the risks by up to 20 to 1. Furthermore, research has shown that car and bus travellers can have a higher exposure to air pollution than pedestrians or cyclists because the pollution is slower to be removed from vehicles once it has entered through vents. A video of this study is available online.

GOVERNMENT POLICY

The RPP2 includes detail on how active travel will help meet emissions targets. The Scottish Government’s vision is that “by 2020, 10% of all journeys in Scotland will be by bike” and beyond 2020, Scotland will continue to “substitute cycling and walking of car journeys up to five miles”. Currently, the Scottish Government foresees its policies and proposals on transferring transport away from private cars to active travel, public transport, and car-share schemes could abate 139 kilotonnes of carbon dioxide equivalent (ktCO$_2$e) per year by 2020. This is equivalent to just under 8% of the total planned emission reductions from the transport sector by 2020.

In RPP2, the Scottish Planning Policy is cited as a key driver for more sustainable infrastructure development, to make more active travel possible. The policy principle of the Scottish Planning Policy (2014h) is “a presumption in favour of development that contributes to sustainable development”. Policies should be guided by “the six qualities of successful places”, the sixth of which involves “prioritising sustainable and active travel choices”. Paragraphs 269-291 detail how planning policy should: “promote opportunities for travel by more sustainable modes in the following order of priority: walking, cycling, public transport, cars” and that “planning permission should not be granted for significant travel-generating uses at locations which [other sustainable travel options are not available]”.

An update to the Scottish Government’s Cycle Action Plan for Scotland (2013b) offers 19 actions that work towards the 10% cycling target. It also discusses views of stakeholders on the previous action plan, describing the current actions to increase cycling and case studies of cycling schemes.

In an earlier stage of development are actions towards the increase of walking which has begun with publication of The National Walking Strategy for Scotland (2014c). The consultation Low Emission Strategy for Scotland (2015) outlines areas which can improve air quality and includes the additional role of the Paths for All charity, to whom the government provides funding, in forming a delivery forum for the National Walking Strategy. Walking has also been considered by the Scottish Government using a tool that explores individual, social and material influences.

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4 http://healthyair.org.uk/healthiest-transport-option-video/
on behaviour (referred to as the ISM tool). The tool is designed to help policymakers think through all aspects of how peoples’ behaviours are influenced. An ISM workshop for walking came up with approaches ranging from providing maps on the ground to encouraging GPs to promote walking (Scottish Government, 2013c).

Two publications bring together the multiple benefits of active travel including climate change mitigation and health. The National Physical Activity Implementation Plan (2014b) proposes actions which focus on different areas including the environment, and health and social care. Timescales of action began before the 2014 Commonwealth Games and extend out to 2024. A Long Term Vision for Active Travel in Scotland 2030 (2014a) brings together the multiple benefits, and demonstrates how active travel should develop in many areas of society. The Scottish Government is monitoring progress in active travel through its National Performance Framework indicator to “increase the proportion of journeys to work made by public or active transport”. The indicator has remained roughly static between 1999 and 2013.

**Smarter Choices, Smarter Places Case Study**

From 2009-2012 Scotland’s Smarter Choices, Smarter Places (SCSP) programme implemented and monitored seven pilot schemes to encourage travel behavioural change. The locations were Barrhead, Dumfries, Dundee, Glasgow East End, Kirkintilloch/Lenzie, Kirkwall and Larbert/Stenhousemuir. The approaches varied between locations and included help in travel planning, bike loan schemes, new cycling and walking infrastructure and signage, increased buses and 20mph zones. The Scottish Government’s Final Report on Monitoring and Evaluation of SCSP (2013d) describes the scheme and funding in detail as well as providing a comprehensive evaluation.

Walking increased in all locations, significantly in five out of the seven locations with the share of journeys made by walking in Larbert/Stenhousemuir increasing by 21 percentage points. Cycling increased in five locations. Car driver trips decreased in all areas, significantly in four locations with Larbert/Stenhousemuir decreasing by 19 percentage points.

