

## **Evidence briefing for the Transport Health and Environment Pan-European Programme (THE PEP) toolbox: Climate change and health**

### **Indicator**

Climate change and health

### **Overview**

Climate change leads directly and indirectly to death and ill health and poses a public health threat on a global scale (Confalonieri et al, 2007; EEA, 2004). Due to different socio-economic conditions there is a lot of variation in the WHO European Region between and within countries both in terms of deaths and ill health from climate change (Ezzati et al, 2004). Transport accounts for more than one-fifth of greenhouse gas emissions, making it an important contributor to climate change. Greenhouse gas emissions from transport are not only increasing due to the rapid growth in transport, but also because of a further shift from rail to road transport. Short-term projections indicate that greenhouse gas emissions from the transport sector will be the same in 2010 as in 2005 and 26 per cent above 1990 levels (EEA, 2008).

There is growing evidence that some burden of disease attributable to climate change can be avoided through preventive action (Menne & Ebi, 2006) consisting of adaptation and mitigation measures. Adaptation measures in the health sector include a variety of actions stretching from early warning, monitoring, surveillance and health system preparedness to access to clean water, safe food and energy (Menne & Bertollini, 2005; WHO Regional Office for Europe, 2008). Mitigation measures include technological, economic and behavioural measures with the aim to reduce greenhouse gases. In this evidence briefing, the mitigation strategies related to the energy and transport sectors are highlighted, following a short review of the most threatening impacts of climate change in the WHO European Region.

### **Definitions**

The United Nations Framework Convention on Climate Change (UNFCCC) defines 'climate change' as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (United Nations, 1992). Many human activities such as agriculture, industry and transport result in the emission of greenhouse gases and thus enhance climate change. The Intergovernmental Panel on Climate Change (IPCC) highlights the new and stronger evidence that the warming observed over the past 50 years is attributable to human activities (IPCC, 2001; 2007).

## **What's the problem? *Key facts***

### **Transport and greenhouse gas emissions**

Since 1990, greenhouse gas emissions from transport have increased by around 23 per cent in the countries belonging to the European Union (EU) before May 2004 (EU-15). Transport accounts for 31 per cent of total energy use in the countries belonging to the EU until 2006 (EU25) (EEA, 2006; 2008). The road transport sector is by far the largest consumer of energy in the transport sector in the EU: it accounts for about 35 per cent of energy consumption in the EU25 (EEA, 2006; 2008). This is the result of a steady growth of road transport over the last decades: since 1980, the number of passenger transport kilometres by car has increased by over 70 per cent (EEA, 2006; 2008). Under business as usual policies, the transport sector is projected to be responsible for 90 per cent of the increase in CO<sub>2</sub> emissions until 2010 (European Commission, 2001). This is in particular related to the growing transport demand in eastern Europe (UNECE-WHO, 2008).

### **Health impacts of climate change**

It is predicted that climate change not only leads to global warming, but also to increased climate variability. Extreme weather and climate events are forecast to become more frequent and intense, and are associated with increases in hospital admissions during hot periods (IPCC, 2007).

Current evidence suggests that climate change in general is associated with significant health impacts: excess mortality from heat-waves and high temperatures, increases in mortality, illness and injuries from more frequent severe weather events (floods, storms), increased burden of food and waterborne illness, altered distributions of vector-borne diseases, changes in water availability and crop yields (Confalonieri et al, 2007). Changes in air quality, an earlier onset of the spring pollen season in the northern hemisphere and more frequent heat waves will affect respiratory diseases (WHO Regional Office for Europe, 2008). Climate change is expected to exacerbate mental health problems, stress and quality of life, for example through post-traumatic stress related to extreme weather events (IPCC, 2007).

### **What influences climate change and health effects?**

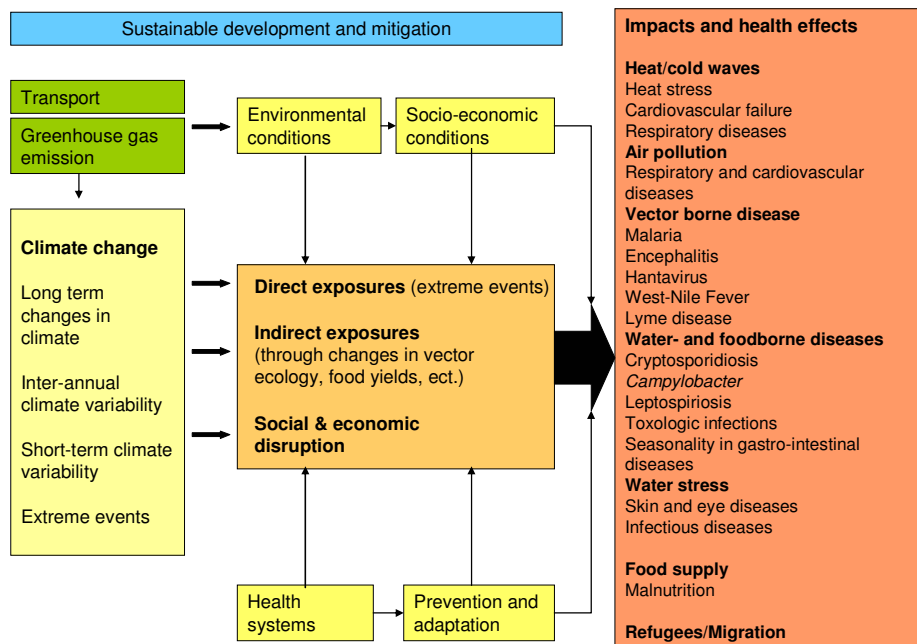
Climate change is expected to affect public health on a global scale. Future generations are expected to experience effects more than the current generation and the effects will be unevenly distributed (Kovats et al, 2005). Populations in low income countries appear to be particularly vulnerable to many of these impacts (Campbell-Lendrum et al, 2003). Four factors determine the health effects of climate change:

