CLEAN AIR NOW

Rapid solutions to the AIR POLLUTION EMERGENCY

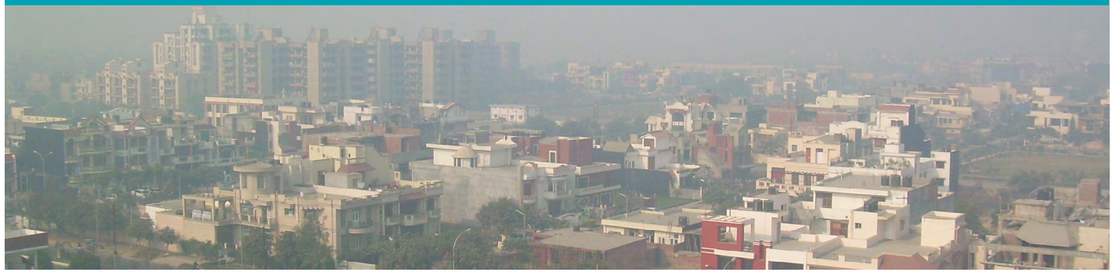
NCD Alliance

10 YEARS 2009-2019

Forum of International Respiratory Societies
United for Lung Health

Introduction

Air pollution is a grave risk that endangers the health of almost everyone in the world. It affects nearly every organ in the body, as well as our mental health and wellbeing. It is a leading risk factor for non-communicable diseases (NCDs) such as stroke, ischaemic heart diseases, lung cancer and chronic obstructive pulmonary disease (COPD). The World Health Organization (WHO) estimates that over seven million people die prematurely every year from exposure to polluted air. Most air pollution, and the associated health impacts and premature deaths, are preventable.



On 1 November 2019, a public health emergency was declared in Delhi, India, because of dangerous levels of air pollution. The local government announced plans to close schools temporarily and distribute millions of face masks to children, recognising that air pollution is not only harmful to children's health and wellbeing but also has a detrimental impact on learning outcomes. School closures on days with poor air quality are becoming increasingly common around the world, in countries including Thailand, Mexico, Malaysia and the US.[1] Hot-off-the-press research shows that days of higher air pollution in the United Kingdom trigger hundreds more heart attacks, strokes and acute asthma attacks each year, resulting in avoidable deaths and a profound 'health emergency'.[2]

Given that 90% of people in the world are exposed to levels of air pollution considered by WHO to be dangerous to health, air pollution should be tackled as a global public health emergency. This briefing explores the range of cost-effective response measures that are available and how quickly the benefits of each one are felt.

Reducing air pollution at its source has a rapid and substantial impact on individuals and public health. A focused review by the Forum of International Respiratory Societies (FIRS), on which this briefing is largely based, shows that within a just few weeks, respiratory and irritation symptoms, such as shortness of breath, cough, phlegm, and sore throat disappear. Furthermore, school absenteeism, clinic visits, hospitalisations, premature births, cardiovascular illness and death, and all-cause mortality decrease significantly.[3]

The widespread benefits across the population and short length of time for the benefits of the measures to be felt, as well as their cost-effectiveness and longer-term co-benefits for health through reducing the risks of climate change, further strengthen the case for urgently tackling air pollution at every level of governance. While cities and regions with the worst air quality have the greatest potential for health benefits, areas where air quality is relatively good by international standards can also achieve health improvements by implementing clean air measures.

[1] Source: https://www.economist.com/the-economist-explains/2019/11/02/how-air-pollution-can-ruin-schoolchildrens-lives

[2] Evangelopoulos D, Katsouyanni K, Walton H, Williams M. Personalising the Health Impacts of Air Pollution: Interim Statistics Summary for a Selection of Statements. Environmental Research Group King's College London, October 2019. http://www.erg.kcl.ac.uk/Research/docs/personalised-health-impacts.pdf

[3] Schraufnagel DE, Balmes JR, De Matteis S, Hoffman B, Kim WJ, Perez-Padilla R, Rice MB, Sood A, Vanker A, Wuebbles DJ. Health benefits of air pollution reduction. Ann Am Thorac Soc 2019;16:1478-87.