The report estimates that, across all the schemes, the average annual saving on direct transport costs was £62 per resident and that 16.4 ktCO$_2$e emissions were saved per year. The economic value of lifetime health gains associated with the increase in the population meeting activity guidelines was estimated to be equivalent to £10.6 – 46 million. The report recommends wider roll-out of the schemes and offers advice on which particular features could be built on. When considering the health benefits of active travel it can often be overlooked that increased active travel may mean less physical activity at other times. An independent study by Norwood (2014) found that individuals in areas covered by SCSP schemes were 6% more likely to meet physical activity guidelines than in non-SCSP locations.

**CHALLENGES AND OPPORTUNITIES**

In their report on the 2015-16 draft budget, the Scottish Parliament Infrastructure and Capital Investment Committee (2015) found “a general consensus…that the overall package of measures funded in the draft budget on transport measures would be insufficient to meet the government’s performance targets on GHG emissions, traffic congestion and levels of sustainable and active travel”. Their recommendations included that:
“Substantial additional funding should be considered to roll out [support for sustainable and active travel] projects that in the medium to long term will be likely to reduce future Government spending plans”

“Funding should be focussed on the widespread implementation of exemplary projects”

“The Scottish Government should...explore different ways of creating greater long term certainty in their future commitments to funding [support for sustainable and active travel]”

The UK Committee on Climate Change (2015) recommended that the ‘Smarter Choices Smarter Places’ programme should be extended beyond 2016 to allow funding of longer-term behaviour change programmes.

Cycling Scotland’s Annual Cycling Monitoring Report (2015) identifies “understanding perceptions of cycling” as a key area for focus. The report, as well as presenting statistics on cycling activity in Scotland, provides information on peoples’ reasons for not cycling to work. The top five reasons are shown in Figure 2.

**Figure 2: Top reasons Scottish people give for not cycling to work**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too far to cycle</td>
<td>36.2%</td>
</tr>
<tr>
<td>Weather too cold/wet/windy</td>
<td>19%</td>
</tr>
<tr>
<td>Do not have a bike</td>
<td>13.9%</td>
</tr>
<tr>
<td>Too many cars on road</td>
<td>13.9%</td>
</tr>
<tr>
<td>Traffic travels too fast</td>
<td>11.7%</td>
</tr>
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A number of initiatives provide examples of measures that seek to address these barriers. For example:

- Copenhagen’s ‘Green Wave’ on major road arteries allows cyclists to ride a wave of green lights into and out of the city during rush hour (Guardian, 2014)
- The new operator of ScotRail, Abellio, is a Dutch company that is looking to integrate active travel with train travel through increased cycle storage and bike hire at stations (Abellio, 2015)
- In Groningen traffic lights turn green more often for cyclists in the rain and in Vienna hot tea and cookies for winter cyclists as in Vienna
- Bike schemes like Glasgow’s NextBike, Copenhagen’s GoBike that includes built-in tablets to give cyclists directions and train times and Paris’s Velib scheme that now includes children’s bikes, P’tit Velib
- Infrastructure improvement that segregate cyclists from traffic, for example London has announced it will build Europe’s longest segregated urban cycleway
- 20 mph speed limits as trialled as part of the Smarter Choices, Smarter Places pilot schemes in Scotland and planned more widely for most of Edinburgh’s roads.
DIET, CLIMATE CHANGE AND HEALTH

Diet and health are inseparable. The Dietary Goals for Scotland (Scottish Government, 2013d) offer advice on several components of diet which impact on many aspects of health. An upper limit on red meat is included within the goals. This is motivated by a link between red meat and bowel cancer.

Scientific research has found links between high red and processed meat consumption and other negative health outcomes. Furthermore, research has drawn attention to large agricultural emissions of greenhouse gases which are disproportionally created by ruminant livestock (Green, 2015).

While animal products form part of Scotland’s economy and can provide important nutritional benefits it will be more challenging to meet global climate change mitigation targets without industrialised nations considering the role of their diet. The Intergovernmental Panel on Climate Change (IPCC) (2014) shows that a change to a nutritionally sufficient low animal product diet has the greatest mitigation potential of all the agricultural options they explored. The National Farmers Union (NFU, 2014) have, however, challenged the suggestion that meat consumption should be reduced:

“Eating less meat is a simplistic solution to what is a highly complex situation….it mustn’t be forgotten that meat and dairy products are an important component of a healthy, balanced diet.”

