



transform scotland briefing

# healthy transport

Walking and cycling, the healthiest and most sustainable modes of transport, need to have much higher priority in transport planning if we are serious about improving national public health levels. The Scottish Government has recognised the importance of walking and cycling, placing them at the top of its travel hierarchy. However, this commitment has not been realised across all areas of policy.

While the failure to integrate health considerations in transport planning can partly be explained by confusion about how health effects can be quantified,<sup>1</sup> it cannot be excused. It is irrefutable that active, non-polluting forms of transport (walking and cycling) are more beneficial to our health than the use of motorised vehicles.

Poor health leads to reduced productivity and added expense to the NHS; a re-examination of current transport policies aimed at redressing this, should be part and parcel of the health agenda at every level of government. The logical way forward is joined-up health and transport policies, a demand that has repeatedly been expressed both by pressure groups and by concerned representatives of the medical community.<sup>2</sup>

## 1. Transport as a Source of Harm

### Physical Inactivity

The reliance on motorised transport and the limited levels of active travel have contributed to sedentary lifestyles in Scotland: this worsens obesity rates, lowers physical strength and overall fitness and is also likely to aggravate mental health problems. For British adults, energy expenditure per day has declined by the equivalent of 2-3 hours of walking.<sup>3</sup> Currently, in Scotland, two-thirds of adults and one-third of children do not meet the recommended amount of exercise.<sup>4</sup>

Scotland currently has some of the worst rates of obesity in the world. In 2008, 26.8% of adults in Scotland were obese and 65.1% were overweight.<sup>5</sup> The Foresight report looks into future trends in obesity levels, it predicts that by 2015 UK wide levels of obesity will rise to 36% for men, 28% for women; by 2025 this will be 47% for men, 36% for women; and by 2050 the obesity levels will be 60% for men, 50% for women.<sup>6</sup>

Obesity now accounts for as many health problems as poverty, smoking and problem drinking; obesity ranks alongside smoking, as a cause of premature mortality.<sup>7</sup> Obesity and overweightness are associated with a number of health conditions including type 2 diabetes, hypertension, coronary heart disease, stroke and cancer.<sup>8</sup>

Childhood obesity is particularly worrying - 31.7% of children were defined as overweight with 15.1% defined as obese.<sup>9</sup> Even in young children obesity is a problem; 20% of children aged 4-6 are defined as overweight, and 8% defined as obese.<sup>10</sup> Many parents choose to transport their children via car in a belief that it will make them safer. Although transporting children by car reduces the risk that they will be involved in an accident as a pedestrian or a cyclist, any reduction in this risk must be put against additional health risks resulting from them taking less exercise.<sup>11</sup>

According to the Scottish Government's Physical Activity Strategy, "the health of two-thirds of the Scottish adult population is now at risk from physical inactivity, making it the most common risk for coronary heart disease in Scotland today."<sup>12</sup> At £175 million per annum,<sup>13</sup> the costs to the NHS of treating obesity-related diseases in Scotland are now comparable to those caused by smoking-related illnesses.<sup>14</sup> Additional costs of obesity – such as adverse effects on employment, productivity, and mental wellbeing, as well as an increasing cost of catering for obesity in infrastructure planning – raise the total cost of obesity in Scotland to over £457 million a year (although this figure is likely an underestimate and the true cost could be over a billion). The cost of obesity are predicted to rise to £3 billion per annum by 2030.<sup>15</sup>

### Stress

Current traffic patterns are also a source of stress. Anxiety and frustration caused by traffic jams (especially peak-hour congestion) and the perception of dangers amongst road users (especially cyclists and elderly pedestrians) are well known to raise stress and aggression levels.<sup>16</sup>

### Road Crashes

In Scotland, 245 people were killed and 2481 seriously injured in road crashes during 2008, with 15,576 reported as casualties overall. The economic cost of road accidents to Scotland was £1,526 million in 2008.<sup>17</sup> A sixth of all road casualties are pedestrians; there were 2,595 pedestrian casualties recorded in 2008. Crashes involving pedestrians are more likely to end in death or serious injury - 27% of pedestrian casualties were killed or seriously injured (694 out of 2,595) compared with 14% of all car users (1,334 out of 9,648). The young are also disproportionately the victims of road accidents; there were 832 child pedestrian casualties recorded in 2008 - 32% of all pedestrians - this included 187 seriously injured and 4 fatalities.



