Health in the green economy

Co-benefits to health of climate change mitigation

TRANSPORT SECTOR *Executive summary*

Key messages

Health gains/risks

- **A shift to active transport (walking and cycling) and rapid transit/public transport combined with improved land use** can yield much greater immediate health "co-benefits" than improving fuel and vehicle efficiency. These strategies need more systematic study by the Intergovernmental Panel on Climate Change (IPCC) in assessment of transport mitigation measures.[1]
- **Potential health gains of a shift from private motorized transport to prioritized walking, cycling and rapid transit/public transport systems** include reduced respiratory/cardiovascular disease from air pollution, less traffic injury and noise stress. In addition, large benefits are expected from increased physical activity, which can prevent some cancers, type 2 diabetes, heart disease and other obesity-related risks. Improved mobility for women, children, the elderly, and low income groups enhances health equity.[2–4]
- **Shifting from gasoline to diesel vehicles could increase emissions of health-damaging small particulates (PM_{10}, $PM_{2.5}$).**[5] IPCC's assessment finds diesel vehicles have potential to reduce transport's CO_2 emissions. However, diesel engines typically emit more small particles, the vehicle pollutant most associated with health impacts. In Europe, large shifts to diesel vehicles over the last decade were a likely cause of stable (not lower) urban PM_{10} levels – despite the introduction of cleaner diesel technologies.[6]
- **Transport-related health risks affect millions of people.** Urban air pollution (much from transport) and traffic injuries kill some 2.6 million people annually, mostly in low- and middle-income countries. Active transport can help prevent many of the 3.2 million deaths from physical inactivity.[7,8]

The climate footprint of transport

Global transport emissions comprised about 23% of direct CO_2 emissions in 2008, with land transport accounting for the largest share (16.5%). Under "business as usual" scenarios, emissions are projected to rise rapidly in absolute terms.[1] Diesel particles also contain black carbon, a short-lived climate change pollutant – although biomass combustion is a more important source.[18,19]

"Win-win" health and transport mitigation strategies

- **IPCC should consider more systematically health co-benefits (and risks) of transport mitigation strategies.** IPCC's *Fourth Assessment Report* on mitigation options for the transport sector gives little, if any, attention to health impacts.[1]
- **Improved active transport and rapid transit/public transport is not only healthy; it is cost-effective.** Studies cited by IPCC of Latin American cities note the large greenhouse gas (GHG) mitigation potential (25%) and relatively low cost (US$ 30/ton CO_2 reduced) of combined improvements in bus rapid transit (BRT), pedestrian upgrades and cycleways.[20]

About Health in the Green Economy

Many strategies to reduce climate change have large, immediate health benefits. Others may pose health risks or tradeoffs. Examined systematically, a powerful new dimension of measures to address climate change emerges.

WHO's *Health in the Green Economy* series is reviewing the evidence about expected health impacts of greenhouse gas mitigation strategies in light of mitigation options for key economic sectors considered in the *Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007* (IPCC).[9]

The aim is to propose important health co-benefits for sector and health policy-makers, and for consideration in the next round of IPCC mitigation reviews (*Working Group III – Fifth Assessment Report* [AR5]). Opportunities for potential health and environment synergies are identified here for key economic sectors. This brief focuses on the transport sector.

World Health Organization

- **More compact land use that integrates urban residential and commercial areas enhances the climate and health co-benefits of transport strategies.** Emphasis on "proximity planning" makes walking, cycling and public transport to access schools, jobs and services more feasible. For example, one study in Santiago, Chile estimated that relocating schools closer to existing residential areas could reduce transport emissions by 12% at a cost of only US$ 2 per ton of carbon reduction over 20 years.[10]
- **Cost-benefit assessments (CBA) commonly performed on transport projects, including those by development banks, often fail to quantify health and equity costs** of roads in terms of pollution, injuries, and barriers to non-motorized/public transport. CBA tools need to become more "multimodal" comparisons of the costs and benefits of various mixes of BRT/rail, non-motorized and road investments in terms of expected health gains, or losses.
- **Well-tested tools exist for considering health in transport and land use policies,** including health impact assessment *(www.who.int/hia)*. These tools can be applied more widely in developed countries and in developing cities.
- **Investments in active transport and rapid transit/public transport can assist budget-conscious government ministries to achieve development objectives cost-effectively** by reducing congestion and the need to fund costly road infrastructure.[11] Transport systems with strong walking, cycling and rapid transit/public transport components also are less vulnerable to price shocks and interruptions in supply of oil or other fuels.