EVIDENCE

Benefits for health

The World Cancer Research Fund (WCRF) (2011, 2014) finds that high consumption of red meat (beef, lamb and pork) and processed meat are linked to increased bowel cancer risk. The high levels of saturated fat in some animal products means that high meat consumption is sometimes suggested as increasing the risk of heart disease (NHS, 2013a). A recent study by Chowdhury (2014) questions the significance of the link between saturated fat and heart disease, though UK guidelines and British Heart Foundation advice to limit saturated fat are unchanged.

Two of the most common causes of death in Scotland are cancer and heart disease, with bowel cancer causing the second highest number of cancer deaths in 2013, according to the NHS Cancer in Scotland report (2014). Red meat can provide protein, zinc and iron as part of a healthy diet. The advice from the WCRF (2014) is to eat no more than 500g of cooked red or processed meat a week.

By reducing high consumption of red and processed meat the additional risk of bowel cancer is removed and the positive health benefits in other areas can then come from its replacements. For instance eating five portions of fruit and vegetables each day can reduce the risk of heart disease, stroke, type 2 diabetes and obesity (NHS, 2013b). The Scientific Advisory Committee on Nutrition (2004) found that eating at least one portion of oily fish a week would also reduce the risk of cardiovascular disease. Some dairy products such as cheese, have high levels of saturated fats and therefore are not necessarily appropriate replacements for reduced meat consumption.
Benefits for climate

Ruminant livestock (cattle and sheep) produce large amounts of methane during digestion. Gram for gram, methane has a much greater warming effect on the climate than CO₂. Figure 3 highlights typical emissions associated with a number of fresh food types based on studies in the UK and Europe (Green, 2015). In this study, beef and lamb result in more than 20 times the emissions of beans and pulses, per kilogram. Other meat products, fish and eggs result in less than a third of the emissions of beef or lamb. The large quantity of milk that goes into each kilogram of cheese means that it too has relatively high associated emissions, however calorie for calorie they are far lower than those associated with beef (Eshel, 2014).

Figure 3: GHG emissions (kgCO₂e) per kilogram of consumed food

<table>
<thead>
<tr>
<th>Food Type</th>
<th>Emissions (kgCO₂e)</th>
</tr>
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<tbody>
<tr>
<td>Beef</td>
<td>35.4</td>
</tr>
<tr>
<td>Lamb</td>
<td>32.5</td>
</tr>
<tr>
<td>Cheese</td>
<td>18.3</td>
</tr>
<tr>
<td>Fish</td>
<td>10.6</td>
</tr>
<tr>
<td>Pork</td>
<td>9.0</td>
</tr>
<tr>
<td>Chicken</td>
<td>6.3</td>
</tr>
<tr>
<td>Eggs</td>
<td>4.7</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>2.8</td>
</tr>
<tr>
<td>Pasta &amp; Rice</td>
<td>1.8</td>
</tr>
<tr>
<td>Cereals &amp; bread</td>
<td>1.7</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1.6</td>
</tr>
<tr>
<td>Pulses &amp; beans</td>
<td>1.5</td>
</tr>
<tr>
<td>Potatoes</td>
<td>1.5</td>
</tr>
<tr>
<td>Fruit</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Source: Green, 2015

The National Atmospheric Emissions Inventory (2014) report shows that 2012 emissions from cattle, sheep and pigs accounts for around 7% of all Scottish CO₂e emissions — equivalent to over two thirds of the emissions from cars.

The amount of emissions (CO₂e) associated with crop production and fertiliser application is similar to that from livestock but the quantity of food produced by each is significantly different. Red meat products accounted for less than a tenth of food produced in 2013; Scotland’s red meat industry produced 217,000 tonnes (Quality Meat Scotland, 2014) while farming of potatoes, cereals and oilseed rape produced 3.9m tonnes of food (National Farmers Union Scotland, 2015).

A report for the UK Committee on Climate Change discusses in detail how emissions and land use could change under various scenarios of changed consumption of animal products (Audsley, 2011). It considers the methane emissions from livestock, the production of livestock feed, and the emissions associated with imported food. Emissions would reduce under all scenarios considered. Emissions could be reduced by over 30% in a scenario which reduced animal product consumption by half and balanced it by increases in plant product consumption.