There were also 150 child cycle casualties, including 18 serious injuries and 2 fatalities.<sup>18</sup> Studies have also shown that the children from the lowest socio-economic groups are significantly more likely to be killed or seriously injured as pedestrian casualties, compared to those from higher socio-economic groups.<sup>19</sup>

The percentage of pedestrians killed in road accidents rises exponentially as speed increases: a 97% survival rate for collisions at 20mph decreases to a 50% survival rate for collisions at 35mph.<sup>20</sup>

### Air Pollution

Motorised vehicles emit a range of pollutants known to have an immediate negative effect on people's physical health. In Scotland, an estimated 2000 people die each year as a result of traffic-related air pollution - five times more than in road crashes.<sup>21</sup>

Carbon monoxide (CO) deprives the body of oxygen by binding haemoglobin. This affects thought processes and reflexes, may aggravate arteriosclerosis and, in the case of pregnant women, retard foetal development. Nitrogen



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oxides (NO<sub>x</sub>), airborne metallic particulates, and hydrocarbons - amongst other particulates found in fuel - affect lung tissue and can contribute to the risk of respiratory diseases and may even bring on cancer.<sup>22</sup> Residents of polluted towns covered by the US-based 'Six Cities Study' have been found to run a 37% higher risk of developing lung cancer than residents of less polluted areas.<sup>23</sup> A further harmful pollutant is ozone (O<sub>3</sub>) - a powerful oxidising agent - which can cause irritation to people's eyes and respiratory system; this

can lead to increased severity of asthma and bronchitis.<sup>24</sup>

According to WHO Europe, children living near roads with heavy vehicle traffic have double the risk of suffering respiratory problems compared to those living near less congested streets.<sup>25</sup> High levels of particulate matter have been shown to increase mortality rates amongst infants by as much as 10%. They also raise mortality across the remaining age groups, particularly in conjunction with cardiovascular and respiratory conditions.<sup>26</sup> While people may feel they are protected from air pollution while they are within cars, in actuality, the highest levels of air pollution are often suffered by car drivers themselves; in-car levels of particulates such as NO<sub>2</sub>, CO and volatile organic compounds (VOCs) have been shown to be 2-3 times higher than roadside levels.<sup>27</sup>

Air pollution is a serious problem in Scotland: there are currently 21 sites designated as Air Quality Management Areas (AQMA) - areas where air quality is not sufficient to meet EU legislation on air pollution - including Edinburgh, Glasgow, Aberdeen and Dundee.<sup>28</sup>



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## Noise Pollution

Noise pollution is often seen as an annoyance rather than a health hazard; however, noise pollution can present a severe health risk. A majority of the world's population now live in noisy environments, with road traffic being the single biggest contributor to urban noise.<sup>29</sup> Noise not only damages people's hearing, it can also have other negative effects both physical and psychological.

Health risks range from stress-related diseases, including sleep deprivation, to cardiovascular problems.<sup>30</sup> Ischaemic heart disease and hypertension have been linked to noise levels of less than 70 decibels (LAeq).<sup>31</sup> Heart attacks are 20% more likely in neighbourhoods with 65-70 dB than in quieter locations,<sup>32</sup> and mortality rates attributable to noise are estimated to be three times the rates associated with carcinogenic air pollutants.<sup>33</sup> Noise has also been proven to affect people's ability to concentrate and learn. According to WHO Europe "children chronically exposed to loud noise show impairments in the acquisition of reading skills, attention and problem-solving ability."<sup>34</sup>

In many areas noise from roads exceeds 65 dB. Government estimates suggest that around 112,000 people in Edinburgh and 170,000 people in Glasgow, are affected by road noise of 65dB or greater. In some areas of Scottish cities the noise levels from roads can exceed 75dB.<sup>35</sup>

## Community Severance

Decades of socially reckless transport planning - such as building major roads through poor urban communities, designing for high traffic speeds rather than the needs of pedestrians - have exposed many neighbourhoods to increased social exclusion. Analyses of residential areas in Europe and the USA have shown significant inverse correlation between intensities of traffic flow and numbers of social contacts, and other indicators of personal well-being.<sup>36</sup> There is also a significant

body of evidence that suggests that lack of social ties, which can result from community severance, can lead to physical and mental health problems.<sup>37</sup> Heavy traffic is inimical to community life, and nowhere is this effect more evident than in the context of urban motorways.

## Climate Change

Road traffic is a major contributor of CO<sub>2</sub> emissions - around a quarter of all emissions in the UK<sup>38</sup> - which contributes to climate change and the associated health risks.<sup>39</sup>

## 2. Transport as a Source of Health

The overriding principle of health-oriented transport planning is the promotion of active travel over the use of motorised transport. According to WHO Europe, evidence shows that "half an hour per day of moderate physical activity - even done in two or three bouts of 10 - 15 minutes - can halve the risk of heart disease, adult diabetes and obesity, reduce by 30 per cent the risk of developing hypertension and reduce blood pressure as much as drugs would."<sup>40</sup>

For the overwhelming majority of people, walking and/or cycling are the easiest and most sustainable way to reach the recommended daily target of 30 minutes of moderate-intensity physical exercise, i.e. exercise that involves an expenditure of 5.0-7.5 kilocalories per minute.<sup>41</sup> Currently two-thirds of all transport trips are less than five miles in length, over half of these trips involve are conducted using private motor vehicles; for trips under 2 miles in length, which make up 40% of all transport trips, over one-third are conducted by private motor vehicles.<sup>42</sup> A shift away from these short car journeys, replacing them instead with walking and cycling, would help people meet the recommended daily amount of exercise.



