

A low-angle, close-up photograph of a woman with dark hair tied back, wearing a red long-sleeved shirt. She is holding a metal hose connected to a public water tap, filling a dark container. Water is flowing from the tap. The background is a bright, clear blue sky with some green foliage visible on the right. A teal vertical bar is on the far right edge of the image.

**A global health  
guardian: climate  
change, air pollution and  
antimicrobial resistance**

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**G**lobal defences against universal transboundary threats to health, like climate change, air pollution and antimicrobial resistance, depend on WHO's role as a guardian of public health. This role involves tracking rapidly evolving threats, quantifying the harm to health, and sounding the alarm. WHO also works to raise political awareness and extend advice on the best protective strategies for safeguarding public health. In these – as in many other areas – protective strategies require collaboration with multiple non-health sectors.

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## Climate change: a climate treaty is also a health treaty

Climate change is the defining issue for the 21<sup>st</sup> century. Climate variables affect the air people breathe, the water they drink, the food they eat, and even where they are able to live. Extreme weather events are becoming the norm and records are constantly being broken, with the past three years ranking as the hottest since records began.

For infectious diseases, climate change is a threat multiplier. It takes existing threats – whether from a cholera outbreak, the spread of Zika to new geographical areas, or the severe malnutrition that accompanies drought – and enhances them. The risks are familiar but their impact is amplified in frequency and severity. A changing climate can expand the distribution of infectious diseases, especially those transmitted by mosquitoes and other vectors, and invite the emergence of others. The emergence of Nipah virus and Hanta virus as human pathogens has been traced to extreme weather events that forced animal hosts to leave their ecological niches and invade human settlements.

In the historic 2015 Paris Agreement on Climate Change, countries made important commitments to cut greenhouse gas emissions and scale up adaptation to climate change. But more needs to be done. As many have noted, **the world is recklessly late in agreeing to take action.**



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The stakes are high. WHO estimates that climate change is already causing tens of thousands of deaths every year. These deaths arise from more frequent epidemics of diseases like cholera, the vastly expanded geographical distribution of diseases like dengue, and deaths that follow extreme weather events, like heatwaves and floods.

Experts predict that, by 2030, climate change will be causing an additional 250 000 deaths each year from malaria, diarrhoeal disease, heat stress and undernutrition alone. The heaviest burden will fall on children, women and the poor, widening already unacceptable gaps in health outcomes.

The health sector has critical evidence, and persuasive arguments, to compel actions that can limit the adverse consequences of climate change. The Paris agreement is not just a treaty for saving the planet from severe, pervasive, and irreversible damage. It is also a significant public health treaty, with a huge potential to save lives worldwide.

If commitments are supported by actions on a sufficient scale, efforts to combat climate change will produce an environment with cleaner air, more abundant and safer freshwater and food, and healthier populations. Existing strategies that work well to combat climate change also bring important health gains. Investments in low-carbon development, clean renewable energy, and greater climate resilience are investments in better health.

Implementing and enforcing higher standards for vehicle emissions and engine efficiency can reduce emissions of short-lived climate pollutants, like black carbon and methane. Doing so could save around 2.4 million lives a year by 2030 and reduce global warming by about half a degree Celsius by 2050. Researchers have estimated that reform of global energy subsidies could reduce carbon dioxide emissions by more than 20%, cut premature air pollution deaths by more than half, and raise government revenues by nearly \$3 trillion. Measures such as early-warning systems for heatwaves and the protection of water, sanitation, and hygiene services against floods and droughts strengthen the resilience of health systems to withstand the shocks of climate change. Doing so safeguards recent progress against climate-sensitive diseases.

In 2015, WHO, in collaboration with the secretariat of the UN Framework Convention on Climate Change and other partners, launched the first set of climate change and health country profiles. The aim is to empower ministers of health and other decision-makers to include health in climate negotiations. Profiles provide a snapshot of up-to-date information about current and future impacts of climate change on human health, and current policy responses in individual countries. They also illustrate, within the country context, the health benefits that arise from actions to mitigate climate change, like shifting to cleaner energy sources, using public transport, and promoting walking and cycling.

Minimizing adverse effects on public health has been part of the Framework Convention on Climate Change's objectives since the first agreement in 1992. However, further efforts are needed to fully exploit the opportunity to protect the planet's most valuable resource, its people. A ruined planet cannot sustain human lives in good health

## **Air pollution: the most deadly form of environmental degradation**

WHO estimates that outdoor and indoor air pollution kill 6.5 million people yearly, making polluted air the most deadly consequence of environmental degradation. Air pollution is one of the most pernicious threats to health because it is so pervasive. No one can escape it. Everyone has to breathe. When breathing becomes deadly, entire cities become a hazard to health.