Evidence of co-benefits

The IPCC report (2014) chapter 11 has found that if a diet including a daily average of around 90g of meat, fish and eggs were to be adopted, not only would it be sufficiently nutritious but it would greatly reduce emissions as well as the cost of achieving emission reduction targets.

Studies considering the emission reduction and health benefits of reduced animal product diets in Europe or the UK are numerous. Scarborough (2014) showed that the emissions from UK
diets are highest from diets including over 100g of meat per day and decrease as the amount of meat and dairy in the diet reduces. UK vegan diets produce less than half of the emissions of high meat diets whilst being closer to WHO nutritional guidelines. Green (2015) demonstrates that a switch from current UK diets to those meeting WHO guidelines would lead to a 17% reduction in dietary emissions - they go further and say that realistic further reductions in meat and dairy, that still meet WHO guidelines, could provide up to a 40% reduction in UK dietary emissions. Replacing half the amount of meat and dairy with fruit and vegetables in the UK diet could provide a 19% reduction in associated emissions whilst delaying or averting 30,000 - 44,000 deaths per year from cardiovascular disease or cancer (Scarborough, 2012). The mutual benefits do not apply only to the UK, by halving consumption of meat, dairy and egg consumption in the EU, a 25-40% reduction in agriculture’s GHG emissions could be achieved, along with reduced health risks (Westhoek, 2014).

**SCOTTISH DIETS**

The Food Standards Agency (FSA) interim report (2014) on food consumption in Scotland compares the average intake of a number of specific food groups with Scottish Dietary Goals (Table 1). For a number of food groups the average intake falls short of the dietary goals.

**Table 1 A comparison of the average intake of fruit and vegetables, oil rich fish and red meat intake in 2012 in Scotland with the Scottish Dietary Goals**

<table>
<thead>
<tr>
<th></th>
<th>Scottish Dietary Goal (mean intake per person per day)</th>
<th>2012</th>
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<tbody>
<tr>
<td>Fruit and vegetables</td>
<td>More than 400g</td>
<td>269g</td>
</tr>
<tr>
<td>Oil rich fish</td>
<td>One portion (140g) per week</td>
<td>27.5g (per week)</td>
</tr>
<tr>
<td>Red meat</td>
<td>Average intake of red and processed meat pegged at around 70g per week</td>
<td>61.5g</td>
</tr>
</tbody>
</table>

Alongside this the Scottish Health Survey (Scottish Government 2014i) found that:

- the proportion of children consuming red meat more than twice a week has increased from 53% in 2003 to 58% in 2012/2013
- the majority of the Scottish population (78%) do not eat the recommended amount of fruit and vegetables
- 16% of children eat at least the recommended one portion of oily fish each week.

The Department for Environment, Food and Rural Affairs (2014) reports the average purchases of food products in Scotland between the years 2010-2013. In Scotland, an average of 154g of meat was purchased per person per day (this includes red and white meat in the form of carcass meat, meat products and eating out). Wastage and cooking will mean that this isn’t the consumption weight, however whether eaten or not the GHGs associated with production will have been emitted.

The Food Standards Agency in Scotland has produced example weekly proportions of a healthy balanced diet called their *Eatwell Week*, shown in Figure 4. This diet proposes around 60g a day of total meat (red and white) (Macdiarmid et al 2013). It is designed to meet current UK Dietary References Values for energy, macronutrients and key micronutrients (Food Standards
Agency 2007); to comply with portion advice on fruit, vegetables and fish; recommendations set out in the Scientific Advisory Committee on Nutrition (SACN) Iron and Health Report (2010) on red meat as a source of iron and not exceed the target for salt intake (Food Standards Agency, 2015). The GHG emissions have been estimated for the diet as approximately 19.11 kgCO$_2$e per week, though due to limited data this does not include emissions associated with regional distribution, consumption and waste (Macdiarmid et al, 2013). The calculation does include differences between domestic and imported food production. This was compared to the current UK diet and found to have approximately 28% less emissions. Whilst meat is only a small part of the diet, the disproportionately large associated emissions can be seen in the protein section of Figure 4.