Context

Policymakers are often torn between tightening controls on emissions to enhance the welfare of the population, and continuing business-as-usual due to economic and other political pressures. This tension is particularly acute in developing countries. In these cases, economic development is seen as positively impacting health by reducing poverty, but this often comes at a cost of deteriorating air quality from increased burning of fossil fuels for energy and transport.[4] Around the world, policymakers may favour short-term commercial interests to long-term health benefits. Yet, the long-term health costs to the population almost always support the cost-effectiveness of reducing air pollution.

Evidence shows that local policies to reduce air pollution not only benefit air quality in cities, where more and more people live, but are also important for mitigating and adapting to global climate change.[5] Given the central role of fossil fuels in driving climate breakdown and the increasing recognition of manifold impacts of climate change on health, the case for action is ever-stronger.

[4] Haines A, Smith KR, Anderson D, Epstein PR, McMichael AJ, Roberts I, et al. Policies for accelerating access to clean energy, improving health, advancing development, and mitigating climate change. Lancet. 2007;370(9594):1264-81.

[5] Slovic AD, de Oliveira MA, Biehl J, Ribeiro H. How Can Urban Policies Improve Air Quality and Help Mitigate Global Climate Change: a Systematic Mapping Review. J Urban Health. 2016;93(1):73-95.

Interventions

Avoidance of polluted areas, building air filters, and the use of respirators (face masks) may have benefits, but halting or reducing air pollution at its source is by far the most important intervention.

Planned or unplanned interventions that reduce air pollution have had considerable health benefits:

Factory and steel mill closures

Factory closures have improved air quality and resulted in health benefits that are almost immediate. The 13-month closure of a large steel mill in **Utah Valley** in the **United States**, for instance, reduced heart and lung disease in the surrounding communities.[6] A follow-up study found that women who were pregnant during the mill closure (especially those in their second trimester) were less likely to have premature births compared to women who were pregnant before the closure or after the mill's reopening.[7]

A copper smelter strike in four southwestern **US states** lasting 8.5 months in 1967-1968 led to an approximately 60% decrease in concentrations of suspended sulphate particles. This was associated with an estimated 2.5% decrease in related deaths.[8]

Special pollution reduction measures in Olympic host cities

In the summer of 1996, the US city of **Atlanta** implemented a 17-day "alternative transportation strategy" that involved increased public transportation, teleworking options, and the closure of downtown Atlanta to automobile traffic. Peak morning traffic decreased by 23% and peak daily ozone levels decreased by 28%. In the next four weeks, there was a 42-44% reduction in children seeking medical care for asthma, an 11% fall in paediatric emergency department visits, and a 19% decrease in hospitalisations for asthma.[9]

For the 1980 **Beijing** Olympics, the Chinese government mandated factory emission reductions and travel restrictions from July to September, which resulted in reduced pollutant concentrations by up to 62%.[10] Within two months, improved lung function among healthy and asthmatic adults in Beijing was observed[11]. There were 58% fewer asthma-related physician visits[12]; reduced cardiovascular mortality, especially among women and the elderly[13]; and lower levels of systemic inflammation among healthy young adults.[14]

[6] Pope CA, 3rd. Respiratory disease associated with community air pollution and a steel mill, Utah Valley. Am J Public Health. 1989;79(5):623-8.

[7] Parker JD, Mendola P, Woodruff TJ. Preterm birth after the Utah Valley Steel Mill closure: a natural experiment. Epidemiology. 2008;19(6):820-3.

[8] Pope CA, 3rd, Rodermund DL, Gee MM. Mortality effects of a copper smelter strike and reduced ambient sulfate particulate matter air pollution. Environ Health Perspect. 2007;115(5):679-83.