Though cities are a principal concern, air pollution easily travels hundreds of kilometres beyond cities to endanger health in surrounding areas. Parts of densely-populated Asia are nearly completely shrouded year-round by a lingering haze of polluted air.

A common misperception is that health damage comes from the kind of heavy pollution that people can see and feel, stinging their eyes or making them cough. However, the biggest risk to health is not during episodes of peak, acute pollution, when governments may advise people, including schoolchildren, to stay home or recommend that people avoid exercising outdoors. What causes the greatest health damage is long-term exposure to pollutants in the air that exceed the safe limits established by WHO. Again, people cannot escape dangerously polluted air, but they cannot always see it either.

Abundant evidence shows that exposure to air pollution, either indoors or outdoors, is a significant cause of respiratory disease, including lung cancer. Air pollution, with its multiple toxic compounds, penetrates deep into the lungs, but it also penetrates the bloodstream, causing inflammation and a gradual narrowing of the arteries, similar to the well-known damage caused by tobacco smoke. WHO estimates that more than one-third of all deaths from stroke, lung cancer, and chronic lung disease are associated with exposure to air pollution.

In the developing world, exposure to indoor air pollution, linked to the use of cheap and dirty fuels for cooking, heating and lighting, is the principal cause of chronic lung disease in women and of pneumonia in young children. This form of exposure contributes to nearly 4.3 million deaths each year. Poverty is the root cause. Less well known is damage to the heart caused by exposure to air pollution. Recent evidence shows how air pollution narrows the blood vessels, contributing to a quarter of fatal heart attacks. The rise in global asthma prevalence, recorded over the past decade, has been linked to increasingly widespread air pollution.

When asked what causes outdoor air pollution, most people will cite the burning of fossil fuels, too many cars, diesel trucks spewing foul exhaust, or the continuing use of coal-fired energy plants. However, the actual causes vary considerably around the world. In parts of the developing world, a principal cause of outdoor air pollution is the burning of wastes and garbage. Agricultural practices, like slash-and-burn tactics, are another major source. This is why the first step for prevention is to identify the sources and then tackle them in a focused way. WHO's country- and city-specific monitoring data reveal the worst hot spots. As global data show, **only one person in ten lives in a city that complies with WHO's safe limits for air quality.**

In response to these challenges, WHO and its partners have launched a Breathe-life campaign which alerts the public to what is regarded as a largely invisible killer. Apart from educating

the public, the campaign encourages the sharing of data and solutions between cities, better monitoring of pollution levels, and better communications when the situation becomes dangerous. In many countries, the media play a major role in alerting the public when air pollution levels surpass WHO's acceptable limits. Such alerts, in turn, can put pressure on governments to take corrective action.

