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SPOTLIGHT

SPOTLIGHT: CLIMATE CHANGE

How the low carbon economy can improve health

Health professionals are uniquely placed to guide the climate change conversation towards better policies that are good for the planet and for people, say **Andy Haines** and **Carlos Dora**

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The current global economy has generated enormous wealth but simultaneously created profound, and in many cases growing, inequalities. Furthermore, the global economy is based on unsustainable foundations, not only because of a dysfunctional global financial system but also because human activities are undermining the planetary life support systems that sustain human health and development.^{1 2}

It has been proposed that there are nine planetary boundaries to the biophysical subsystems that provide the conditions for human civilisation to flourish: climate change, rate of biodiversity loss, ocean acidification, stratospheric ozone depletion, interference with nitrogen and phosphorus cycles, global freshwater use, changes in land use, chemical pollution, and atmospheric aerosol loading. If disrupted beyond certain limits these processes could cause unacceptable environmental damage.³

For some of these boundaries there is evidence of a threshold level that if exceeded could lead to non-linear, abrupt changes, with adverse, and in some cases potentially catastrophic, consequences for humanity. Thresholds have probably already been exceeded in three of these interlinked processes: climate change, rate of biodiversity loss, and the nitrogen cycle. For some others the boundaries are being approached and without decisive action they are likely to be exceeded in the foreseeable future. Despite scientific uncertainties it is clear that humanity can only flourish within finite ecological limits.

At the same time, as awareness of the global scale of the environmental challenges has become evident, concern is also growing about the burgeoning epidemic of non-communicable diseases in low and middle income countries. The recent UN High Level Meeting on Non-communicable Diseases concluded with a ringing endorsement of a range of policies to promote health, prevent non-communicable diseases, and scale up cost effective treatments.⁴ However, there was little consideration of the critical links between the current non-communicable

disease epidemic (including cardiovascular disease, chronic pulmonary diseases, and obesity related conditions) and environmental drivers, such as exposures to air pollution and urban environments that profoundly shape sedentary lifestyles. These drivers are in many cases related to processes that emit greenhouse gases to power economies and produce food.

Health and sustainability are indivisible at a global level, as improvements in health cannot be maintained without safeguarding the underlying systems on which human health and development depend. We outline some of the policies that can significantly improve both health and promote sustainability, with a particular focus on reducing greenhouse gas emissions to mitigate climate change. Some of these policies could also have added environmental benefits, by reducing biodiversity loss and land use change, for example.

Addressing climate change

In order to avert dangerous climate change (that is, climate change that leads to major abrupt or irreversible changes in the climate system or a component of the system) many climate scientists consider that it is necessary to keep global mean temperature increases to no more than 2°C above pre-industrial levels. It will nonetheless be difficult, if not impossible, to hold temperature increases below this level given current trajectories of greenhouse gas emissions.⁵ Decisive action is needed to cut global emissions by at least 50% by 2050. This figure implies a cut of at least 80% for a developed country such as the UK,⁶ which has benefited historically from access to affordable fossil fuels. The Contraction and Convergence (C&C) position,⁷ in which countries aim for a similar per capita emission cap, seems the most promising approach to addressing the profound inequities in greenhouse gas emissions that currently exist.

According to one measure, the benefits over time of approaches to move the world on to a low carbon path could be around \$2.5 trillion (£1.6 trillion; €1.9 trillion) annually.⁸ Despite the

evidence that technologies and policies for reducing greenhouse gas emissions are likely to be some of the main drivers of a sustainable economy, and that the cost of mitigation is likely to be lower than the cost of the damage caused by climate change, in practice progress has been too little, too late. The Kyoto Protocol expires in 2012 and the challenge is to reach an agreement that results in sufficient reductions in greenhouse gas emissions at the UN Framework Convention on Climate Change negotiations.

The benefits to health of a low carbon economy

Health has been a missing dimension in climate policies. It is not widely appreciated that there are many benefits to health that are likely to accrue from a low carbon economy. (The term “low carbon economy” is used for simplicity; although not all greenhouse gases contain carbon, neither are greenhouse gases the only climate change pollutants—black carbon, for example). These collateral benefits (often called co-benefits) have frequently been overlooked by policy makers and constitute an added rationale for deep cuts in greenhouse gas emissions. Co-benefits should make deep cuts in greenhouse gases more attractive because they offer the promise of accelerated progress towards both public health and climate goals.⁹

Low carbon strategies can directly or indirectly affect health by acting upon health exposures and risks related to ambient (outdoor) air pollution from electricity production, primarily from coal; indoor air pollution in homes reliant on coal and biomass fuels; transport related air pollution and the spread of sedentary lifestyles; and agriculture and nutrition, particularly as a result of increased consumption of animal products and changes in land use.