[9] Friedman MS, Powell KE, Hutwagner L, Graham LM, Teague WG. Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma. JAMA. 2001;285(7):897-905.

[10] Li Y, Wang W, Kan H, Xu X, Chen B. Air quality and outpatient visits for asthma in adults during the 2008 Summer Olympic Games in Beijing. Sci Total Environ. 2010;408(5):1226-7.

[11] Mu L, Deng F, Tian L, Li Y, Swanson M, Ying J, et al. Peak expiratory flow, breath rate and blood pressure in adults with changes in particulate matter air pollution during the Beijing Olympics: a panel study. Environ Res. 2014;133:4-11.

[12] Li Y, Wang W, Kan H, Xu X, Chen B. Air quality and outpatient visits for asthma in adults during the 2008 Summer Olympic Games in Beijing. Sci Total Environ. 2010;408(5):1226-7.

[13] Su C, Hampel R, Franck U, Wiedensohler A, Cyrys J, Pan X, et al. Assessing responses of cardiovascular mortality to particulate matter air pollution for pre-, during- and post-2008 Olympics periods. Environ Res. 2015;142:112-22.

[14] Rich DQ, Kipen HM, Huang W, Wang G, Wang Y, Zhu P, et al. Association between changes in air pollution levels during the Beijing Olympics and biomarkers of inflammation and thrombosis in healthy young adults. JAMA. 2012;307(19):2068-78.

Replacing dirty diesel school buses

Children that are transported in older diesel buses are exposed to fine particulate matter ($PM_{2.5}$), black carbon, particle-bound polycyclic aromatic hydrocarbons, and nitrogen dioxide (NO_2). In the cities of **Tacoma** and **Seattle** in **Washington state** in the US, a study found that reducing pollution from diesel school buses decreased asthma and school absenteeism and improved lung function in the children.[15] Moving to electric buses would provide even cleaner public transportation and greater health benefits.

Cleaner cook stoves in homes

Every year poor air quality claims 3.8 million lives from indoor pollution in homes, largely caused by burning household fuel for cooking, heating and lighting purposes.[16] Studies in **Mexico** and **Guatemala** have shown that stoves which reduce or eliminate indoor air pollution improve respiratory and non-respiratory symptoms, such as eye discomfort and headaches; decrease respiratory infections; and improve lung function and lung growth.[17] Several trials have also demonstrated that cook stove interventions lead to a long-term reduction in blood pressure.[18,19] In **Nigeria**, cooking with an ethanol stove improved infant birth weight, gestational age at delivery, and perinatal mortality compared with open fire cooking.[20] Interventions to reduce household air pollution in both low- and high-income countries have benefits to human health.[21]

[15] Adar SD, D'Souza J, Sheppard L, Kaufman JD, Hallstrand TS, Davey ME, et al. Adopting Clean Fuels and Technologies on School Buses. Pollution and Health Impacts in Children. Am J Respir Crit Care Med. 2015;191(12):1413-21.

[16] WHO Webpage: Ambient air pollution: Health impacts (online). And WHO Factsheet: Household air pollution and health (online).

[17] Sood A, Assad NA, Barnes PJ, Churg A, Gordon SB, Harrod KS, et al. ERS/ATS workshop report on respiratory health effects of household air pollution. Eur Respir J. 2018;51(1)

[18] Alexander D, Northcross A, Wilson N, Dutta A, Pandya R, Ibigbami T, et al. Randomized Controlled Ethanol Cookstove Intervention and Blood Pressure in Pregnant Nigerian Women. Am J Respir Crit Care Med. 2017;195(12):1629-39.

[19] McCracken JP, Smith KR, Diaz A, Mittleman MA, Schwartz J. Chimney stove intervention to reduce long-term wood smoke exposure lowers blood pressure among Guatemalan women. Environ Health Perspect. 2007;115(7):996-1001.

