

TRANSPORT AND THE ENVIRONMENT

INTRODUCTION

Modern transport systems have a diverse range of social and environmental impacts at local, regional and global levels (Button, 1993). Turner et al (1994) assert that environmental degradation from human activity occurs when external costs are not taken into account in the free market. There is a growing awareness that this applies to transport, where environmental costs and other externalities are neglected or underestimated in transport prices (Button, 1990; Maddison et al, 1996).

This paper provides an overview of the main environmental impacts from transport. Many of these impacts are directly related to wider external costs, notably the health affects from air pollution. Other impacts to humans from transport are also significant, particularly road accidents, which kill 500,000 people and injure 15 million worldwide each year (Perkins et al, 1998).

RESOURCE USE

Energy consumption in the UK transport sector increased by two thirds between 1973 and 1998 (DTI, 1999). Its share of total UK energy consumption increased from 21% to 34% over the same period; the change largely due to rising volumes of road traffic which accounts for 77% of the transport sector's energy use (DETR, 1999). This trend not only has a direct environmental impact in terms of finite fossil fuel depletion (primarily oil), but represents the environmental footprint of the transport sector, with implications for many of the impacts related to the extraction, manufacture and use of oil and oil products (Cairns, 1998).

CLIMATE CHANGE

Extensive literature exists describing the science underlying climate change; see for example Kemp (1994) and Houghton et al (2001). The impacts of global climate change are predicted to be diverse and potentially devastating (Met Office, 1999).

Combustion of fossil fuels is the predominant source of carbon dioxide (CO₂), the most important man-made greenhouse gas (GHG) (Maddison et al, 1996). Transport's contribution to climate change arises mostly from the combustion of refined petroleum that comprises almost all transport fuel (OECD, 2000). Transport accounts for around 26 per cent of the UK's CO₂ emissions, over 90% of which are derived from road transport (DTLR, 2001). Transport is the fastest growing source of GHG emissions in the UK, which are predicted to increase by approximately 27% between 2000 and 2020 (DETR,

2000a). In the EU, CO₂ emissions from transport are forecast to increase by 40 per cent by 2010 from 1990 levels (CEC, 2001).

Figure 1 shows that whilst emissions of GHGs from other sectors are either decreasing or are at least relatively stable, transport emissions are set to increase rapidly over the next 20 years (DETR, 2000a).