Closing the health equity gap

- **Low- and middle-income cities may have the most to gain in health terms from low-carbon transport strategies.** These cities are experiencing the most rapid urban population growth as well as traffic congestion, air pollution and traffic injury risks. The same cities face growing noncommunicable disease risks from more sedentary lifestyles. Healthy transport strategies can help address these risks.
- **Healthier transport strategies will yield a wide range of health benefits for the majority of the world's population, and large equity benefits for vulnerable groups.** Women, older adults, children, disabled people, and lower income groups all have less access to private vehicles, and also may be more exposed to certain transport-related health risks. These same groups benefit most significantly from improved public and non-motorized transport that improves their independent mobility and access to goods, services, employment and education.[11–13]
- **Biofuels production for transport mitigation may pose a threat to food security when diversion of** food crops to fuel decreases access to nutritious and affordable foods.[14,15] This compromises the right to food.[16]
- **Export of older, more polluting vehicles from developed to developing countries pose health risks for the latter.** As developed countries shift to lower-emissions vehicles, older vehicles are still being resold at low prices to developing country markets, where regulatory controls on fuels and vehicle maintenance may be less strict.[17] This can exacerbate air pollution, traffic congestion, and injury risks, particularly when public transport systems are weak and inefficient.

BACKGROUND AND RATIONALE

Transport has powerful impacts on health. Well-designed transport policies and infrastructure investment priorities can lead to far-reaching reductions in traffic-related health risks from air and noise pollution and injuries. Cycling and walking, on their own or as part of a rapid transit/public transport journey, can greatly enhance levels of physical activity, and help prevent a range of chronic diseases including heart disease, some cancers, and type 2 diabetes.

SCOPE AND METHODS

This analysis reviewed potential health impacts of mitigation strategies considered in the Intergovernmental Panel on Climate Change's *Fourth Assessment Report – Working Group III*.[1] It draws on an extensive review of nearly 300 peer-reviewed and health-relevant scientific articles and reports.

The focus was on studies of the health impacts of strategies as implemented in real-life settings, as well as evidence on transport-related health risk factors. Existing tools for assessing health impacts of transport decisions were described, as were case studies of climate- and health-friendly transport policies. The review was limited to land transport, which has the greatest impacts on health as well as the largest share of transport's GHG emissions. Passenger transport, not freight, was, however, the key focus. The search strategy drew upon keywords from the IPCC mitigation assessment to identify studies on the health impacts of:

1) modified vehicles and fuels;
2) transport pricing strategies;
3) transport and land use policies promoting shifts to non-motorized transport/public transport as well as compact land use.

Based on these findings, we classified the likely health effects of a given mitigation strategy, or package of strategies, from "--" (strongly negative for health) to "++" (strongly positive for health). Summaries of evidence on the health effects of key transport-related policies and risk factors (e.g. air pollution and traffic injuries) were also presented. Evidence on the health equity effects of each factor was difficult to quantify using this methodology and was described qualitatively. These classifications, presented in the Appraisal of health implications of IPCC-assessed mitigation strategies (Table 1), should be regarded as indicative, rather than definitive.

The transport sector is also a major source of greenhouse gas emissions, and thus an important focus of climate change mitigation. To optimize the social and economic benefits that can be derived from mitigation, transport mitigation strategies need to be examined in light of their expected health impacts, both co-benefits and potential risks.

Additionally, strategies may be examined in light of their potential to achieve greater health equity by improving the access of diverse groups to social and economic opportunities.

In light of this need, WHO undertook a review of potential health co-benefits (and risks, where relevant) of transport mitigation strategies.

SUMMARY OF INITIAL FINDINGS

The major focus of the IPCC review is how improved fuels and vehicle technologies can support mitigation. However, to obtain greater health co-benefits, transport mitigation strategies should place greater emphasis on transport and land use planning that makes cities more accessible by walking, cycling and improved rapid transit/public transport. Greater emphasis on land use planning and mode shift may also enhance the mitigation potential of transport strategies. Land use strategies that reduce the need for motorized travel while promoting better access also need more study.