- 1) how many people are exposed;
- 2) how resilient and prepared is the population to cope with the impacts;
- 3) how frequent and severe are the events and the impacts; and
- 4) how well are health systems prepared.

In the light of the severe health impacts of climate change as described above, it is desirable to reduce greenhouse gas emissions from all sources in order to slow down the rate of climate change. A key activity with po-

tential to reduce greenhouse gas emission is transport. Figure 1 visualizes the pathways on which fossil fuel driven transport affects health through climate change.

Figure 1: How transport affects health through climate change



### What are the potential tools for action?

Climate change will continue to pose challenges to current and future populations in terms of health-risk management and the reliability of infrastructure, such as health services and the supply of energy. Adaptation measures must be taken to reduce the current and future burden of disease due to climate change. At the same time, both high and low income countries will have to reduce net emissions of greenhouse gases. Currently, high-income countries emit around 4.3 tons of carbon per person, the countries of the Commonwealth of Independent States (CIS)<sup>1</sup>, emit 2.2 tons per person, and the low-income countries emit 1.1 tons. The sustainable level of emissions per capita in 2100 is around 0.3 tons, so less than one-third of what low-income countries are emitting today. This target can only be achieved through sustainable mitigation measures and a ‘renewable transition’ - i.e. a whole-scale shift from fossil fuels to renewable sources of energy and a shift to public transport and more walking and cycling in urban areas (IPCC 2007, EEA 2008) and, as far as possible, an overall reduction of person-km driven.

The tools to address mitigation can be grouped into technology measures, the promotion of change in user behaviour, modal balance policy and taxation measures. In terms of specific mitigation measures in the transport sector, the fourth assessment report of the IPCC reviewed a number of promising policies and measures, such as spatial and transport planning, taxation and pricing, regulatory and operational instruments (e.g. traffic management, control and information), fuel economy standards in road transport, transport demand management, non-

<sup>1</sup> Also referred to as eastern Europe, the caucasus and central Asia (EECCA), including 12 countries.

climate policies influencing greenhouse gas emissions as well as co-benefits and ancillary benefits for human health (Kahn Ribeiro et al, 2007).

The cornerstone of the technology measures in the EU is a voluntary commitment by the automobile industry, the European Automobile Manufacturers Association (ACEA) agreement, to ensure that the CO<sub>2</sub> emissions of new cars will be reduced by 25 per cent over ten years. The progress in reducing emissions has, however, almost come to a standstill: only half of the target reduction was achieved by the end of 2006 (EEA 2008). Measures such as vehicle taxation are effective and needed to tempt users to buy smaller cars. Eco-driving campaigns in Germany and the Netherlands teach road users how to drive as efficiently as possible. Large-scale field trials are needed, though, to establish the energy savings of eco-driving (e.g. combining correct tyre pressure with moderate acceleration) (EEA, 2007).

EU policy to return the market share of rail transport to the level it had in 1998 (modal balance) has not been achieved for the rail freight sector (EEA, 2007). Reducing transport volumes is one way of reducing the emission of greenhouse gases, but difficult to achieve. Better urban planning (compact cities), competitive urban transport as well as safe walking and cycling are ways to curb traffic growth in the long-term.

#### *Kyoto Protocol*

The main policy tool to reduce greenhouse gas emissions is an international agreement. Over a decade ago, most countries joined the international treaty 'United Nations Framework Convention on Climate Change (UNFCCC)' to consider what can be done to reduce global warming and to cope with whatever temperature increases are inevitable. A number of nations approved an addition to the treaty: the Kyoto Protocol, which has more powerful (and legally binding) measures (UNFCCC, Kyoto, 1997). However, many countries in the WHO European Region are making no or little progress in reducing their emissions, and on a global level many developing countries are having difficulties skipping the fossil energy intensive phase in their development, which increasingly contributes to the warming of the atmosphere.

