



**Pathfinder
Initiative**

Summary of the Lancet Pathfinder Commission report

Pathways to a healthy net-zero future

November 2023

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The world is heating up at an alarming rate. The World Health Organization describes climate change as the greatest threat to human health. Despite a growing awareness of the challenges we face, actions are not being implemented at the rate or scale needed to avoid disaster. The effects of policies needed to mitigate climate change are often presented as negatives: give up this, stop doing that... or else. In fact, many of the interventions advocated also bring an additional and positive benefit: better health. More emphasis on these health benefits can be a powerful incentive for more ambitious climate action.

Introduction

Deep, rapid cuts in greenhouse gas (GHG) emissions are needed to limit future global temperature increases to 1.5 degrees Celsius (°C) above pre-industrial levels. However, current progress towards this goal, which forms part of the Paris Climate Agreement, is slow.^{1,2}

Delaying action to mitigate climate change and its effects is not only harmful, it is also ignoring an opportunity. Evidence suggests that effective GHG mitigation strategies can bring major benefits to human health, in addition to reducing the health impacts of climate change. These health co-benefits are delivered primarily through reduced air pollution, the consumption of healthier diets, and increased physical activity. Better evidence on the type and magnitude of such co-benefits, and a better understanding of how to implement plans to achieve them, would accelerate progress towards the goal of net-zero GHG emissions by 2050.

The Lancet Pathfinder Commission was established to collate and analyse evidence on the near-term health effects of GHG mitigation. This evidence includes both modelling studies – in which existing data are used to predict the likely outcome of policy changes – and the evaluation of actions already implemented. The Commission's aim is to assess the magnitude of the health benefits of different climate mitigation actions and, where possible, the factors that facilitate or impede them.

The Commission and its report are part of the wider Pathfinder Initiative that aims to accelerate the transition to net-zero societies through providing practical, evidence-based emissions reduction pathways that also benefit human health. The Pathfinder Initiative is funded by the Wellcome Trust with support from the Oak Foundation. Research is led by a research team based at the London School of Hygiene & Tropical Medicine (LSHTM). Partner organisations in the first phase of Pathfinder (2020–2023) were the C40 Cities network, CDP (originally the 'Carbon Disclosure Project'), the Organization for Economic Co-operation and Development (OECD), the UN Sustainable Development Solutions Network (SDSN) and the Alliance for Health Policy and Systems Research. The second phase of work will involve a broader network of global partners working together to advance research and action on climate and health.

The following sections present key findings and recommendations from the Commission report, including the proposal for a new coalition of actors committed to the implementation, monitoring and evaluation of rapid action to mitigate climate change and improve health.

Cyclists using bike lanes established as part of the 'Más bicis, menos emisiones' programme in Buenos Aires, Argentina (Image credit: City of Buenos Aires)



Key messages



Modelled evidence highlights the opportunity for climate mitigation action across sectors to bring major benefits to health in the near-term. Increased ambition is urgently needed to achieve these health co-benefits and accelerate a just transition to a net-zero future.



Health co-benefits are additional to benefits from reducing the health impacts of climate change and are delivered primarily through reduced air pollution from replacing fossil fuels with clean, renewable energy sources; consumption of healthy, sustainable diets; and the promotion of active travel and public transport.



To capitalise on these additional health gains, while reducing inequities and meeting climate targets, health co-benefits must be incorporated into the delivery of the Paris Climate Agreement, including through Nationally Determined Contributions (NDCs) and Long-Term Low-Emission Development Strategies (LT-LEDS).



Systems approaches that integrate adaptation and mitigation are needed to manage trade-offs (potential negative side effects) and reduce the likelihood of exceeding the limits of adaptation. Examples of implemented and evaluated transformative action are needed to inspire and inform change.



Improved monitoring of progress alongside better harmonised research can support ambitious climate action. More emphasis must be placed on estimating the magnitude of both the health and GHG effects of implemented mitigation actions, including through processes such as the Global Stocktake.



A coalition of organisations, and subnational and national initiatives, is proposed to accelerate progress towards net-zero GHG emissions and improve health, with a commitment to monitor and evaluate effects on health and GHG emissions as well as to share experiences about successes and failures.