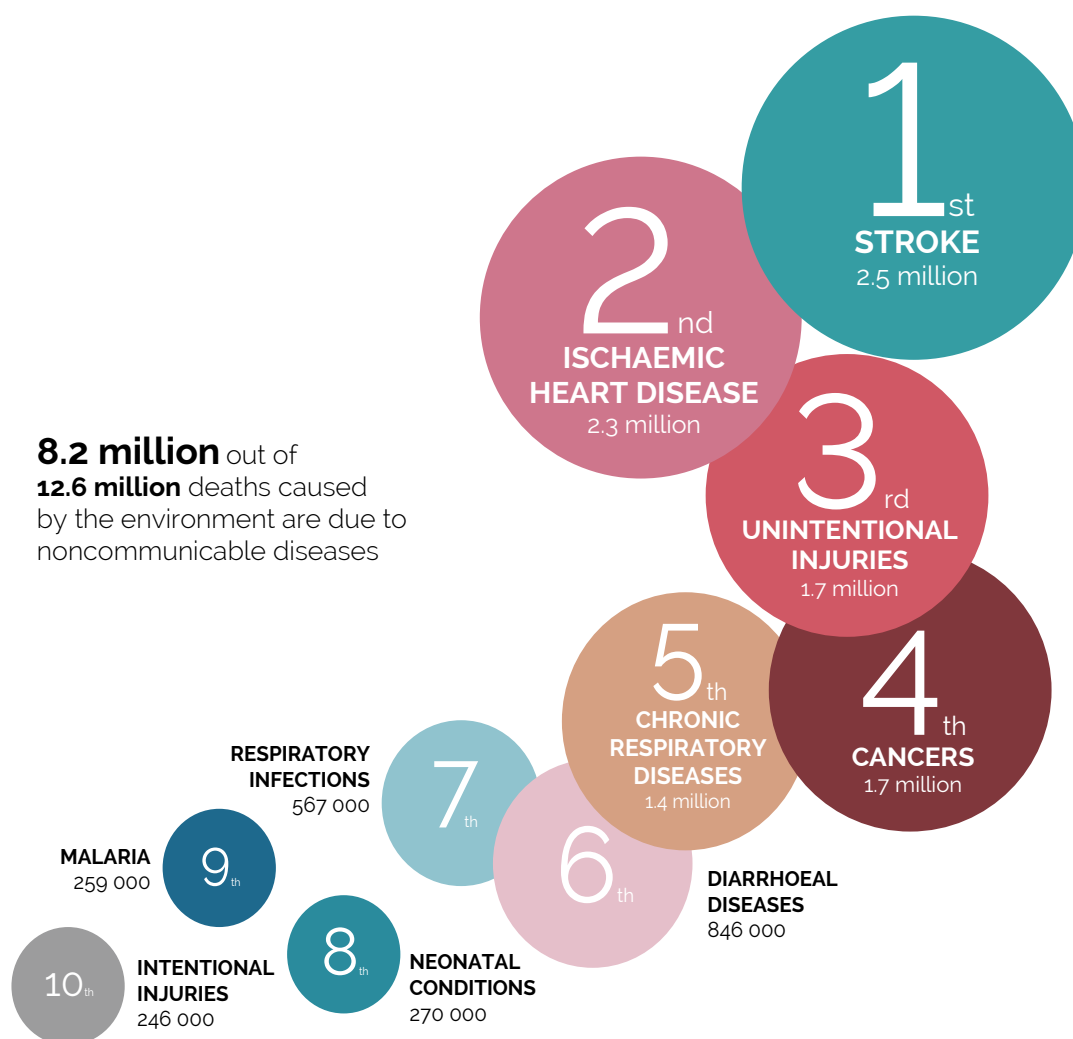
One of the strongest economic incentives to clean up the air comes when foreign investment firms decide to leave a country because they do not want their employees, and especially their children, to be exposed to harmful air pollution. Threatened departures of investment firms generally get the government's attention and can compel corrective action.

The best solutions, like a shift to cleaner energy and re-engineering cities to encourage walking and cycling and to promote the use of public transportation, take time and cost money. Some more immediate solutions include passing legislation that prohibits the use of slash-and-burn tactics in agriculture and stops the open incineration of wastes. Other strategies for mitigating urban air pollution include energy-efficient buildings, good waste management, and strong emission controls on industrial smokestacks. Several cities, especially in Latin America, have cut air pollution by improving systems for public transport, adding green spaces, and creating paths that invite walking and cycling.

Combining short-term and long-term measures is a good way to move forward. For example, China, a country that still depends heavily on coal as an energy source, is investing billions of dollars in converting the entire country to the use of cleaner energy sources. A more immediate measure is to move coal-fired energy plants from cities into less densely-populated areas.

Children are especially vulnerable to the harm caused by air pollution. Damage from exposure to air pollution starts in the womb. Children born to exposed mothers show lower birth weights and are especially vulnerable to pneumonia. In 2017, WHO released a report documenting the disproportionate impact that environmental factors, including air pollution, have on children. The report identifies respiratory diseases, including pneumonia, as the biggest single cause of childhood deaths. Respiratory diseases in children are strongly linked to exposure to both outdoor and indoor air pollution.

## Top 10 causes of death from the environment



Source: WHO

## Antimicrobial resistance: now a political priority

Antimicrobial resistance is one of the most complex global health challenges, threatening to reverse the substantial progress against infectious diseases made since the golden era of antibiotic discovery during the second half of the previous century. These "miracles of modern medicine", and their tremendous gains for health, have long been taken for granted. The world largely ignored repeated WHO warnings that some antibiotics are losing effectiveness after

decades of overuse and underuse in human medicine and food production. As WHO reports show, antimicrobial resistance is on the rise in every region of the world.

**With few replacement products in the pipeline, the world is moving towards a post-antibiotic era in which common infectious will once again kill.** If current trends continue, sophisticated interventions, like organ transplantation, joint replacements, cancer chemotherapy, and care of pre-term infants, will become more difficult or even too dangerous to undertake.