Most of the world's countries eventually agreed to the Protocol, but some nations, including the United States and Australia, chose not to ratify it. Following ratification by the Russian Federation, the Kyoto Protocol entered into force on 16 February 2005. The Protocol requires developed countries to reduce their greenhouse gas emissions below the levels specified for each of them in the Treaty. These targets must be met within a five-year time frame between 2008 and 2012, and add up to a total cut in greenhouse gas emissions of at least five per cent against the baseline of 1990. The review and enforcement of these commitments is carried out by United Nations-based bodies (United Nations (1992)).

The Protocol places a heavier burden on developed nations under the principle of 'common but differentiated responsibilities.' In order to give parties a certain degree of flexibility in meeting their emission reduction targets, the Protocol developed three innovative mechanisms known as Emissions Trading, Joint Implementation and the Clean Development Mechanism (CDM). These so-called "market-based mechanisms" allow developed parties to earn and trade emissions credits through projects implemented either in other developed countries or in developing countries, which they can use towards meeting their commitments. These mechanisms help identify the lowest-cost opportunities for reducing emissions and attract private sector participation in emission reduction efforts. Developing nations benefit in terms of technology transfer and investment brought about through collaboration with industrialized nations under the CDM.

## Costs and benefits

An important and cheap measure to decrease greenhouse gas emissions from transport is the shift from motorized transport to active travel (walking, cycling). A simplified calculation was carried out by Mudu et al (in press) to demonstrate the potential carbon dioxide (CO<sub>2</sub>) savings (as a proxy for energy/carbon savings) from investments and interventions in active travel. Replacing car trips with human-powered mobility results in significant potential savings in CO<sub>2</sub> emissions (see Table 2). The following rates of investment into active travel were used as basis for three scenarios.

- a) Five per cent of car trips shorter than 8 km are replaced with walking/cycling (low impact scenario).
- b) Twenty per cent of car trips shorter than 8 km are replaced with walking/cycling (medium impact scenario).
- c) Fifty per cent of car trips shorter than 8km are replaced with walking/cycling (high impact scenario).

Cities of sizes ranging from 100,000 to 2 million inhabitants were taken as reference cities. The share of short trips (below 8 km) in and out of urban areas was taken from United Kingdom data. The displayed CO<sub>2</sub> emissions savings include hot exhaust, cold start and fuel life-cycle emissions.

Table 2: CO<sub>2</sub> emission savings by replacing car trips with walking or cycling

Cities	Reference population	CO <sub>2</sub> emissions (exhaust + life-cycle, in tons p.a.)			
		Short trips (<8 km)	Low impact (5%)	Medium impact (20%)	High impact (50%)
Small	100,000	25,226	1,261	5,045	12,613
Medium	500,000	126,128	6,306	25,226	63,064
Large	2,000,000	504,512	25,226	100,902	252,256
'EU-21'	457,095,000	115,304,951	5,765,248	23,060,990	57,652,476

Source: Mudu et al. (in press) based on calculations from <http://www.tremove.org/>. Notes:

- Average distance travelled by car per person = 6046 km (Eurostat and TREMOVE, DG ENV)
- Share of short (<8 km) trips = 16.6% of all car kilometres driven (based on UK National Transport Survey for 2004)
- 'EU-21' include: Austria, Belgium, Czech Republic, Germany, Denmark Estonia, Finland, France, Greece, Hungary, Ireland, Luxembourg, Netherlands, Norway, Poland, Portugal, Sweden, Switzerland, Slovenia, United Kingdom

The estimates in Table 2 clearly demonstrate the significant energy savings that can be achieved within and beyond the EU through concerted and well-planned investments in active travel. For example, the potential CO<sub>2</sub> emissions savings based on a central 20 per cent success scenario for a medium-large city equals about 12,600 times the average amount emitted for driving a medium-sized car for one year (~2 t CO<sub>2</sub> equivalents per annum), or the CO<sub>2</sub> equivalent of running more than 250,000 refrigerators for one year (~0.1 t CO<sub>2</sub> equivalents per annum), or more than 6,300 return flights from Europe to the Caribbean (~4 tCO<sub>2</sub> equivalents per return flight) Mudu et al (in press).

## Uncertainties

In addition to the uncertainties about the future development of human activities and climate change and its impacts in general, further challenges include:

- political, financial and human resource investment
- perception of climate change impacts and possibilities and limits to mitigate them

- climate change and adaptation to the impacts
- inequalities in and within countries
- potential large-scale impacts.

### Relevant web sites

- WHO Regional Office for Europe web site (<http://www.euro.who.int/globalchange>)
- Intergovernmental Panel on Climate Change (IPCC) web site (<http://www.ipcc.ch/>)
- United Nations Framework Convention on Climate Change web site (<http://unfccc.int/>)

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