Pathways to net zero alongside improved public health

The burning of fossil fuels for energy and transport, together with emissions from food systems and land use change currently account for over 90% of global GHG emissions. These processes undermine public health in several ways. Credible estimates suggest that:

- **Over 3.5 million** deaths per year are caused by air pollution from fossil fuel burning³
- **Over 5 million** deaths per year from coronary heart disease, type 2 diabetes, and breast and colon cancers are linked to physical inactivity⁴
- **Over 10 million** deaths per year could be prevented by shifting to healthy, sustainable diets that include more whole grains, nuts, vegetables and fruits.⁵

A drive to achieve net zero by 2050 at the latest creates a unique opportunity to foster transformative change in all sectors of society including electricity generation, transport, industry, buildings, food, healthcare and education.

Climate mitigation actions bring health co-benefits largely through three main pathways that address the burdens of ill-health outlined previously:



The air we breathe

Reduced air pollution from phasing out fossil fuels and replacing them with clean renewable energy, and, as far as possible, addressing other sources of GHG emissions linked to air pollution



The food we produce and eat

A switch to healthy, sustainable diets, that rely less on GHG-intensive forms of agriculture and food production



The ways we move

Increased physical activity from active travel (walking and cycling) in combination with public transport and reduced private car use particularly in urban settings

The potential magnitude of health co-benefits is impressive, amounting to millions of premature deaths prevented worldwide for each pathway. The near-term health co-benefits of mitigation come in addition to reducing the health impacts of global temperature rise and averting deaths caused by climate change itself.^{6,7}

The urgency of boosting climate change mitigation and safeguarding human health points to a need for new and sustainable approaches for scaling up our actions.

A drive to achieve net zero by 2050 at the latest creates a unique opportunity to foster transformative change in all sectors of society.

Reduced climate change

Reducing climate change also leads to further benefits downstream, including:



Fewer deaths and injuries from extreme weather events



Increased food security

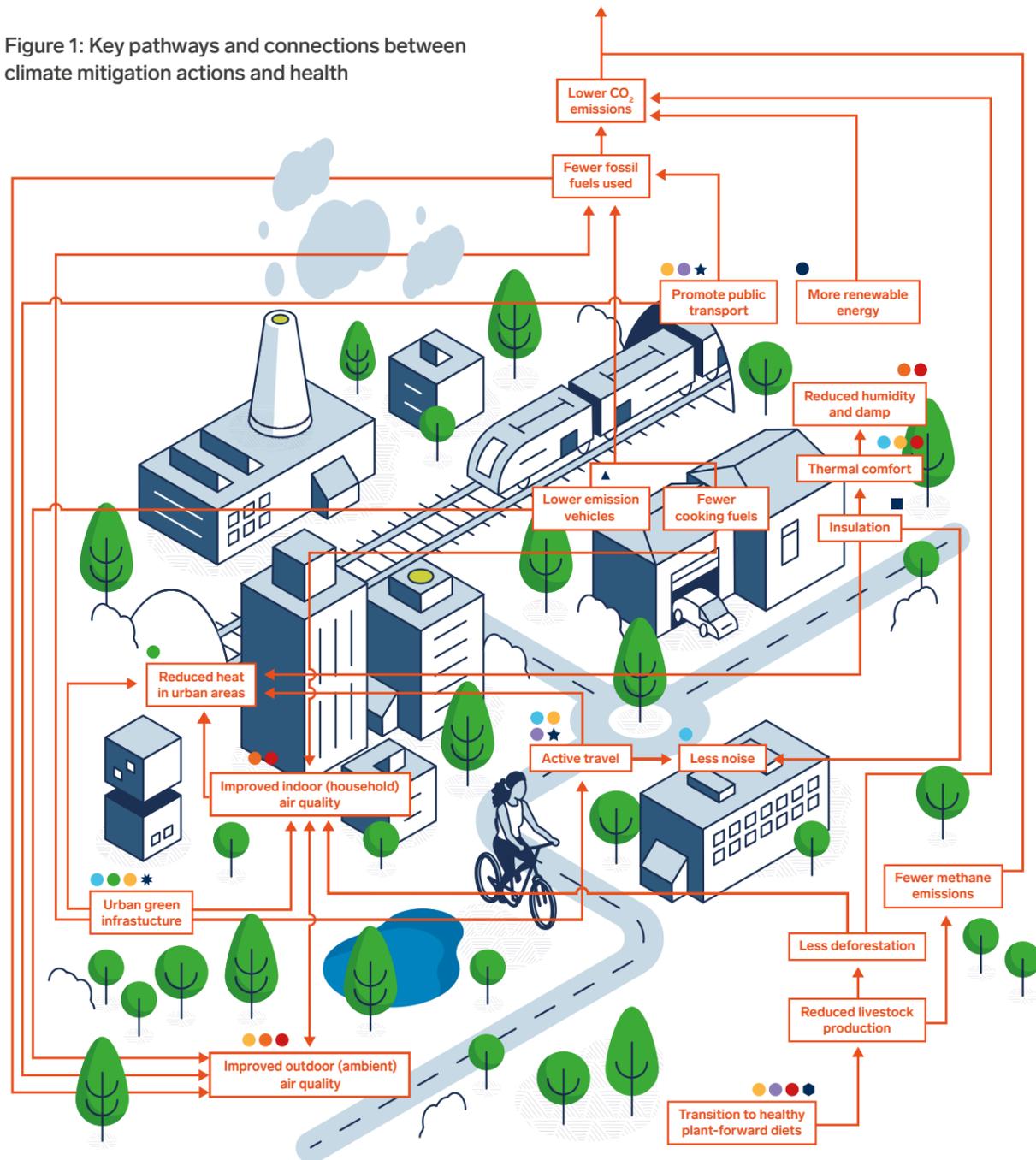


Reduced spread of vector-borne diseases



Reduced heat-related mortality

Figure 1: Key pathways and connections between climate mitigation actions and health



Example interventions

These interventions have benefits both for health and for reducing GHG emissions (climate change mitigation).

- Renewable energy replaces energy from fossil fuels
- Improve insulation and ventilation in homes
- Encourage use of lower emission, electric vehicles
- Promote active travel and public transport
- Reduce solid fuel used for cooking
- Less red meat in diets
- Increased fruit and vegetables in diets
- Integrated natural/semi-natural areas and features into city environments

Health co-benefits

- Better mental health
- Fewer deaths from extreme heat
- Less cardiovascular disease
- Less respiratory disease
- Lower rates of cancer
- Lower rates of obesity

Challenges for achieving a just and equitable transition to net zero

The inequalities in per capita emissions are stark. In 2019, the top 10% of global emitters (about 770 million individuals) were estimated to be responsible on average for about 48% of global CO₂ emissions, while the lowest 50% of emitters (3.8 billion individuals) were responsible for around 12% of all emissions. The top 1% contributed to around 17% of all annual emissions.⁸

Effective policies must address these inequalities by prioritising a reduction in emissions from the highest emitters, while ensuring that the needs of all are satisfactorily met. This may require increased consumption by those in areas with currently low emissions.⁹ Keeping global temperature rises to under 1.5°C and failing that to well under 2°C, may bring economic benefits that partly or wholly offset, or even exceed, the costs of mitigation.^{10,11}

Key to a just and equitable transition will be ensuring that the co-benefits delivered by climate mitigation benefit all, including women and minority groups. There is a growing body of evidence showing how marginalised and vulnerable populations are at greatest risk from climate breakdown, but the unintended negative impacts to these groups from certain climate mitigation actions are less often considered.¹² Policies must ensure that vulnerable populations are protected from unintended consequences and that climate actions do not exacerbate existing inequities.



A woman tending to her crops in Bakau Women's Gardens, The Gambia (Image credit: LSHTM)

Evidence on the health co-benefits of climate action

The Lancet Pathfinder Commission report highlights key findings from an umbrella review (an analysis of systematic reviews), which brings together existing evidence on the effectiveness of strategies for mitigating climate change and improving human health. 6,902 records were identified, of which 317 full texts were screened. 26 reviews met inclusion criteria of presenting quantitative estimates of both changes in GHG emissions and health impacts. Following a screening of all primary studies, the final umbrella review comprised 14 systematic reviews and 57 primary studies. 200 mitigation actions across a range of sectors were identified.