It is also acknowledged that active people are less prone to depression, have lower rates of smoking and substance abuse and generally tend to have a greater sense of well-being and self-worth as well as a higher life expectancy.<sup>43</sup> The long-term health benefits of cycling outweigh the risk of accidents; such risks can themselves be reduced by adequate cycling provision and speed management plans.<sup>44</sup>

## 3. Active Travel In Scotland

Current and previous Scottish administrations have for many years spelled out their commitment to better health through active travel. The 1999 Scottish Public Health White Paper Towards a Healthier Scotland identified walking and cycling as making "a vital contribution to positive health and active aging" while the 2003 draft of the Scottish Government's walking strategy acknowledged brisk walking (3-4 mph) as "an ideal way to increase levels of physical activity"<sup>45</sup> During the same year the Scottish Government also published a national physical activity strategy that reaffirmed the need for greater activity as part of a healthier Scotland, and set a target of 50% of adults and 80% of children meeting the minimum recommended levels of physical activity by 2022. The strategy highlighted



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active travel as a way to reach these targets.<sup>46</sup> Subsequent reviews of this strategy under the current administration found that while physical activity level had increased, on the whole, certain groups were not showing the desired increase in physical activity. Findings showed that women - across all age groups, but especially young girls - were doing considerably worse than men in attaining an increase in activity levels. There were also concerns over the physical activity levels in boys under 16 and men over 45. The review concluded that continued attention on promoting physical activity was needed if all groups were to meet the targets.<sup>47</sup>

The Scottish Government commissioned 'Preventing overweight and obesity in Scotland' report provided a routemap for reducing obesity in Scotland, the paper identifies active travel as one of four key components in tackling obesity through "increasing opportunities for and uptake of walking, cycling and other physical activity in our daily lives".<sup>48</sup> In 2010 the Scottish Government

launched its 'Cycling Action Plan for Scotland' which contained a target of 10% of all journeys in Scotland to be made by bike.<sup>49</sup>

However, designated funding for active travel in Scotland is currently less than 1% of the Scottish Government's transport budget.<sup>50</sup> Most of the transport budget is allocated towards motorised transport on long linear journeys (a minority of trips) rather than short and local journeys (the majority of all transport trips).<sup>51</sup> Such spending encourages the perception that transport planning and infrastructure development should be focused principally on traveling far, fast and often.

Evidence from Sustrans shows that each cycling and walking scheme represents a positive economic impact of £122.93 per person.<sup>52</sup> Further evidence from 'Towards a Healthier Economy', published by Transform Scotland Trust, found that an increase in cycling mode share to 13% of all journeys would produce a benefit to the Scottish economy of £2 billion per year.<sup>53</sup>



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## 4. Recommendations

### Targeting

- To be successful, active travel strategies and long-term development plans must focus on improving the daily experience of pedestrians and cyclists of all ages and abilities. Meaningful improvements must be made to the conditions for walking and cycling, with active travel consistently promoted over several years. This will lead to cycling and walking becoming normal and popular forms of transport in two to three years.
- Government needs to set higher, more measurable targets for greater modal shifts towards walking and cycling as part of SOAs, policies and travel planning initiatives at all of Scotland's institutions.
- Learning lessons from abroad and from within the UK is vital if we are to progress active travel. The single most important lesson from 'continental best practice' cities such as Copenhagen, Malmö, Basel, Freiburg, Groningen, or the successes in the English sustainable transport towns (Worcester, Darlington and Peterborough) is that without political leadership and long-term commitment, no single policy, or set of policies can succeed.<sup>54</sup>

### Investment

- We need to see a major boost in investment in walking and cycling. Without further investment in active travel in the next Spending Review, it will not be feasible for the Scottish Government to meet its aspirations that 10% of all journeys be made by bike by 2020. Unlike spending on major infrastructure projects investment in walking and cycling is generally inexpensive and delivers excellent returns on investment.<sup>55</sup> Improvements to walking and cycling infrastructure can be implemented on a much smaller time

scale than large infrastructure projects, and can be rolled out across the country, spreading the benefit, unlike location specific large infrastructure projects.