**Figure 4: Food proportions and associated emissions of the Eatwell Week**

![Food proportions and associated emissions](image)

**GOVERNMENT POLICY**

The Scottish Government (2013d) has set population dietary goals. These include many familiar nutritional intake targets as well as a maximum and average red meat intake level. The red meat target is based upon advice in the Scientific Advisory Committee on Nutrition (SACN) Iron and Health Report (2010) on red meat as a source of iron. The SACN report was motivated by findings of the link between bowel cancer and red meat. However, it was produced to inform people of the effects of reduced red meat consumption iron intake. It did not explicitly consider the reduced bowel cancer risk. The dietary goals aim for an average intake of red meat per person of 70g and a maximum intake of 90g for the highest consumers. A reduction in red meat consumption is also consistent with calorie and saturated fat dietary goals.

The Farming for a Better Climate programme is the principal means for reducing agriculture emissions outlined in the RPP2. This is a programme to encourage farmers to voluntarily take up win-win measures such as renewable energy generation, optimised fertiliser and manure management, and optimised livestock breeding and feeding. It does not promote a reduction in meat production in Scotland.

The Scottish Government’s National Food and Drink Policy (2009) expresses the desire to “link our environmental goals to our food and nutritional goals”. However, it does not mention the role of production/consumption of animal-based food in emissions nor more broadly the possible emissions associated with its dietary advice.
CHALLENGES AND OPPORTUNITIES

Despite an extensive UN Food and Agriculture report (2006) on the effect of livestock on the environment, recent research finds there is still a lack of awareness of the impact of animal products in our diet. The think-tank, Chatham House (2014), has published a multi-country study of the awareness gap of the impact of livestock on climate. It found that recognition of livestock as a significant contributor to climate change is markedly low. This is compared to waste disposal and treatment and housing energy efficiency which have lower levels of emissions but more people identified as significant. The study found that those more aware of the impact of livestock were more likely to show willingness to reduce meat and dairy consumption. It found that, in the UK, respondents were more likely to perceive experts, environmental groups, government and traditional media as helpful sources of information on climate change and livestock. Very few perceived companies/labelling and social media to be helpful.

Studies find that, due to increasing global population and demand for animal products, global reductions in agricultural emissions are very unlikely without industrialised countries reducing animal product consumption to recommended levels (Bajželj, 2014, Hedenus, 2014). Even with sustainable intensification and waste reductions of 50%, Bajželj (2014) estimates that by 2050, agriculture will use up more than half of the annual global carbon budget available if warming is to have a reasonable chance of being limited to 2°C. By not addressing the carbon footprint of livestock within diet, the size of the task in other sectors will become greater.

In their report on Scotland’s progress towards meeting emission reduction targets the UK Committee on Climate Change (2015) did not make any specific recommendations relating to diet. The report did suggest that the Scottish Government review the uptake and success of measures set out in the Farming for a Better Climate programme and develop proposals aimed at improving nitrogen efficiency.

HOME ENERGY EFFICIENCY, CLIMATE CHANGE AND HEALTH

Improving the energy efficiency of homes has received support from Scottish Government for the combined benefits of reducing emissions and eradicating fuel poverty. The Scottish Government is aiming to eradicate fuel poverty in Scotland, “as far as is practicable”, by November 2016 (Scottish Government, 2002). Those in fuel poverty can be vulnerable to negative health effects such as cardiovascular disease and respiratory illness as well as impacts on mental health and wellbeing.

Fuel poverty is defined as those households that “in order to maintain a satisfactory heating regime, …would be required to spend more than 10% of its income (including Housing Benefit or Income Support for Mortgage Interest) on all household fuel use”. The most recent Scottish Government update on Fuel Poverty (2014e) shows that, in 2013, 39% of Scottish homes were fuel poor.

Three factors control the prevalence of fuel poverty: fuel price, home energy efficiency and household income (Scottish Government, 2014e). Scotland and the UK have significant numbers of houses that are of a low level of energy efficiency, with 64% of homes in 2013 being rated D-G in energy efficiency (Scottish Government, 2014g). Of the fuel poverty levers, the Scottish Government has direct influence over home energy efficiency and in this area there has been progress. While fuel poverty has risen over the period 2003-2013, this has been principally due to fuel price changes and has been less than it would have been without the improvement in home energy efficiency (Scottish Government, 2014e).
EVIDENCE

Benefits for health

Home energy efficiency of all Scottish housing stock will affect the ability to meet emission abatement targets. Health benefits come by concentrating funding and efforts towards the subset of these households which are also fuel poor. Fuel poverty implies that pressure is on a household’s finances and choices may have to be made which are contrary to the best decision for health. An outcome may be not to maintain a satisfactory level of heating. For an ordinary household, the *satisfactory level of heating* is considered to be 21°C in the living room and 18°C for the rest of the house for 9 hours a day on weekdays and 16 hours a day on weekends. The temperature and number of heating hours increases for vulnerable households (Scottish Government, 2012).