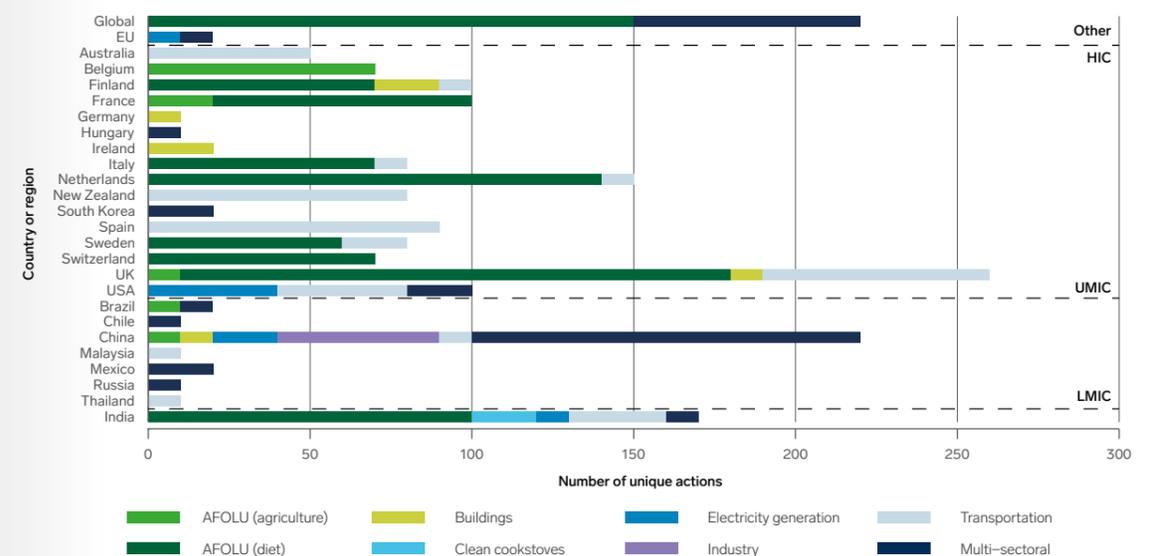
The climate impacts of mitigation actions were converted to CO₂ equivalents (CO₂eq)* to allow the inclusion of other GHGs, notably methane, alongside CO₂. The health impacts of actions were converted to reductions in years of life lost (YLL) per 100,000 population (which can also be expressed as life years gained). These measures allowed results of highly heterogeneous studies in different populations to be collated and compared.

Most of the evidence (52% of all actions) was from the food sector, mainly concerning dietary changes. Actions to cut emissions in the transport sector made up 22% of the total, followed by multi-sectoral actions (15%). Fewer than 10 actions were reported from each of the buildings, electricity generation and industry sectors.

Actions came primarily from high-income settings (129 actions, 65%), with a further 30 from upper middle-income settings (15%). All studies from low-income settings were excluded as they did not meet the inclusion criteria, emphasising the need for more resources to be devoted to gathering evidence from low-income settings. India was the only country from a lower-middle income setting that was included, and accounted for 17 actions (19%). The countries featured most often were the UK and China, followed by India, the Netherlands, Finland, France and the US (see figure 2).

*CO₂ equivalent (CO₂eq) is the mass of CO₂ emissions that would cause the same temperature change (often referred to as 'Global Warming Potential', or 'GWP'), over 100 years, as an emitted mass of GHG or mixture of GHGs.