A systematic evaluation of potential health benefits should be included in the next IPCC mitigation review of strategies involving transport and land use to ensure "win-win"

Table 1: Appraisal of health implications of IPCC-assessed mitigation strategies

Mitigation strategy	Potential to reduce emissions (illustrative example)	Likely reduction of health risk factors			Additional effects, limitations and comments
		Size and direction of effect		Strength of evidence	
IPCCa Modified vehicles and fuels	21% reduction in light-duty vehicle CO_2 emissions by 2030 under a high-efficiency vehicle scenario, almost all at costs less than US$ 100/ tCO_2.	Air pollution	- to ++	Moderate	Increasing fuel efficiency could lower travel costs and thus promote more motorized transport. Alternatively, improved vehicles may be more expensive, reducing their use in low-income settings. Particulate emissions may be higher from diesel engines than from equivalent gasoline engines per unit of travel, which could worsen health. Air quality impacts of biofuels remain unclear. Significant concern exists regarding biofuels' production impacts on food security and nutrition for the poor.
		Physical activity	0	Weak	
		Road traffic injury	0	Weak	
		Noise	0	Weak	
		Social effects	0	Weak	
		Land use	0	Weak	
IPCCb Pricing policies regarding vehicle and fuel use, and pricing of travel to urban centers or by different modes (e.g. congestion pricing)	Depends on whether target is pricing of modified vehicles and fuels (IPCCa) or land use changes and alternatives to private motorized transport (IPCCc). Congestion charges have reduced emissions by 13–30%, while a subsidy for low-carbon fuel has been estimated to reduce emissions by 6%.	Air pollution	- to ++	Weak	Pricing policies to encourage vehicle/fuel improvements are likely to lead to health benefits similar to IPCCa, but not to reduce travel. Pricing to encourage use of non-motorized transport and public transport is likely to lead to health benefits similar to IPCCc. Policies would have different effects on health equity depending on mode targeted, e.g. public transport or private, and type of pricing tool, e.g. taxes or subsidies.
		Physical activity	0 to ++	Weak	
		Road traffic injury	0 to ++	Weak	
		Noise	0 to ++	Weak	
		Social effects	0 to ++	Weak	
		Land use	0 to ++	Weak	
IPCCc Land use changes and alternatives to private motorized transport	Package of walkways, cycleways and bus rapid transit could reduce emissions by 25% at a cost of US$ 30/tCO_2.[20] Improved land use could reduce emissions by 21% over a 20-year period at a cost of US$ 91/tCO_2.[10]	Air pollution	++	Moderate	Can help ensure equity of access for people without cars. Can make walking and cycling safer for vulnerable groups, e.g. children, older adults and people without cars. Increases in walking and cycling need to be accompanied by improvements in the safety of the walking and cycling environment.
		Physical activity	++	Moderate	
		Road traffic injury	++	Moderate	
		Noise	++	Weak	
		Social effects	++	Weak	
		Land use	Not applicable		

Notes: Source for potential to reduce emissions: see Section 4.6 in full-text document online at www.who.int/hia/green_economy/en/index.html

Size and direction of likely health effects were rated from "--" (strongly negative effects) to "++" (strongly positive effects), with the midpoint "0" representing no significant effects.

Strength of evidence was rated from 0 (no evidence) through weak (small number of observational studies only, or good (theoretical or indirect rationale for an effect) to moderate (large number of observational studies, or observational studies plus clear theoretical rationale).

outcomes for health, the environment and people's mobility and access.

Overarching goals of healthy transport include: a) reduced deaths and disease generally from transport-generated air, noise and water pollution b) reduced exposures of disadvantaged groups to excessive transport-related injuries and health risks; c) safer and more efficient access, especially for vulnerable groups, including to jobs, services and social oportunities; d) increased physical activity, including safe walking and bicycling; e) reduced greenhouse gas emissions from transport that contribute to future, as well as present-day, health impacts. These goals can be achieved via four main strategies:

- Compact land use systems that increase density and diversity of uses;
- Investments in, and prioritization of, transport networks for pedestrian and cyclists;
- Investments in, and prioritization of, transport networks for rapid transit/public transport;
- Engineering and traffic calming measures to protect vulnerable road users from motorized transport's hazards.

Health-oriented transport strategies can be supported by tested policy-support tools such as:

1) Health impact assessment that identifies and addresses health co-benefits and risks at the planning stage, as well as measures to improve health and reduce health inequities.
2) Strengthened land use/transport planning codes and enforcement; for example, ensuring universal access to safe cycling and pedestrian routes and to rapid transit/public transport for basic routines.
3) Development and monitoring of healthy transport performance criteria and indicators, including better indicators for active travel/physical activity; use of non-motorized modes as well as public transport; air/noise pollution exposures; pedestrian injuries; and mobility/access.

Key messages presented here summarize the final outcomes of the review. The full report can be obtained through WHO's Department of Public Health and Environment or online at: http://www.who.int/hia/green_economy/en/index.html

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A modern tram line in Greece provides clean transport. (©Bigstock)