The Scottish Government’s Fuel Poverty Evidence Review (2012) made an important distinction between fuel poverty and cold homes. It explained that evidence available to it did not suggest direct links between fuel poverty and physical health or winter mortality in Scotland, but instead that cold homes were the basis of most available evidence for impacts on health. This can be because people living in fuel poverty may heat their homes instead of spending in other areas. They did however find some evidence of a link between fuel poverty and mental wellbeing particularly for young people and for the link between heating costs and stress. The review also evidences that for children the risk of physical and mental health problems increases the longer they live in cold homes.

The UK Health Forum (2014) describes the health impacts of cold homes and fuel poverty in the UK. The principle areas of morbidity affected by cold and damp homes are circulatory diseases and respiratory illnesses. This affects all ages but particularly children and the elderly. It can also result in low infant weight gain. The report estimates that there were over 9,000 excess winter deaths in the UK due to cold housing in 2012/13. There is also strong and growing evidence for the impact of fuel poverty and cold homes on mental health and wellbeing. The report presents a cycle that can form between fuel poverty, stress, physical health problems and increased health-risk behaviours such as alcohol consumption.

An analysis of studies looking at the health benefits of energy efficiency interventions shows that small but significant positive benefits are seen, with the more recent studies showing greater benefits (Maidment, 2014). The analysis also considered whether materials used, or reduced ventilation, could reduce the indoor air quality and therefore be detrimental to health. In general, most studies found positive effects. The greatest health benefits were seen for interventions targeted at children and those with poor health and focussed single measures where specific problems were addressed.

Benefits for climate

“Investing in energy efficiency to tackle fuel poverty has contributed to reducing emissions from the [residential] sector by 19.2% [between 1990 and 2011]. A recent report from the UK Committee on Climate Change found that Scotland’s housing stock is now, on average, the most efficient in the UK.” (Scottish Government, 2014e). Scotland is seeing a steady improvement in several areas of energy efficiency. There has been an overall reduction in emissions from the residential sector since 1990, this is despite an increase in the number of homes (Scottish Government, 2013). The Scottish Housing Condition Survey (SHCS) models the emissions from households based on standard behaviour (Scottish Government, 2014g). On that basis, modelled SHCS emissions show reductions since 2010 of 6% in total and 8% per household due to improvements in housing stock energy efficiency.
Potential emissions abatement by further improvements are not presented by SHCS but the remaining areas for improvement should give some scope – figures are based on 2013 housing condition. While most housing now has some level of loft insulation, 48% of households with a loft still have less than 200mm of insulation. Of those houses with cavity walls, 31% have not been insulated.

Solid wall insulation is an area that has made little progress with 89% of solid wall households still un-insulated. Overall, 46% of the housing stock has un-insulated walls while 322,000 of these homes show no obvious impediment to addition of insulation. Boilers not meeting the minimum EU efficiency account for 62% of gas and oil boilers, down 6% since 2012 (Scottish Government, 2014g). The trend is expected to continue as boilers reach the end of their life. Within all areas the social housing sector is showing greater efficiency than the private sector. Further potential for reductions in emissions could be provided through renewable and district heating sources.

GOVERNMENT POLICY

The Scottish Government has set two complementary targets in this area: “to ensure, so far as reasonably practicable, that people are not living in fuel poverty in Scotland by November 2016” and by 2020 “to reduce total final energy consumption in Scotland by 12% (against a baseline of the average final energy consumption in 2005-7)” (Scottish Government, 2014j).

Outcome two of the Scottish Planning Policy identifies that “planning can support the transformational change required to meet emission reduction targets and influence climate change. Planning can also influence people’s choices to reduce the environmental impacts of consumption and production, particularly through energy efficiency and the reduction of waste”. Paragraph 110 confirms that the planning system should enable the provision of energy efficient housing. According to the Scottish Government’s Fuel Poverty Progress Report (2014e) energy standards for new buildings to begin in 2015 “will result in emissions that are 45% lower than the 2007 standards and 21% lower than the current 2010 standards”.