- During the course of the next Scottish Government spending review (for the period 2011-2014), there should be a programmed increase in the funds made available to the Government's Sustainable Transport Team, so that by the end of that spending review period 10% of the total transport budget is devoted to active travel. This recommendation is in accordance with the recommendation of the Association of Directors of Public Health, endorsed by over 100 national public health and other groups, in their document *Take Action on Active Travel*.<sup>56</sup>
- As part of the above, funding should allow the retention of the ringfenced Cycling, Walking and Safer Streets (CWSS) budget (with its application better controlled by the STT), and the reintroduction of ring-fenced funding for School Travel Coordinators.

### Delivery

- Ensure that transport planning recognises that congestion is not the only important transport cost in urban areas and that land use planning and transport policies focus on equitable access, shorter distances and reductions in the need to travel.<sup>57</sup> There is currently no recognition of health impacts in the Scottish Transport Appraisal Guidance (STAG), the impact of planning decisions on health should be included within STAG.
- Address skills shortages in transport, land use planning and engineering with regards to planning, design and delivery of high quality, cohesive, connective and integrated provisions for walking and cycling.

- Make 20mph the default speed limit in urban areas, enforce traffic law to tackle poor driving behaviour towards more vulnerable roadway users, and raise awareness of the needs of cyclists and pedestrians. New developments should ensure that they have good walking, cycling and public transport links and that they have adequate local shops and facilities.
- Create a National Active Travel Plan, which would incorporate all existing policies, forthcoming policies such as CAPS and a national strategy for walking. The plan should be managed by a National Active Travel Committee chaired by the Minister for Transport, Infrastructure and Climate Change, with its performance observed by the Parliament's TICC Committee.
- Such a plan would place active travel at the heart of transport planning, targeting, funding and delivery. Recent reports, such as that from the Institute of Mechanical Engineers recommend that only by adopting a 'war-footing' can climate change targets be met.<sup>58</sup> The above structure would show Scotland to be in the vanguard of planning for a transformation in active travel planning and delivery and assist transport to meet its climate change and public health commitments.