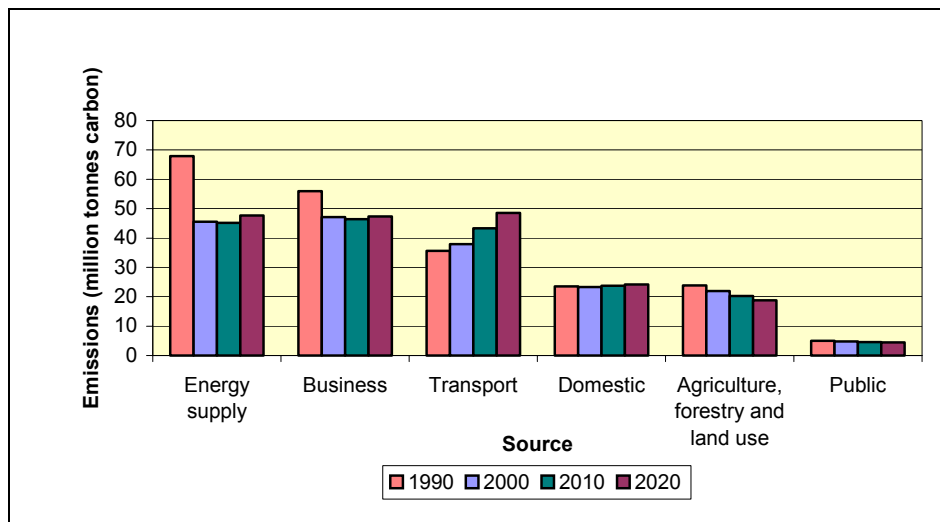


Figure 1: Projected UK Greenhouse Gas Emissions. Source: DETR, 2000a

Whilst trends in GHG emissions from road transport have increased in the recent past and are predicted to increase rapidly in the future, emissions from rail and coastal shipping have increased only slightly since the mid-1980s (RCEP, 1994). The substantial growth in air transport, not reflected in national figures quoted above, is a growing source of greenhouse gas emissions worldwide (IPCC, 1999). Air transport is responsible for between 8 and 12 per cent of transport related carbon emissions, but the potential impact on climate change is twice as great because the carbon is emitted at high altitudes (WBSCD, 2001). Aircraft also emit water vapour, which contributes to the greenhouse effect (IPCC, 1999).

Transport is also responsible for emissions of other GHGs, including methane (CH₄), that is released during petroleum extraction and nitrous oxide (N₂O) that is present in exhaust gases (OECD, 2000). Both gases are potent GHGs; methane has a global warming potential 21 times that of CO₂, and nitrous oxide 310 times that of CO₂ (DETR, 2000a).

AIR POLLUTION

Of all the environmental impacts from transport, those resulting from emissions of pollutant gases and particulate matter have received most attention, probably because of

the immediate nature of the health effects, particularly in urban areas (Tolba and El-Kholy, 1992). It has been estimated that between 12,000 and 24,000 early deaths are caused by short-term air pollution in the UK each year (COMEAP, 1998). Air pollution also affects the natural and built environment; forests, crops, wildlife and buildings can all suffer significant damage from high levels of airborne pollutants (CVTF, 1999).

Motor vehicles are the most significant source of air pollution in the transport sector (RCEP, 1994). Primary pollutants are those that are emitted directly from vehicle exhausts, including carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOCs), particulates, sulphur dioxide (SO₂) and lead. Emissions of these pollutants may lead to poor air quality, potentially causing human and environmental risks (ACE, 2001). Road freight transport is a significant source of particulate emissions; diesel-engined road vehicles (predominantly goods vehicles) accounting for 18 per cent of total UK emissions in 1997 (DETR, 2000b). Secondary pollutants can be formed by reactions between several pollutant emissions. For example, ground-level ozone, the main constituent of photochemical smog, is produced from the action of sunlight on NO_x and VOCs (OECD, 2000).

Tighter standards on vehicle exhaust emissions and fuel quality have actually resulted in reductions of pollutant emissions from transport in the UK, as demonstrated in Figure 2.

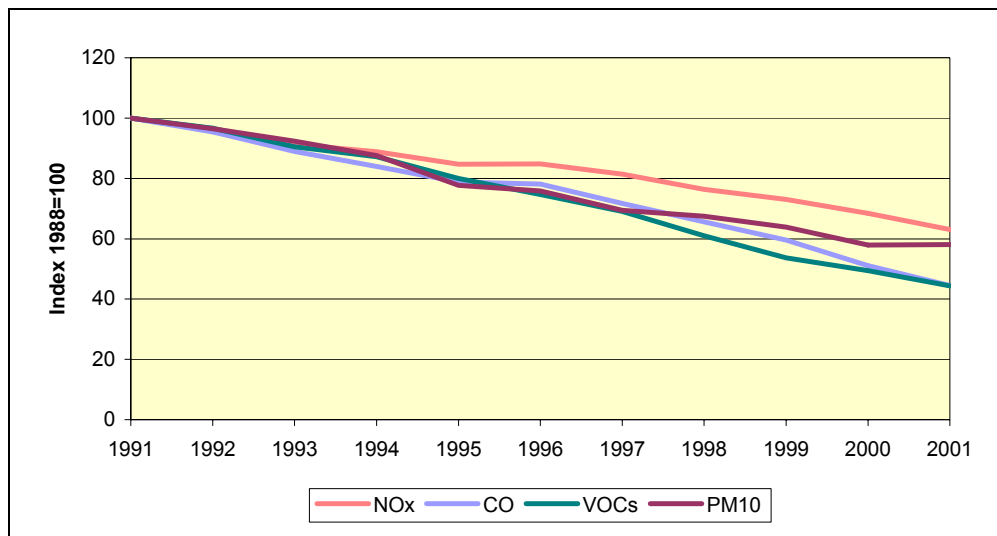


Figure 2: Pollutant Emissions from Transport in the UK 1991-2001. Source: DfT, 2003

Figure 3 illustrates that despite reductions in emissions of air pollutants, the transport sector remains a significant overall contributor. It should be noted that transport's share of total emissions tends to be greater in urban areas. For example, road transport contributes 78 per cent of particulate emissions in London, compared to 16 per cent nationally (CVTF, 1999).