[20] Alexander DA, Northcross A, Karrison T, Morhasson-Bello O, Wilson N, Atalabi OM, Dutta A, Adu D, Ibigbami T, Olamijulo J, Adepoju D, Ojengbede O, Olopade CO. Pregnancy outcomes and ethanol cook stove intervention: A randomized-controlled trial in Ibadan, Nigeria. *Environ Int* 2018; 111: 152-163.

[21] Sood A, Assad NA, Barnes PJ, Churg A, Gordon SB, Harrod KS, et al. ERS/ATS workshop report on respiratory health effects of household air pollution. Eur Respir J. 2018;51(1).

Benefits of national and supranational air quality interventions

National policies to reduce pollutant emissions have demonstrated significant success, whilst being cost-effective due to the population-wide benefits.

US Clean Air Act

The **US** Environmental Protection Agency (EPA) calculated that the monetised health benefits of the Clean Air Act exceeded the implementation costs by a factor of 32:1.[22] These benefits, valued at two trillion dollars in 2020, are primarily attributed to significant reductions in outdoor particulate matter (PM), leading to the prevention of an estimated 230,000 deaths per year caused by polluted air. Further benefits are also quantified as a result of lower ozone levels (7,100 deaths prevented per year), fewer heart attacks (200,000 fewer cases of acute myocardial infarction per year), 66,000 fewer hospital admissions per year for respiratory conditions, and a reduction in asthma attacks by 2.4 million per year.[23]

IN THE US

BENEFITS

valued at two trillion dollars in 2020

REDUCTIONS in outdoor particulate matter (PM)

PREVENTION

230,000 deaths per year caused by polluted air

Air quality regulations in Europe, nationally and EU-wide

National and **European Union** air quality regulations have also resulted in dramatic reductions of air pollution in Europe. In **Dublin**, for example, black smoke concentrations declined by up to 70% after a ban on coal sales in 1990. Subsequently, annual respiratory deaths decreased by 17%. In **Switzerland**, between 1990 and 2001, the health of adult small airways improved as a result of better air quality: For every 10,000 people in the community, there were 259 fewer people with regular cough, 179 fewer people with chronic cough or phlegm, and 137 fewer people with wheezing or shortness of breath.[24,25]

IN DUBLIN

Black smoke concentrations declined by up to 70%

after a ban on coal sales in 1990

Annual RESPIRATORY DEATHS decreased by 17%

[22] United States Environment Protection Agency. The benefits and costs of the Clean Air Act from 1990 to 2020: Summary report. Research Triangle Park, NC: United States Environment Protection Agency, 2011.

[23] Idem.

[24] Downs SH, Schindler C, Liu LJ, Keidel D, Bayer-Oglesby L, Brutsche MH, et al. Reduced exposure to PM10 and attenuated age-related decline in lung function. N Engl J Med. 2007;357(23):2338- 47.

[25] Schindler C, Keidel D, Gerbase MW, Zemp E, Bettschart R, Brandli O, et al. Improvements in PM10 exposure and reduced rates of respiratory symptoms in a cohort of Swiss adults (SAPALDIA). Am J Respir Crit Care Med. 2009;179(7):579-87.

Research from the National Institute for Public Health and the Environment in the Netherlands finds that European Union policies have considerably reduced concentrations of air pollutants since 1980. Without EU air quality policies, the study finds that the average life expectancy in the **Netherlands** would have been six years shorter.[26]

Counting the human cost of pollution peaks in England

Following the Great Smog of **London**, which lasted for five days in December 1952 and was largely attributed to the burning of low-grade coal in urban power stations and homes, several pieces of legislation were introduced, including the Clean Air Acts of 1956 and 1968. Official figures at the time recorded 4000 additional deaths during the five days of smog, but subsequent research places the death toll of the episode at around 12,000 people.[27] The Clean Air Act of 1956 banned the burning of polluting fuels in "smoke control areas" across the UK.