Electricity production

A shift away from the combustion of coal for electricity generation will reduce both carbon dioxide emissions (the major greenhouse gas) and fine particulate air pollution. A number of studies have estimated the health benefits from low carbon electricity generation. It has, for example, been estimated that in the case of India around 90 000 premature deaths annually could be avoided as a result of reduced atmospheric concentrations of fine particles from reduced coal combustion.¹⁰ In high income nations the health co-benefits would be comparatively less because of existing air pollution legislation, but still worthwhile.

Indoor air pollution

WHO estimates that in 2004 over half the cases of pneumonia in children were related to exposure to indoor smoke from the combustion of biomass or coal in inefficient cook stoves or open fires.¹¹ Indoor air pollution also causes chronic obstructive pulmonary disease, particularly in women. Black carbon and other greenhouse pollutants are released from inefficient biomass combustion. Thus improved efficiency cook stoves or the use of biogas, for example, can greatly reduce indoor air pollution as well as helping to mitigate climate change. One study has suggested that in India around two million premature deaths, particularly in women and children, could be averted by introducing 150 million improved efficiency cook stoves over a decade, with a concomitant reduction of between 0.5 to 1.0 billion tonnes of CO₂ equivalent greenhouse pollutants.¹²

Improved insulation and building design can substantially reduce greenhouse gas emissions as well as protect dwellers from

thermal stress. Adequate ventilation needs to be built into energy efficient building projects, to avoid dampness, mould, radon, and other indoor pollutants.¹³ Improved ventilation may enhance quality of life in asthma¹⁴ and reduce transmission of some respiratory diseases in healthcare settings. Screens on windows and doors protect from vector borne diseases like malaria and reduce energy consumption from air conditioning and related greenhouse gases.¹⁵ Some important untapped opportunities for health advances and greenhouse gas reductions lie in the use of clean and low carbon solutions in slum improvements, where 40% of the increase in urban populations will take place by the year 2050.¹⁶

Transport

Major increases in greenhouse gas emissions are projected from the transport sector without decisive policies to address the growth in emissions. Motorised transport is responsible for the vast majority of the deaths from road traffic injuries (1.3 million a year)¹¹ and makes a substantial contribution to urban air pollution (also responsible for around 1.3 million deaths a year).¹⁷ Reliance on private motorised transport can also be a major contributor to sedentary lifestyles, associated with obesity and with 3.2 million non-communicable disease deaths a year.¹¹ Increased active travel could reduce greenhouse gas emissions and the disease burden from ischaemic heart disease, cerebrovascular disease, depression, Alzheimer’s disease, diabetes, and breast and colon cancer.¹⁸ ↓

Longitudinal studies in Copenhagen¹⁹ and Shanghai²⁰ have shown that all cause mortality was 30-40% less among those who cycled compared to those who did not use active transport or get equivalent amounts of leisure time exercise, even after the increased risk of road injuries to cyclists and confounders were considered. A systematic review of interventions to promote physical activity found that urban planning interventions in land use and transport were among the most effective—and better than other health promotion approaches focused on individuals (see also table 1↓).²¹

Agriculture and nutrition

The demand for animal products is projected to increase in the coming decades, particularly in middle income nations. Food and agriculture contribute 10-12% of global greenhouse gas emissions, with major additional contributions from deforestation and other land use change. A large proportion of emissions is attributed to rearing animals. Ruminants contribute a disproportionate share because they emit methane, a potent greenhouse gas. Also, pastureland used for livestock grazing and forage crops occupies 26% of the Earth’s terrestrial surface and livestock feed crops occupy around 30% of arable land.²³ The increased reliance upon grain commodities for both livestock feed and the increase in crops grown to make biofuels, along with shifting patterns of rainfall and drought, have contributed to sharp increases in commodity prices, threatening the nutrition of the world’s poorest populations.²⁴ At the same time, people in many low and middle income countries are eating more meat and dairy products, often in unhealthy diets that increasingly mirror those in some developed economies. This is despite the clear evidence, in health terms, that excessive saturated fat consumption from meat and dairy products can substantially increase ischaemic heart disease and stroke. In addition, large bowel cancer has been linked to high levels of processed meat consumption. One study suggested that as a result of decreases in saturated fat intake, reducing animal product consumption by 30% could reduce the ischaemic heart

disease burden by around 15% in high consuming societies such as the UK and São Paulo, Brazil.²⁵