Figure 2: Unique mitigation actions studied in each country by sector

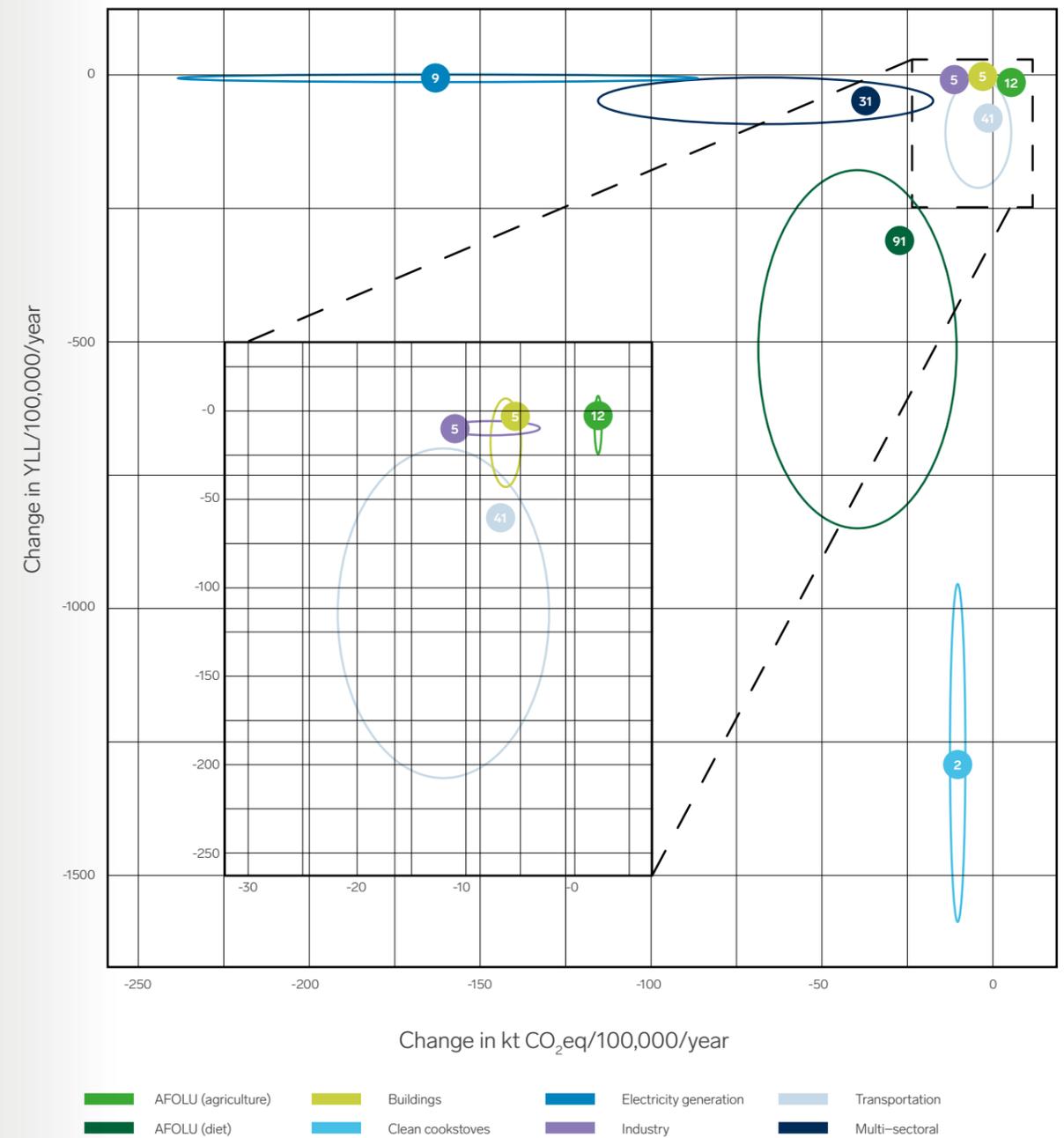


These actions include those reducing black smoke and black carbon. AFOLU=Agriculture, Forestry, and Other Land Use. HIC=high-income country. LMIC=lower-middle-income country. UMIC=upper-middle-income country.

Key findings

- The greatest benefits to health from climate action are delivered through reductions in air pollution, improved diets, and increased physical activity.
- Actions to decarbonise electricity generation had the greatest impact on GHG emission reductions (a median reduction of 171 kt CO₂eq per 100,000 population per year), followed by multisectoral actions. Actions with a high impact on GHGs affected health through reduced exposure to ambient air pollution (see figure 3).
- Clean cookstoves had the greatest estimated health co-benefits (resulting in a median of 1,279 life years gained per 100,000 population per year). Clean cookstoves have potentially significant health benefits due to reductions in childhood pneumonia caused by poor indoor air quality. The imperative to reduce the health burden of household air pollution in low and middle income countries emphasises the need for a just transition to universal access to clean renewable energy.
- Dietary changes had the second largest health benefit across sectors (a median of 306 life years gained per 100,000 population per year), and the largest health impact when considering data from global evidence as the studies on clean cookstoves included in the Pathfinder review focused on India. Health and environmental benefits from dietary change vary globally, depending on prevailing dietary patterns.
- Actions in the transport sector resulted in a median of 60 life years gained per 100,000 population per year, with the biggest benefits resulting from actions that combine promotion of active travel (walking and cycling) alongside public transport and reduced private car use.
- In the electricity generation sector, actions resulted in a median of 11 life years gained per 100,000 population per year. There was some evidence for larger benefits in India (149 life years gained per 100,000 population per year). Global modelling studies show potential large benefits to health from reductions in ambient air pollution but these are not currently reflected in the data within systematic reviews which tend to feature small scale actions with limited benefits.
- While evidence suggests that nature-based solutions, including forest protection, agroforestry, and land restoration, can sequester and store carbon and bring health benefits, quantitative estimates are sparse. Actions on sanitation were also absent from the umbrella review, as were mitigation actions in the oceans.
- A lack of consistent approaches to estimating health co-benefits of mitigation actions among studies reviewed highlights the need for harmonisation of modelling and evaluative research methods to better understand which actions bring the biggest benefits for climate and health in different contexts.