Thanks to EU regulation, **UK** air quality has continued to improve. However, many cities are still breaching the European air quality standards set by law. Emergency services in English cities are called out to significantly more life-threatening cases on peak pollution days. Across nine cities, research has shown that these peak pollution days result in over 120 additional cardiac arrests, more than 230 additional strokes, and nearly 200 more people with asthma requiring hospital treatment, compared with average pollution days.[28] This demonstrates an immediate relationship between heart attacks, strokes, respiratory illnesses, and dirty air[29] – as well as the better-known long-term health effects. It also illustrates that immediate action and interventions to improve air quality, tackle pollution, and reduce the number and intensity of peak pollution days will save lives, delivering immediate health benefits and reducing costs to health and emergency services.

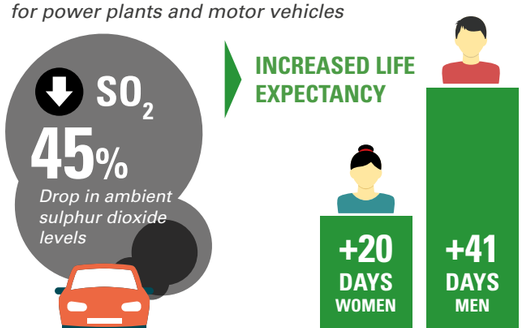
Air quality regulations in Asia, national and city level

Air quality regulations at the national and city level in some Asian countries have resulted in important public health gains. A 1990 restriction on the sulphur content of fuel oil used for power plants and motor vehicles in **Hong Kong** led to a 45% drop in ambient sulphur dioxide levels. This intervention also led to a reduction in the annual rate of total deaths caused by exposure to sulphur dioxide (2.1%), respiratory deaths (3.9%) and cardiovascular deaths (2.0%); and it increased life expectancy by 20 days for women and 41 days for men.[30]

The **Japanese** government passed legislation to limit transportation-related emissions in 2001. By 2009, the average fine particulate matter ($PM_{2.5}$) levels had decreased from 38 to 26 μg/m^3, and nitrogen dioxide had decreased from 30 to 21 ppb. This improvement in air quality was linked to a 0.6% and 1.1% lower prevalence of paediatric asthma caused by fine particulate matter and nitrogen dioxide, respectively.[31]

IN HONG KONG

1990 restriction on the sulphur content of fuel oil used for power plants and motor vehicles



[26] Source: https://www.rivm.nl/node/148421 and full article: https://www.sciencedirect.com/science/article/abs/pii/S1352231019307484?via%3Dihub (11 Nov 2019).

[27] Bell, M. L, Davis, D.l., and Fletcher, T. A retrospective assessment of mortality from the London smog episode of 1952: the role of influenza and pollution. Environ Health Perspect. 2004 Jan; 112(1): 6–8.

[28] Evangelopoulos D, Katsouyanni K, Walton H, Williams M. Personalising the Health Impacts of Air Pollution: Interim Statistics Summary for a Selection of Statements. Environmental Research Group King's College London, October 2019. http://www.erg.kcl.ac.uk/Research/docs/personalised-health-impacts.pdf

[29] Source: https://www.theguardian.com/environment/2019/oct/21/scores-more-heart-attacks-and-strokes-on-high-pollution-days-figures-show

[30] Hedley AJ, Wong CM, Thach TQ, Ma S, Lam TH, Anderson HR. Cardiorespiratory and all-cause mortality after restrictions on sulphur content of fuel in Hong Kong: an intervention study. Lancet. 2002;360(9346):1646-52.

[31] Hasunuma H, Ishimaru Y, Yoda Y, Shima M. Decline of ambient air pollution levels due to measures to control automobile emissions and effects on the prevalence of respiratory and allergic disorders among children in Japan. Environ Res. 2014;131:111-8.