The Scottish Government’s Sustainable Housing Strategy (2013e) sets out the 2030 route-map for sustainable housing and describes the Home Energy Efficiency Programme for Scotland (HEEPS). An aim of HEEPS is to follow the Fuel Poverty Forum’s suggestion of a move to Area Based Schemes, implemented by local councils, to tackle fuel poverty but for national schemes to provide for the most vulnerable. The Affordable Warmth Scheme looks to get support from the UK-wide ECO Home Heating Cost Reduction Obligation for all eligible Scottish households. A two year extension of the Energy Assistance Scheme is to ensure that the most vulnerable and poor households who were eligible for the Affordable Warmth Scheme will still receive assistance.

The Energy Efficiency Standard for Social Housing (EESSH) sets a minimum energy efficiency rating of social housing in Scotland to be achieved by 2020. The SHCS showed that private housing efficiency standards are currently lagging behind social sector housing. A Scottish Government consultation beginning in 2015 is looking to create a standard for all privately
owned homes. The rented sector of private homes in England and Wales is now under new regulations to improve energy efficiency by 2018. As well as minimum energy efficiency standards coming into place, tenants have been given extra power to make landlords take up existing government schemes for energy efficiency (Department of Energy and Climate Change, 2014).

A draft Heat Vision puts energy efficiency and fuel poverty alongside complementary proposals in community and renewable heating (Scottish Government, 2013f). Included is the target to achieve “11% of heat demand from renewable sources by 2020”. Draft policy statements on community energy and heat generation both discuss how these play a role in tackling fuel poverty (Scottish Government, 2014c, 2014j). Specifically, support for district heating can help those properties not served by the mains gas network to secure affordable heating infrastructure. These documents also discuss the Scottish Government’s Heat Mapping Programme which looks to identify, on local scales, demand for heat and low carbon supply opportunities (Scotland’s Heat Map).

Emissions reductions in 2020 from energy efficiency policies and proposals set out in RPP2 is estimated to be 803 ktCO₂e, while from renewable and district measures it is estimated at 236 ktCO₂e. Following a 19% reduction in residential emission between 1990 and 2011 and some additional Scottish Government funding and finance schemes to public sector and small businesses the new “estimated emissions from the homes and communities sector in 2020 are projected to be 5,106 ktCO₂e ... 37% lower than the 1990 baseline emissions from housing...” Additional detail on the state of Scottish fuel poverty and government policy can be found in the SPICe Fuel Poverty Briefing (Liddell, 2015).

**CHALLENGES AND OPPORTUNITIES**

In their report on the 2015-16 draft budget, the Infrastructure and Capital Investment committee (2015) concluded that:

- “the Scottish Government [should] continue to fund measures to enhance the future sustainability of all new houses built”
- “Given the potential carbon savings from upgrading existing homes, the Committee strongly believes that improving the energy efficiency of homes should be a national infrastructure priority”
- “The Scottish Government should explore ways of valuing the holistic benefits of home energy efficiency and balance these benefits with the investment costs”

In the Scottish Government's Fuel Poverty update (2014e) it is made clear that not all levers of fuel poverty are devolved, "We don’t have control over prices and we don’t have powers over ECO and Warm Home Discount that are funded through consumer energy bills.” The Smith Commission (2014) has since agreed that further powers in this area be devolved:

> “Powers to determine how supplier obligations in relation to energy efficiency and fuel poverty, such as the Energy Company Obligation and Warm Home Discount, are designed and implemented in Scotland will be devolved. Responsibility for setting the way the money is raised (the scale, costs and apportionment of the obligations as well as the obligated parties) will remain reserved.”

The UK Committee on Climate Change (2015) recommends that Scottish Government:

- Carry out an evaluation of current energy efficiency programmes (especially the area-based schemes)
• Develop effective energy efficiency schemes for multi-tenanted properties
• Make energy efficiency funding available over a sufficiently long timescale to ensure that complex projects can be completed
• Ensure that policies effectively target electrically-heated homes both in terms of energy efficiency improvement and incentives for low-carbon heat
• Adopt ambitious minimum energy efficiency standards in both owner-occupied and privately rented sector housing within the regulations planned for consultation in spring 2015

Energy Action Scotland (2014) provides detail on the barriers to tackling fuel poverty and improving energy efficiency. It concludes that in rural off-grid areas ECO and HEEPs are not working as intended and that longevity of schemes and quality assurance of work need focus. The report considers the single-access point for public advice and the area-based schemes to be working well.