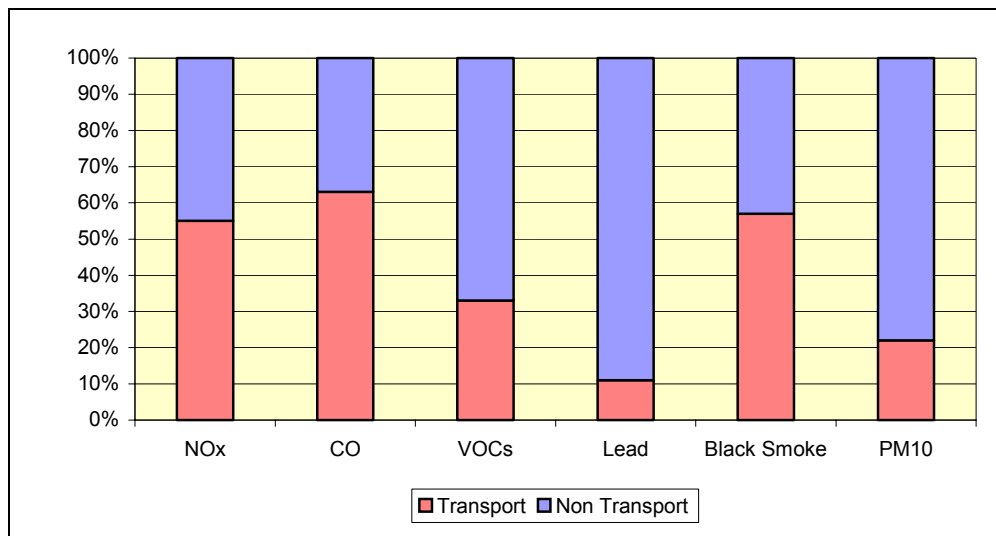


Figure 3: Proportion of Pollutant Emissions from Transport and Other End Users in the UK 2001. Source: DfT, 2003.

NOISE

Transport noise is a major and increasing source of acoustic nuisance in urban areas (OECD, 2000). Maddison et al (1996) describe the health effects from noise pollution, which include disruption of sleep and generation of stress. Research undertaken over a 24-hour period in 1990 showed that noise from roads was recorded outside 92 per cent of a sample of dwellings in England and Wales. Aircraft noise was the next most common source recorded at 62 per cent of sites, whilst noise from railways was recorded at only 15 per cent of sites (Sargent and Fothergill, 1993).

OTHER IMPACTS

Transport causes other diverse environmental impacts; the required infrastructure occupies substantial areas of land, roads taking up a fifth of the surface of urban areas in the UK (TEST, 1991). Construction of transport infrastructure uses vast quantities of natural resources and energy, whilst potentially damaging, fragmenting and destroying natural habitats (Tolba and El-Kholy, 1992).

Road vehicles, trains, ships and aircraft have impacts not only in their use stage, but also in manufacture, for example energy and resource use, and at their end of life - road vehicles account for 10 per cent of the total volume of EU hazardous waste (IEM, 1997). Contamination of surface and ground waters can be caused by fuel spillages, maintenance activities and from disposal of waste (for example of lubricating oil) (IEM, 1997).

Road congestion exacerbates other environmental impacts through greater fuel consumption and greater emissions (IEM, 1997). It also has economic and social costs, estimated to be as high as £37 billion in the UK each year (Sansom et al, 2001; ENDS, 2001).

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