Emergency measures in Delhi, India, 2019

Pictures from **Delhi**, India in autumn of 2019 make the horror of air pollution visible. The national government of India and several of its cities had previously put into place a broad range of policies to halt pollution and expand green space.[32] The interventions included developing and monitoring air pollution standards, emissions testing, travel restrictions, increased taxes on and removal of subsidies from polluting sources, increased use of clean energy, and the restriction of burning biomass fuels.[33,34] However, it is clear that the measures were insufficient or not adequately enforced, as Delhi declared an unprecedented 'air pollution emergency' on 1 November 2019. Since then, further emergency measures have been introduced, including halting construction works, traffic restrictions, a temporary ban on fireworks, school closures, and the distribution of face masks.[35] But local campaigners fear that the temporary measures will not sustainably tackle the main sources of pollution, including crop stubble burning, which is estimated to account for half of Delhi's air pollution, along with transport and factory emissions.[36]

[32] Imam AU, Banerjee UK. Urbanisation and greening of Indian cities: Problems, practices, and policies. Ambio. 2016;45(4):442-57.

[33] Murukutla N, Negi NS, Puri P, Mullin S, Onyon L. Online media coverage of air pollution risks and current policies in India: A content analysis. WHO South East Asia J Public Health. 2017;6(2):41- 50.

[34] Chatterjee P. India takes steps to curb air pollution. Bull World Health Organ. 2016;94:487-8.

[35] https://www.bbc.com/news/world-asia-india-50258947

[36] https://www.bbc.com/news/world-asia-india-50280390

Non-implementation of clean air policies in Africa

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Similar problems of population growth, urbanisation, and industrialisation make air pollution a major challenge in **Africa** as well. Many national and local programmes are in place to reduce indoor air pollution.[37] However, national air pollution policies in many regions have not been implemented, and this has been blamed on a lack of data and information on air quality.[38] There is increasing recognition of the need to implement and evaluate the impact of such policies, particularly through partnerships with other global agencies including the United Nations Environment Program.[39]

[37] Thomas E, Wickramasinghe K, Mendis S, Roberts N, Foster C. Improved stove interventions to reduce household air pollution in low and middle income countries: a descriptive systematic review. BMC Public Health. 2015;15:650.

[38] Atani M 1970;Pages. Accessed at United Nations Environment Programme at https://www.unenvironment.org/news-and-stories/story/air-pollution-africas-invisible-silent- killer-1.

[39] Manual TA;Pages. Accessed at Department of the Presidency, Republic of South Africa at https://www.gov.za/sites/default/files/gcis_document/201409/ndp-2030-our-future-make-it- workr.pdf.

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Global

Climate Change Reduction Strategies as win-wins for clean air and health

Many studies have shown that the changes occurring in the Earth's climate contribute to poor air quality and further exacerbate health risks.[40,41] Warmer temperatures[42], including more extremely warm days[43]; and changing weather patterns, including increased stagnation[44], altered frequency of weather fronts[45], more frequent heavy rain events[46], and changing emissions from vegetation and human sources[47]; will affect future levels of ozone and particulate matter, which are air pollutants that especially impact human health.[48] Curbing climate change is also essential to prevent air pollution-related deaths. Even in countries with relatively low average air pollution concentrations, populations in hot spots, such as highly urbanised areas with a high traffic load, can benefit profoundly from carbon-neutral mobility through its co-benefits of reducing air pollutants.[49]

Read more about the link between climate, air pollution and health in the Lancet Climate and Health Countdown*

*https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32596-6/fulltext

[40] Lin JT, Patten KO, Hayhoe K, Liang XZ, Wuebbles DJ. Effects of future climate and biogenic emissions changes on surface ozone over the United States and China. Journal of Applied Meteorology and Climatology. 2008;47(7):1888-909.

[41] Jacob DJ, Winner DA. Effect of climate change on air quality. Atmospheric Environment. 2009;43(1):51-63.

[42] United States Global Change Research Program (USGCRP). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment. In: Program USGCR, ed. Washington, DC: U.S. Global Change Research Program; 2018:1515pp.