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## 5. References

- <sup>1</sup> The need for adequate, comprehensive models and methods to identify health impacts of different transport arrangements is presently being addressed by WHO Europe (with assistance from the EU); cf. Dora, Carlos, Mudu, Pierpaolo and Racioppi, Francesca (2002) 'Development of tools for assessing the health effects of urban transport policies', presented at Conference of the International Society for Exposure Assessment/ International Society for Environmental Epidemiology (ISEA/ISEE) 2002. For details of current research projects in this field see <<http://www.euro.who.int/transport>>.
- <sup>2</sup> Transport and Health Study Group (1991) Health on the Move: Policies for Health Promoting Transport. Public Health Alliance; Lucy Hamer (1999) Making T.H.E. Links. Integrating Sustainable Transport, Health and Environmental policies. A guide for local authorities and health authorities, London, Health Education Authority; Association of Directors of Public Health (2008): Take Action on Active Travel – <<http://www.adph.org.uk/news.php>>. This report, by the Association of Directors of Public Health, has received the support of over 100 organisations from across the UK, including our own organisations. Supporters of the report include such groups as the Institute of Highway Engineers, Royal Institute of British Architects, Chartered Institute of Environmental Health, Royal College of Physicians, Sustainable Development Commission and many other prestigious and professional bodies central to public health, environment and transport policy and practice.
- <sup>3</sup> Prentice, A. M. and Jebb, S. A. (1995) 'Obesity in Britain: gluttony or sloth?', *British Medical Journal* 311, p. 437-39.
- <sup>4</sup> Adults are recommended 30 mins of moderate exercise five days a week, and children are recommended to get 1 hour moderate exercise daily. NHS Health Scotland (2010) Five-year review of Let's Make Scotland More Active: A strategy for physical activity - Update statement from the review group, <<http://www.paha.org.uk/Resource/five-year-review-of-lets-make-scotland-more-active-update-statement-from-the-review-group>>.
- <sup>5</sup> Out of all the OECD countries only USA and Mexico have worse rates of obesity. Cf. Scottish Government (2010a) Preventing Overweight and Obesity in Scotland: A Route Map Towards Healthy Weight, Edinburgh, <<http://www.scotland.gov.uk/Publications/2010/02/17140721/19>>.
- <sup>6</sup> UK wide obesity levels are slightly lower than the average for Scotland, around 23% for the UK in 2007 according to the Foresight report and 26.8% in Scotland for 2010 according to the Preventing Overweight and Obesity in Scotland report. Foresight (2007) Tackling Obesities: Future Choices – Project Report 2nd Edition Government Office for Science <<http://www.foresight.gov.uk/OurWork/ActiveProjects/Obesity/Obesity.asp>>; Scottish Government (2010a) op cit.
- <sup>7</sup> Scottish Government (2010a) op cit. p. 2
- <sup>8</sup> Foresight (2007) op cit.
- <sup>9</sup> The overweight figure includes children defined as obese, figures from Scottish Government (2010a), taken from Scottish Government (2009) Scottish Health Survey 2008, <<http://www.scotland.gov.uk/Publications/2009/09/28102003/0>>.
- <sup>10</sup> The overweight figure includes children defined as obese, figures obtained from Information Services Division (ISD) of NHS National Services Scotland see <<http://www.isdscotland.org/isd/3640.html>>.
- <sup>11</sup> DiGiuseppi, Carolyn, Li, LiLeah and Roberts, Ian (1997) 'Influence of changing travel patterns on child death rates from injury: trend analysis', *British Medical Journal* 314, p. 710 and (1998) 'Influence of travel patterns on mortality from injury among teenagers in England and Wales, 1985-95: trend analysis', *British Medical Journal* 316, p. 904 <<http://bmj.com/cgi/content/full/316/7135/904>>.
- <sup>12</sup> Physical Activity Task Force (2002) Let's Make Scotland More Active, Edinburgh, p. 6. Obesity is also known to contribute to a range of cancers - cf. Cancer Research UK (2003) 'Calls for men to exercise as record obesity rates increase cancer risks' (press release 25/06/03).
- <sup>13</sup> Scottish Government (2010a).
- <sup>14</sup> Andrew Walker (University of Glasgow) quoted in <<http://news.bbc.co.uk/1/hi/scotland/2977602.stm>>.
- <sup>15</sup> The government accept this cost as a low estimate, the real cost may be as high £1.4 billion per year, Scottish Government (2010a); Cf. the Foresight report gives further future cost calculation for obesity for the whole of the UK, Foresight (2007).
- <sup>16</sup> Diekstra, R. and Kroon, M. (1997) 'Cars and behaviour: Psychological barriers to car restraint and sustainable urban transport', in Tolley, R. (ed) *The Greening of Urban Transport: Planning for Walking and Cycling in Western Cities*, John Wiley, Chichester, Sussex (Chapter 11).
- <sup>17</sup> Scottish Government (2009) Reported Road Casualties Scotland, 2008 <<http://www.scotland.gov.uk/Publications/2009/11/23103624/0>>.
- <sup>18</sup> Scottish Government (2009) Statistical Bulletin: Transport Series: Key 2008 Road Casualty Statistics. <<http://www.scotland.gov.uk/Publications/2009/06/19135601/0>>.
- <sup>19</sup> White, D., Raeside, R. and Barker, D. (2000) Road Accidents and Children Living in Disadvantaged Areas, Edinburgh, Scottish Executive, 1997-99 (Development Department Research Programme Research Findings No. 81) and Abdalla, I., Raeside, Barker, D.J. and McQuigan, D.R. (1997) "An Investigation into the Relationships between Area Social Characteristics and Road Accident Casualties", *Accident Analysis and Prevention*, Vol 29, No. 5.
- <sup>20</sup> Royal Society for the Prevention of Accidents (2010) Inappropriate Speed <<http://www.rosipa.com/roadsafety/adviceandinformation/driving/speed/inappropriate-speed.aspx>>.