Figure 3: Climate and human health impacts of mitigation action by sector



Ellipse height corresponds to the range of data (interquartile range or IQR) for each sector's change in health impact (YLL/100 000 per year) and ellipse width corresponds to the IQR for each sector's change in climate mitigation impact(kt CO₂eq/100 000 per year). The plotted points are the median and the numbers indicate the number of actions. Some estimates of environmental impact could not be converted to CO₂eq (eg, black carbon and black smoke), hence there were fewer actions for the buildings and transportation sectors than for other sectors. AFOLU=Agriculture, Forestry, and Other Land Use. CO₂eq=CO₂ equivalent. kt=kilotonnes. YLL=years of life lost.

Health benefits of clean air

Recent evidence suggests larger health benefits can be achieved by reducing even low levels of ambient air pollution, including reductions in premature deaths from a more diverse range of health outcomes than have been previously included in many studies. Almost the whole world population (99%) would benefit from reduced air pollution from phasing out fossil fuels because they are currently exposed to levels that put their health at risk.¹³ As the Pathfinder review is based on existing systematic reviews which do not always include the latest evidence, many of the published benefits of actions that impact health via the ambient air pollution pathway may be underestimates.

Tackling short-lived climate pollutants

More emphasis must be placed on tackling short-lived climate pollutants (SLCPs), particularly as reducing them has rapid climate benefits that complement the longer-term benefits of reducing CO₂ emissions. SLCPs like tropospheric ozone (O₃) and black carbon are air pollutants responsible for many premature deaths.

The Global Methane Assessment shows that methane (an ozone precursor) emissions from human activities can be reduced by up to 45% this decade which would avoid almost 0.3°C of global temperature increase by 2045. This would also avert an estimated 260,000 premature deaths from O₃, 775,000 asthma-related hospital visits, 73 billion hours of lost labour from extreme heat, and 25 million tonnes of crop losses annually.¹⁴



Image credit: aphotostory/istock via Getty Images

Moving from modelled evidence to implementation and evaluation

Real-world examples of transformative change are needed to inform and inspire further actions for delivering an equitable transition to a sustainable future. Currently there is a lack of evidence on the climate and health impacts of solutions already implemented.

Through the umbrella review, a call for evidence, search of the literature and collaboration with Pathfinder partner organisations, 27 case studies of implemented mitigation actions that included measures of GHG emission reductions and health co-benefits were identified.

The case studies presented here exemplify actions at a range of scales and across different sectors that have potential for significant wins for climate and health if taken up at scale. A full list of identified and evaluated interventions is provided online in the Pathfinder Climate and Health Evidence Bank climatehealthevidence.org.

Case studies

Energy: CO₂ emission reduction from electricity generation leading to improved air quality in the US

Between 2005 and 2016, the US power sector replaced some of its coal and natural gas energy generation with solar and wind power.^{15, 16, 17} The percentage increase in renewable energy varied widely between regions, partly due to varying levels of stringency between states to meet certain policies. One such policy, the renewable portfolio standards (RPS), requires electrical generating companies to meet a growing portion of their load with eligible forms of renewable electricity.

In total, 147 megatonnes of CO₂ emissions were avoided from wind and solar power generation in 2015 alone. Between 2007 and 2015, improvements in air quality prevented between around 3,000 and 13,000 premature deaths. The economic benefits of renewable energy power generation were estimated at between 30 and 100+ billion US dollars. The authors of the study suggest that new estimates currently underway will likely show even larger gains from wind and solar energy in the US. There is also major scope to scale up these actions to bring greater benefits for climate and health.

Original publication:

Millstein D, Wiser R, Bolinger M, Barbose G. *The climate and air-quality benefits of wind and solar power in the United States. Nature Energy 2017 2:9 2017; 2: 1–10.*

Barbose G, Wiser R, Heeter J, et al. *A retrospective analysis of benefits and impacts of U.S. renewable portfolio standards. Energy Policy 2016; 96: 645–60.*

Retrofitting buildings: The Victorian Healthy Homes Program in Australia

A randomised controlled trial funded by the Sustainability Fund of the Victorian Government and Sustainability Victoria, assessed the impact of energy efficiency and thermal comfort upgrades on electricity and gas usage, building temperature, healthcare use, self-reported health and quality of life in the Australian state of Victoria.¹⁸

Between 2018 and 2020 the programme upgraded 984 low-income houses by carrying out work including insulation of ceilings and underfloor spaces, draught exclusion, space heating, and installing internal window coverings. Households were allocated to an intervention group (upgraded before winter) or a control group (upgraded after winter).