Why health should be taken into account in climate change mitigation strategies

Too often, those greenhouse gas mitigation strategies that have been championed by the mitigation experts themselves (including the Intergovernmental Panel on Climate Change (IPCC) in its fourth assessment report²⁶), emphasise technology heavy solutions that are not necessarily optimal for health or health equity.²⁷ The IPCC, for example, focuses most of its attention on transport mitigation on improved fuels and vehicles, including biofuels. These strategies can reduce the levels of fine particulates and other traffic related pollutants, as well greenhouse gas emissions, but do not yield the benefits for traffic injuries, noise, or physical activity that can result from shifts away from car travel to efficient public and non-motorised transport.²⁸ Furthermore, increasing car use can quickly offset benefits from improved engines and fuels.²⁹

Similarly, the IPCC largely overlooks the problems for both health and climate change of a continuously expanding livestock production sector, for discussion of technology intensive approaches to livestock production and carbon sequestration. The grave omissions—for mitigation as well as health—illustrate why such strategies should be subject to closer analysis relevant to health, such as health impact assessment and cost-benefit analysis including all relevant health issues. Such analysis would also alert policy makers to where adverse health effects could occur, as in the case of some biofuels or diesel.

Many of the policies mentioned above are also highly cost beneficial for health and poverty reduction. For example, the benefit-cost ratio of replacing polluting and leaky biomass stoves with liquefied petroleum gas (LPG) stoves has been estimated at 4:1. These positive outcomes in terms of fuel, time, health, and climate are likely to be even greater with newer, more advanced biomass stove technologies that rely on renewable fuels and can greatly reduce the emissions of climate and health damaging pollutants.³⁰ For every dollar investment in active transport, there is up to \$30 return. A systematic review of the economic benefits of cycling interventions, including economic benefits of health impacts from more physical activity, found a median benefit-cost ratio of 5:1, with a range of -0.4 to 32.5.³¹

Although there are many synergies between health and a low carbon economy, health is not yet central to the low carbon economy discourse. Why should policies to reduce greenhouse gases consider health?

Firstly, because the external costs to health as well as the expected gains produced by these policies need to be considered in decision making processes so as to achieve the most benefits to society. Excluding health costs may lead to policy choices that are not optimal to society. For example, when costs to society exceed those for an individual road user, the levels of road use will be higher than socially optimal.³² Secondly, because individuals and policy makers are making decisions, such as those to promote a sustainable low carbon economy, based on partial information. This lack of due diligence may lead to risks that could have been avoided. Thirdly, health professionals should be the voice of population groups, like children, who may lose out in certain policy decisions, but who have no voice in decision making. Finally, the health sector has evidence that can guide other sectoral policy decisions in the direction of reducing health and social inequities.

The health sector has a unique contribution to make to climate policies by providing tools and expertise for health impact assessments and economic analyses, and by developing health monitoring and evaluation of mitigation policies. Health professionals can promote greater accountability, and generate the evidence to aid the selection of policies that will improve health and reduce greenhouse gas emissions.

AH has studied and written widely on climate change and health issues. He was chair of the Task Force on Climate Change Mitigation and Public Health, which published its findings in a series of articles in the *Lancet* in 2009. CD leads WHO's work on health in a green economy, analysing the health co-benefits of the policies to mitigate climate change proposed by the IPCC. He has worked widely in health sector policies and health impact assessments and has led WHO initiatives on those issues. The views expressed here do not necessarily represent the decisions or policies of WHO. AH and CD are co-guarantors.

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Table

Table 1 | Win-win transport strategies to maximise health and climate gains²²

Strategy	Key pathways
Land use systems that increase density and diversity of uses	Increases proximity of destinations, reducing need for car travel and reducing vehicle kilometres travelled (VKT) Improves access by walking, cycling, and rapid transit/public transport
Investment in and provision of transport network space for pedestrian and cycle infrastructure	Improves access by walking and cycling Encourages shift from car use to walking and cycling, reducing VKT
Investment in and provision of transport network space for rapid transit/public transport infrastructure	Improves access to rapid transit/public transport Encourages shift from car use to rapid transit/public transport, reducing VKT
Engineering and speed reduction measures to moderate the leading hazards of motorised transport	Reduced speeds improve safety of walking and cycling Increased separation of vehicles from walkers and cyclists improves safety of walking and cycling Encourage walking and cycling by reducing real and perceived road dangers Technological improvements reduce production of hazards from vehicles (greenhouse gases, air pollutants, noise)

Figure



[Image: Tim Graham/Getty Images]