- <sup>21</sup> Walter, Bernhard F. and FitzRoy, Felix R. (2002) 'Air Pollution and Mortality in a Sample of British Cities', University of St. Andrews - cited in Rob Edwards, 'Car Fumes a bigger killer than crashes on the roads', *Sunday Herald*, 21/01/01, p. 7.
- <sup>22</sup> Benzene has been linked with cancer, leukaemia and impotence. - Holman, C. (1989) *Air Pollution and Health*. London, Friends of the Earth; Savitz, D. and Feingold, L. (1989) 'Association of childhood cancer with residential traffic density', *Scandinavian Journal of Work, Environment and Health* 15, p. 360-63; Guerra, G. et al. (1995) 'Benzene emissions from motor vehicle traffic in the urban area of Milan: hypothesis of health impact assessment', *Atmospheric Environment* 29, p. 3559-69; International Agency for Research on Cancer (1989) Diesel and Gasoline Engine Exhaust and Some Nitroarenes. IARC monographs on the evaluation of carcinogenic risk in humans 46 - cited in Morton, Stephen, 'Evidence of the Impact of Transport on Health'.
- <sup>23</sup> Dockery, Douglas et al. 'An Association Between Air Pollution and Mortality in Six U.S. Cities', *New England Journal of Medicine*, 12/9/93 and 4/28/94 (discussion). For bibliographic details of related studies see <[http://whyfiles.org/030air\\_pollution/biblio.html](http://whyfiles.org/030air_pollution/biblio.html)>.
- <sup>24</sup> Committee on the Medical Effects of Air Pollutants (1998) *Handbook on Air Pollution and Health*, London, The Stationery Office.
- <sup>25</sup> Ibid.
- <sup>26</sup> Lynham, Barry (1997) *Traffic and Health*, Brussels, European Federation for Transport and Environment, p. 9.
- <sup>27</sup> Ibid. p.2.
- <sup>28</sup> See Defra website for list of AQMA in UK <<http://aqma.defra.gov/list.php>>.
- <sup>29</sup> Cf. <<http://www.euro.who.int/en/what-we-do/health-topics/environmental-health/health-impact-assessment/activities/health-effects-and-risk-of-transport-systems-hearts>>.
- <sup>30</sup> According to WHO, safe average noise levels for residential areas would be 45 decibels during the day and 35 decibels at night. Prolonged exposure to higher levels increases the body's release of adrenaline, which accelerates the heart's ageing process and, alongside noradrenaline and cortisone, heightens the risk of heart attacks. – August Schick (Universität Oldenburg) quoted in 'Schlimmer als Dioxin: Lärm ist das "schädlichste Umweltgift" und fast jeder ist ihm ausgesetzt', Leipziger Agentur für Nachrichten aus den Sozialwissenschaften (LANS); <<http://www.lans-online.de/laerm.htm>> see also Willy Passchier-Vermeer and Wim F. Passchier (2000) *Noise Exposure and Public Health, Environmental Health Perspectives*, Vol. 108, Supplement 1: Reviews in Environmental Health, (2000), pp. 123-131.
- <sup>31</sup> TRDora, C. and Phillips, M. (eds) (1999), *Background Document on Transport, Environment and Health (Draft) for the Third Ministerial Conference on Environment and Health*, London, 16-18 June 1999 (WHO Europe), p. 10.
- <sup>32</sup> Wolfgang Babisch (Umweltbundesamt/Federal Environmental Agency, Berlin) quoted in 'Lärm schlimmer als Luftverschmutzung', *Frankfurter Rundschau*, 12/07/03, Ausgabe D, p. 26; Babisch, Wolfgang (1998), 'Epidemiological studies of cardiovascular effects of noise' in Prasher, D. and Luxon, I. (eds), *Advances in Noise. Vol. 1. Biological effects*. London, Whurr Publishers, pp. 312-27.
- <sup>33</sup> In Germany, as many as 10,000 heart attacks are thought to have been caused by the noise levels produced by unconstrained road traffic in 1998; Lothar Wendel and Joy Hensel (BUND-Arbeitskreis Gesundheit) 'Gesundheitliche Schäden durch Lärm' at <<http://www.bund.net>> (Verkehr).
- <sup>34</sup> Matheson, Mark (2003) 'The influence of noise on psychological patterns and cognitive abilities in children', presented at Neue Ergebnisse der Lärmwirkungsforschung, Rhein-Main-Institut e. V. and VCD, Dreieich, 07/07/03; Staffan Hygge, 'Children, noise and learning', presented at Workshop 'Kinder und Lärm'/Noise pollution: Health and other effects on children', Institut für Technische Akustik, Technische Universität Berlin, 30/04/03; Lambert, J. and Vallet, M. (1994) Study related to the preparation of a communication on a future EC Noise Policy. Final Report. INRETS Report LEN No. 9420, Lyon.
- <sup>35</sup> Scottish Government estimates for noise levels are calculated as required under Article 10(2) of the Environmental Noise Directive (2002/49/EC) see <<http://www.scottish-noisemapping.org/public/noise-statistics.aspx>>.
- <sup>36</sup> McCarthy, Mark (1999) 'Transport and health' in Marmot, Michael and Wilkinson, Richard G. (eds), *The Social Determinants of Health*, Oxford, OUP, pp. 132-54 (with reference to British Medical Association (1997), *Road Transport and Health*, London, BMA, pp. 38-43.) See also Appleyard, D. and Lintell, M. (1972) 'The environmental quality of city streets: the resident's viewpoint', *American Institute of Planners Journal* 38, pp. 84-101; Clarke, J. M. et al (1991), *The appraisal of community severance*, Crowthorne, Transport Road Research Laboratory (Transport Road Research Laboratory Contractor Report 135); Hine, J. and Russell, J. (1996) 'The impact of traffic on pedestrian behaviour: assessing the traffic barrier on radial routes', *Traffic Engineering and Control*, 32 (2), pp. 81-85 (all cited in Morton op cit).
- <sup>37</sup> Seeman, Teresa E. (1996) social ties and health: The benefits of social integration *Annals of Epidemiology* - (Vol. 6, Issue 5, Pages 442-451); Holt-Lunstad J, Smith TB, Layton JB, (2010) Social Relationships and Mortality Risk: A Meta-analytic Review, in *PLoS Med* 7(7): e1000316. doi:10.1371/journal.pmed.1000316; Lisa F. Berkman and S. Leonard Syme (1979)