Following the winter period, researchers found that the home upgrade reduced gas and electricity use, which resulted in reductions of 0.128 t CO₂eq per upgrade for gas and 0.078 t CO₂eq for electricity, as well as significant energy cost savings.

The intervention group reported higher mental health scores than controls, had fewer days of absence from usual activities, and reported a reduction in breathlessness. Intervention households were also warmer and had lower healthcare costs. The findings from the programme could inform actions in other settings where there is a need to improve home energy efficiency.

Original publication:

Sustainability Victoria and University of Technology Sydney. *The Victorian Healthy Homes Program. Research findings. Melbourne, 2022.*

Healthcare provision and sustainable forest use: Health in Harmony, West Kalimantan, Indonesia

More than 60% of lowland forests within protected areas in Borneo's West Kalimantan region were lost to illegal logging between 1985 and 2001. Health in Harmony, through consultation with local communities, identified the costs of healthcare access as a key driver of illegal logging and unsustainable forest use.

In partnership with the district government and the national park management, Health in Harmony established a local health clinic that provided accessible healthcare services by allowing for non-cash payment and discounts on care, based on the amount of logging in each community. Conservation programmes, educational programmes, and alternative livelihood trainings were also offered.¹⁹

The intervention provided healthcare access to more than 28,400 patients. From 2007 to 2012, infant mortality declined from 3.4 to 1.1 deaths per 100 households. This was reflected in fewer diagnosed cases of malaria, tuberculosis, childhood-cluster diseases, chronic obstructive pulmonary disease (COPD), and diabetes.²⁰

The intervention led to a 90% reduction in the number of households relying on logging as a primary income source and prevented an estimated 27.4 km² of deforestation in the national park between 2008 and 2018.

A major factor in the success of this intervention was that it was designed by the community, and it provided multiple cross-sectoral solutions in response to the problems identified in the community. The need to pay healthcare costs has been shown to be a major driver of ecosystem degradation in other parts of Indonesia and elsewhere, suggesting potential for scale up of this intervention.

Original publication:

Jones IJ, MacDonald AJ, Hopkins SR, et al. *Improving rural health care reduces illegal logging and conserves carbon in a tropical forest. Proc Natl Acad Sci USA 2020.*



A woman planting seedlings in Indonesia (Image credit: Health in Harmony)

Climate resilient development

As well as cutting emissions to reduce climate change, societies need to adapt to changes that cannot be prevented. Rapid cuts in GHG emissions will reduce the scale of adaptation responses required to protect health and make it less likely that the limits to adaptation will be reached. Unfortunately, some adaptation actions make mitigation more challenging; the use of more air conditioning, for example, increases energy demands and, potentially, fossil fuel dependency. By contrast, passive ventilation, cool roofs and more green space in cities can reduce extreme heat exposure and so lessen energy demands.

Although mitigation and adaptation actions must be integrated, there are few documented examples of this to guide policy and practice.²¹ Climate funders, policymakers and researchers should scale up efforts to integrate and evaluate the effects of climate action. Deep decarbonisation to achieve climate mitigation goals will require transformation at a societal level. This will include changing economic systems and relationships, and the ways in which societal goals are measured.

Transformative actions to a healthy net-zero future

There are increasing calls for transformative change, and a recognition that net zero (and other sustainability goals) cannot be achieved within existing and dominant social and economic systems because these are themselves a cause of the climate crisis.^{22,23} For example, global emissions in the housing sector,²⁴ and total emissions from transport in European countries,²⁵ both show that efficiency gains have been significant. But these have been more than offset by growing emissions linked to rising demand for larger living spaces and increased travel requirements.

Policies and actions need to go beyond solely seeking improvements in efficiency (mostly via technological change) while leaving in place unsustainable systems. Taking action to reduce demand for energy and materials in high consuming countries and so limit emissions, while at the same time delivering health and livelihood benefits, will require new policy approaches and implementation strategies. Results from the umbrella review show that large and widespread behaviour changes will be needed to achieve climate and health benefits at scale. A greater focus on systemic transformation may help to trigger the changes needed to achieve the Paris Climate Agreement goals.²⁶

This will require governments to set bolder health and climate goals, and to coordinate inter-ministerial and cross-sectoral collaboration, innovation and investment oriented around these goals.