FURTHER CO-BENEFITS OF CLIMATE CHANGE MITIGATION

The approaches discussed in this briefing should be seen as examples of how the environment and health are connected but they are by no means the only cases of such mutual benefit. A report for the UK Committee on Climate Change presents the costs and benefits to health of climate change mitigation approaches in all emissions sectors; the benefits far outweigh the costs (Ricardo-AEA, 2013). A selection of other example approaches is given in Table 2 below.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Mitigation approach</th>
<th>Health co-benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>Switch of generation from coal and gas to nuclear and/or renewables</td>
<td>Improved air quality</td>
</tr>
<tr>
<td>Transport</td>
<td>Improved logistics of heavy goods vehicles</td>
<td>Reduced road accidents and noise pollution, and improved air quality</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Anaerobic digestion of farm waste and manure</td>
<td>Improved air and water quality</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Afforestation</td>
<td>Improved air, soil and water quality</td>
</tr>
</tbody>
</table>

Source: Ricardo-AEA, 2013

The co-benefits of mitigation approaches are not limited to climate and health. There are connections between some mitigation approaches and helping those in poverty and addressing inequality. This supports another strategic objective, a wealthier and fairer Scotland. Furthermore, there is much evidence that investment in mitigation approaches leads to direct economic benefits and growth. The report for the UK Committee on Climate Change estimates that their emission reduction scenario has net economic benefit of approximately £85bn.
A specific example is the UK Department for Transport report (2014) which reviewed literature on the costs and benefits of active travel. Considering UK active travel projects, the report finds there is a benefit of £5.62 for every pound spent. These benefits are well above that needed for the department to value them ‘very highly’. The benefits are for individual health, the NHS, the transport system and transport efficiency.

**SCOTTISH GOVERNMENT AND PARLIAMENTARY CONSIDERATION OF MULTIPLE BENEFITS**

The parliamentary scrutiny and evidence of RPP2 proposed the importance of multiple benefits of mitigation policies. The Economy, Energy and Tourism committee (2013) recommended that:

“The final RPP2 include further detail, and some examples, of the potential wider economic, social and environmental benefits of implementing the proposals and policies”

This point was echoed by the Rural Affairs, Climate Change and the Environment committee (2013). In their evidence for RPP2, the Scottish Environment Protection Agency (2013) expressed concern that:

“RPP2 indicates that the costs of the policies and proposals is £1.6 billion and outweighs their direct benefits of £1.2 billion, but this completely ignores the wider benefits of climate actions and sends out the message that climate action is disproportionately costly and also risks these benefits not being given due regard in decision making.”

The final publication of RPP2 describes the wider benefits of improved home energy efficiency and a shift to more active travel but does not include them in the cost-benefit analysis. In describing its approach to cost-benefit analysis it states that:

“The estimated benefits are partial and primarily reflect the increased energy efficiency resulting from the investment in climate change policies and proposals. In particular they do not include the benefits associated with reduced global warming. The Stern Report estimated these benefits at a global level to be between 5% and 20% of GDP. Neither do the figures include important co-benefits such as job creation, health improvement, local air quality and biodiversity.”

The formation of the Scottish Government Cabinet Sub-Committee for Climate Change in June 2014 connects cabinet secretaries and ministers across multiple areas. Chaired by the Cabinet Secretary for Rural Affairs and the Environment, it included in attendance at its inaugural meeting the Cabinet Secretary for Finance, Employment and Sustainable Growth, the Minister for Housing and Welfare, the Minister for Local Government and Planning and the Minister for Transport and Veterans.

In 2016, the third report on policies and proposals for meeting Scotland’s emission reduction targets will be published by Scottish Government to update and extend RPP2.


Ekelund, U. et al. (2015) Physical activity and all-cause mortality across levels of overall and abdominal adiposity in European men and women: the European Prospective Investigation into


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