Social Networks, Host Resistance, And Mortality: A Nine-Year Follow-up Study of Alameda County Residents, in *American Journal of Epidemiology* Vol. 109, No. 2: pp.186-204.

<sup>38</sup> Figures given by Committee on Climate Change <<http://www.theccc.org.uk/sectors/transport/>>.

<sup>39</sup> Cf. World Health Organization (2003) *Climate change and human health: risks and responses*; Department of Health (2001) *Health Effects of Climate Change in the UK*.

<sup>4</sup> Dora, Carlos and Racioppi, Francesca (2001) 'Cycling and walking: the planners don't always count it!', *European Bulletin on Environment and Health*, May 2001, and (2002) 'Development of guidelines for health impact assessment (HIA) of transport policies through walking and cycling. Abstract of a paper presented at the annual meeting of the International Society for Exposure Assessment (IAIA) '20 See also Oja, P., Vuori, I. and Paronen, O. (1998) 'Daily walking and cycling to work: their utility as health enhancing physical activity', *Patient Education and Counseling* 33, pp. 87-94. See also Murphy, M. and Hardman, A. E. (1998) 'Training effects of short and long bouts of brisk walking in sedentary women' in *Medicine and Science in Sports and Exercise* 30, 1, pp. 152-57.

<sup>41</sup> Scottish Executive Physical Activity Task Force (2002) *Let's Make Scotland More Active. A Strategy for Physical Activity - A Consultation*, Edinburgh, p. 9; Health Education Board for Scotland, *The promotion of physical activity in Scotland: strategic statement*, Section 4. In 2002, 68% of all Scots aged between 17 and 75 were categorised 'inactive', i.e. assumed to engage in less than the equivalent of 30 minutes of moderate exercise five days per week. If the Physical Activity Task Force succeeds in reducing this figure by 1% per annum over five successive years (2002-2007) a total of 2,839 life years could be saved, which corresponds to an economic gain of £85.2 million. Annual hospital admissions related to inactivity would fall by about 2.5%, saving the NHS about £3.5 million - Scottish Executive Physical Activity Task Force (2002) *The economic benefits of a physical activity strategy for Scotland - preliminary analysis*, Edinburgh, Scottish Executive.

<sup>42</sup> Private motor vehicles include drivers and passengers of cars, lorry and vans. Does not include motorcycles. Figures taken from Scottish results for the National Travel Survey for 2004/2005 and 2007/2008, see <<http://www.scotland.gov.uk/Topics/Statistics/Browse/Transport-Travel/TablesPublications/TravelByScottishResidents>>.

<sup>43</sup> Scottish Executive, *A Walking Strategy for Scotland Consultation Document*, Sections 3.10ff <<http://www.scotland.gov.uk/consultations/culture/wfsf-03.asp>>; Stuart Biddle and Nanette Mutrie report that "exercise and physical activity participation" are "consistently associated with positive mood and affect" and that this trend has actually been more pronounced in experiments involving moderate exercise than in relation to vigorous exercise (p. 201). While definitive statements require further, well-controlled trials, exercise has also been shown to be moderately beneficial with regard to anxiety and non-clinical depression, and, under certain conditions, cognitive function. - Biddle, S. J. H. and Mutrie, N (2001) *Psychology of Physical Activity: Determinants, well-being, and interventions*. London, Routledge (Chapter 8, pp. 167-201). See also: Stephens, T. (1988) 'Physical activity and mental health in the United States and Canada: Evidence for four population surveys', *Preventive Medicine*, 17, pp. 35-47 (cited in Biddle and Mutrie, *ibid*); Cramer, S., Nieman, D. and Lee, J. (1991) 'The Effects of Moderate Exercise Training on Psychological Wellbeing and Mood State in Women', *Journal of Psychosomatic Research* 35, pp. 437-49 and Lee, Rebecca E. et al. (1991) 'A Prospective Analysis of the Relationship Between Walking and Mood in Sedentary Ethnic Minority Women', *Women and Health* 32, 4, pp. 1-16.

<sup>44</sup> According to a calculation by Mayer Hillman, the health

benefits gained from cycling outweigh the risk of fatal accidents by 20:1 - Hillman, M. (1993) 'Cycling and the promotion of health', *Policy Studies* 14, pp. 49-58; BMA Professional, Scientific, and International Affairs Division (1992) *Cycling Towards Health and Safety*, Oxford, OUP; National Cycling Strategy (2003) *Cycling and Health*, London, DfT.