[43] Zobel Z, Wang JL, Wuebbles DJ, Kotamarthi VR. High-Resolution Dynamical Downscaling Ensemble Projections of Future Extreme Temperature Distributions for the United States. Earths Future. 2017;5(12):1234-51.

[44] Horton DE, Skinner CB, Singh D, Diffenbaugh NS. Occurrence and persistence of future atmospheric stagnation events. Nat Clim Chang. 2014;4:698-703.

[45] Turner AJ, Fiore AM, Horowitz LW, Bauer M. Summertime cyclones over the Great Lakes Storm Track from 1860-2100: variability, trends, and association with ozone pollution. Atmospheric Chemistry and Physics. 2013;13(2):565-78.

[46] Zobel Z, Wang JL, Wuebbles DJ, Kotamarthi VR. Analyses for High-Resolution Projections Through the End of the 21st Century for Precipitation Extremes Over the United States. Earths Future. 2018;6(10):1471-90.

[47] Lam YF, Fu JS, Wu S, Mickley LJ. Impacts of future climate change and effects of biogenic emissions on surface ozone and particulate matter concentrations in the United States. Atmospheric Chemistry and Physics. 2011;11(10):4789-806.

[48] G. B. D. Risk Factors Collaborators. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990- 2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017;390(10100):1345-422.

[49] United States Global Change Research Program (USGCRP). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment. In: Program USGCR, ed. Washington, DC: U.S. Global Change Research Program; 2018:1515pp.

Conclusion

7 million people die prematurely every year around the world due to air pollution. This is a public health emergency of today. Solutions cannot wait. This briefing illustrates that actions taken around the world can bring various quick wins for health. Local, national and regional air pollution policies not only benefit air quality in cities, but also have important and immediate health co-benefits and are important for mitigating global climate change in the longer-term. Governments and UN agencies, including WHO, can use this evidence to identify cost-effective policy interventions to ensure safe, clean air for all. The assessment of clean air measures should consider the co-benefits across all of the Sustainable Development Goals, including for health systems and public budgets, economic development and productivity, equity and gender equality, urban mobility, and climate. Local and national leaders should not hesitate to adopt and implement packages of measures to tackle all causes of air pollution at-source, thus bringing immediate health benefits to their citizens.

Calls to Action

Research shows that commitment or investment can quickly pay for itself, and many times over, in terms of prevented NCDs, reduced health costs and economic burden, and will bring with it a suite of co-benefits for sustainable development. WHO recommendations should provide guidance to all levels of government, from national to local, to meet the WHO guideline levels for safe, healthy air quality[50], and must address the major sources of air pollution in different contexts and resource settings:

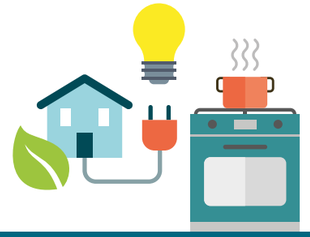
ADOPT AND STRICTLY ENFORCE EMISSION STANDARDS FOR ALL POLLUTANTS in all relevant sectors, including industry, energy, transport, waste and agriculture.

INCLUDE AIR QUALITY MEASURES in urban, rural and transport planning at city, regional and national level, including measures to encourage modal shift and active mobility, noting the additional benefits to health and wellbeing, the curbing of climate change, and the reduction of health inequalities.

RAPIDLY PHASE OUT HEALTH-HARMFUL SUBSIDIES for fossil fuels and polluting industries and introduce penalties for polluters and/or taxes on pollution.

REDIRECT INVESTMENT TO HEALTH-PROMOTING, accessible alternatives including clean transport and renewable energy, and towards the provision of universal health coverage.

IMPROVE HOUSING CONDITIONS and ensure access to clean energy sources for indoor cooking, heating and lighting.



[50] Source: http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf?ua=1

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