Recommendations



1. Leadership to support ambitious, collective and transformative action on climate and health

There is an urgent need for committed political leadership and a step-change in action informed by evidence. A coalition of high-ambition national and sub-national governments, organisations and other entities across a range of settings should commit to leading by example and sharing insights from the implementation of climate mitigation policies.

Climate funders and policy actors should support the use of standard approaches when measuring the effects of climate mitigation actions. Interventions should be co-designed with relevant stakeholders and affected populations, using a systems approach intended to increase equity and manage trade-offs.



2. Integrating health into climate policies

Parties to the Paris Agreement should support the integration of health into climate policy by ensuring that future NDCs and LT-LEDS include quantification of the health co-benefits of climate action.

Health and equity impacts should be monitored and reported through the Global Stocktake process (GST), which takes place every five years to assess collective progress towards meeting the goals of the Paris Climate Change Agreement.



3. Making a compelling case for change

International and domestic funders of climate action should support implementing agencies and governments to assess and communicate the health impacts of policies to reduce GHG emissions.

Health professionals and policy makers should clearly communicate the potential health and economic co-benefits of transitioning to net-zero across all sectors of society.



4. Better evidence for decision making

To enable faster and easier learning, researchers and research funders should support real-world, at scale intervention evaluations and the required measurement systems. Strengthening research capacity, particularly in collaboration with LMIC researchers and Indigenous communities, should also be a priority.

Researchers and research funders must focus efforts on addressing data gaps to inform policy and action. This includes, for example, research on the role of nature-based solutions (e.g. forest protection, agroforestry and green space in cities) in delivering equitable mitigation and adaptation benefits, while promoting health and wellbeing, and the health benefits from actions to mitigate short-lived climate pollutants such as methane and black carbon in different contexts.

Coalition on Climate Action for Health

A key recommendation of the report is the establishment of a new Coalition on Climate Action for Health to support the implementation and evaluation of climate solutions that benefit health and society. The Coalition will comprise cities, nations, non-governmental organisations, businesses and their representative bodies and funding agencies. Signatories will commit to rapid climate action, as well as to monitoring, evaluating and communicating the impacts of their actions to foster mutual learning.

The Pathfinder Initiative is now inviting organisations to support the formation of, and participate in, the Coalition to enhance ambition and accelerate the just transition to a healthy net-zero future.

Principles of the Coalition:

- The implementation of rapid reductions in GHG emissions consistent with the Paris Agreement targets through evidence-based actions that aim to improve health and health equity.
- The use of key principles from systems thinking and implementation science in the design and delivery of actions, including co-design of actions to optimise benefits to health and wellbeing, minimise harms and assessment of potential trade-offs.
- An ongoing assessment of the success or failure of actions through regular measurement and reporting on progress using robust evaluation methods, including following the Paris Rulebook for emissions and standard approaches to estimating changes in health-related exposures, determinants, and/or outcomes as well as the costs of action and wider social impacts (such as employment and poverty).
- The support of mutual learning by, for example, sharing lessons learnt, including barriers and facilitators of success, as well as resources such as training materials, courses, technical manuals, and decision support aids. Lessons learnt will be communicated to constituents and members and, where necessary, efforts will be made to combat misinformation.

Conclusions

The Pathfinder Initiative has identified a range of potential GHG mitigation 'win-win' actions in different sectors that benefit both the climate and health, particularly when implemented in ways that can improve equity and minimise trade-offs. The scope and scale of documented GHG mitigation actions with health co-benefits is, however, inadequate both to achieve the Paris Agreement target, to limit the temperature increase to 1.5°C above pre-industrial levels and failing that to well under 2°C, and to capitalise on the large potential benefits for health.

More evidence of effective implementation strategies is required, but we cannot wait for more evidence before acting. Evaluation of the effects of GHG mitigation actions on health, equity and GHG emissions must be undertaken in real time, using standardised approaches informed by guidelines so that outcomes are comparable across sectors and locations. This will be essential to combat disinformation and 'greenwashing', which impede progress and prevent objective assessment of the impacts of climate action.

Transformative approaches that aim to safeguard health while achieving net-zero GHG emissions must be developed, implemented at scale and evaluated through equitable collaboration and shared learning.

Time is short. But we still have the opportunity to change course, improve health and save lives.

Image credit:
ANGHI/Shutterstock.com



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