<sup>45</sup> Scottish Office (1999) *Towards a Healthier Scotland - A White Paper on Health*. Edinburgh, The Stationery Office; Scottish Executive (2003) *A Walking Strategy for Scotland: Consultation Document*, Edinburgh, Scottish Executive, pp. 10 and 31 <<http://www.scotland.gov.uk/consultations/culture/wfsf.pdf>>. Having allocated a mere £22 million to measures that encourage active travel through its Cycling, Walking & Safer Streets fund, the Executive has yet to deliver on this issue.

<sup>46</sup> Physical Activity Taskforce (2003) *Let's Make Scotland More Active: A strategy for physical activity* <<http://www.scotland.gov.uk/Publications/2003/02/16324/17895>>.

<sup>47</sup> NHS Health Scotland (2010) op cit.

<sup>48</sup> Scottish Government (2010a) op cit.

<sup>49</sup> Scottish Government (2010b) *Cycle Action Plan For Scotland*, <<http://www.cyclingactionplanforscotland.org>>.

<sup>50</sup> Calculations from Spokes: the Lothian Cycle Campaign, as published in 2009. Spokes' survey has been described by SPICe as "The most comprehensive analysis of funding for Scottish cycling projects from all sources" - SPICe (2009) *Cycling in Scotland* <[www.scottish.parliament.uk/business/research/briefings-09/SB09-48.pdf](http://www.scottish.parliament.uk/business/research/briefings-09/SB09-48.pdf)>.

<sup>51</sup> Scottish Government (2009): *Scottish Household Survey: Travel Diary 2007/2008* - <<http://www.scotland.gov.uk/Resource/Doc/933/0087945.pdf>> reports that "[t]he majority of journeys were less than 5 km. In 2007/2008, the average (mean) journey distance was 10 km, compared to a median of only 3 km. This showed that half of all journeys were 3km or less; in fact 40% were less than 2 km. Over half (53%) of all driver journeys were less than 5 km, with 28% less than 2km".

<sup>52</sup> Sustrans (2006). *Economic appraisal of local walking and cycling routes*, Bristol, Sustrans, quoted in Transform Scotland Trust (2008) *Towards a Healthier Economy: Why investing in sustainable transport makes economic sense*. <<http://www.transformsotland.org.uk/GetFile.aspx?Itemid=108>>.

<sup>53</sup> This calculation is made using the World Health Organisation 'Health Economic Assessment Tool for Cycling' or HEAT for cycling, this figure is likely an underestimate as the calculation of health benefits only use figures for cost of mortality and does not include costs of reducing morbidity, Taken from Transform Scotland Trust (2010) op cit.

<sup>54</sup> For example, analyses by Sustrans, carried out in conjunction with The University of Leeds, found that Benefit-Cost Ratios (BCRs) for walking and cycling schemes can be very high (results were found in the range 15:1 to 33:1) - see <<http://www.sustrans.org.uk/resources/research-and-monitoring/economic-appraisal-of-cycling-and-walking-schemes>>. Active travel also plays a significant role in 'Smarter Choices' interventions (in particular school travel plans, workplace travel plans and personalised travel planning) - see <<http://www.transformsotland.org.uk/smarter-ways-forward.aspx>>. Programmes of Smarter Choices have been found to be effective in reducing congestion, with BCRs of 10:1 or higher - see, e.g. <<http://www.dft.gov.uk/pgr/sustainable/smarterchoices/ctwwt/>>.

<sup>55</sup> Association of Directors of Public Health (2008): *Take Action on Active Travel* - <<http://www.adph.org.uk/news.php>>. This report has received the support of over 100 organisations from across the UK, including our own organisations.

Supporters of the report include such groups as the Institute of Highway Engineers, Royal Institute of British Architects, Chartered Institute of Environmental Health, Royal College of Physicians, Sustainable Development Commission and many other prestigious and professional bodies central to public health, environment and transport policy and practice.

<sup>56</sup> This would require greater emphasis on planning regulations and incentives for example for more mixed use/compact developments and in-fill developments (and greater disincentives for schemes that do not incorporate such plans). A vibrant and sustainable economy relies on access to jobs and services, so encouraging planning that provides for shorter distances and better access for everybody without the need to own and operate a car is vital for sustainable economic growth.

<sup>57</sup> Cf. Transform Scotland Trust (2010) *Civilising the Streets*, <<http://www.transformsotland.org.uk/GetFile.aspx?Itemid=277>>; Department for Transport (2010) *The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Full Report* <<http://www.dft.gov.uk/pgr/sustainable/smarterchoices/programmes/>>.

<sup>58</sup> Institute of Mechanical Engineers (2009): *Climate Change: have we lost the battle?* - <<http://www.imeche.org/media/press/MAGpressrelease>>.

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