Already, the emergence and spread of drug resistance has made common illnesses, like bacterial pneumonia, post-operative infections, certain cancers, and the world's biggest infectious killers, namely HIV, tuberculosis, and malaria, increasingly difficult and costly to treat. The tuberculosis experience, in particular, shows how easily drug-resistant strains can pass directly from one person to another and how well they can travel internationally. Second- and third-choice antibiotics are more costly, more toxic, need longer durations of treatment, and may require administration in intensive care units.

Superbugs haunt hospitals and intensive care units all around the world. Gonorrhoea is now resistant to multiple classes of drugs. An epidemic of multidrug-resistant typhoid fever has been rolling across parts of Africa and Asia. Worsening antimicrobial resistance could have serious public health, economic, and social consequences around the world. **The World Bank has warned that antimicrobial resistance could cause as much damage to the economy as the 2008 financial crisis.**

Antimicrobial resistance can be tackled only through a concerted global effort, led by heads of state and global institutions, and through coordinated action by the health and agricultural sectors, in partnership with the food industry, campaign groups, and community organizations. Incentives need to be found to encourage the development of replacement products. The pharmaceutical industry is reluctant to invest in costly antibacterial discovery. The return on investment is poor, as antibiotics are taken for a short time, cure their target disease, and can fail – especially when misused – after a brief market life.

Consumers have to stop demanding antibiotics when they have a viral infection, like a cold or influenza. Doctors have to stop prescribing them inappropriately. The medical profession needs better diagnostic tests, so that antibiotics are prescribed only on the basis of a firm diagnosis. More vaccines are needed to prevent infections in the first place.

The food industry needs to reduce its massive use of antibiotics, at sub-therapeutic doses, as growth promoters. Specific antibiotics, listed by WHO as critically important for human medicine, should not be used in animal husbandry or agriculture. Consumers should make antibiotic-free meat their preferred choice. Governments need closely aligned policies on the responsible use of medicines in human and animal health, and new standards for antibiotic use in food production. All of these actions are urgently needed.

Political awareness of the need for urgent action is now high. The 2015 World Health Assembly adopted a global action plan which sets out a series of strategic objectives. The action plan, developed in close collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE), recognizes that a crisis of this magnitude requires an effective One Health approach involving coordination among many



sectors at national and international levels. In 2016, the UN General Assembly held its first high-level meeting on antimicrobial resistance and adopted a far-reaching political declaration. The issue has also been on the agendas of recent G7 and G20 summits.

More than 100 countries have completed, or are about to complete, their national multisectoral action plans. WHO has established a global antimicrobial resistance surveillance system to track which drug-resistant pathogens are posing the greatest challenge. In May 2016, the Drugs for Neglected Diseases initiative and WHO launched a global research and development partnership to develop new antibiotics and promote their responsible use.

In August 2016, WHO updated its guidelines for the prevention and treatment of three common sexually transmitted infections – chlamydia, gonorrhoea, and syphilis. Based on a review and analysis of national guidelines and prescribing practices for 20 common syndromes, WHO is revising the antibiotics included in the WHO model list of essential medicines. The Organization has also rolled out a global awareness-raising campaign targeting policy-makers, health and agriculture workers, and consumers.

For HIV, the drug regimens recommended by WHO carry high barriers to the development of drug resistance. However, with 18 million people currently receiving antiretroviral therapy, the emergence of more widespread levels of drug resistance is expected to occur. In July 2017, WHO will launch the first Global Action Plan on HIV Drug Resistance. The plan sets out guidance that can help countries prevent and, if necessary, manage the emergence of HIV drug resistance, a risk that could threaten the remarkable gains made over the past 15 years. The malaria situation is already precarious, as parasites are developing resistance to artemisinin-combination therapies and mosquitoes are showing resistance to the most commonly used insecticides. However, the biggest current threat comes from resistant strains of tuberculosis. WHO estimates that nearly half a million cases of multi-drug resistant tuberculosis occur each year. Extensively drug-resistant TB has now been reported by more than 100 countries.

To scale up activities, governments can build on existing regulatory frameworks, surveillance systems, laboratory and infection control infrastructure, and human resources that are already in place to manage drug resistance in medicines for HIV, tuberculosis, and malaria. Diagnostic tools, logistics, and technologies for sharing data can be used to link programmes at the country level. Most supranational tuberculosis reference laboratories have already confirmed they could expand susceptibility testing for other pathogens, should funding be made available.

An ad-hoc interagency coordination group is being established by the UN Secretary-General in consultation with WHO, FAO and OIE. In 2017, **WHO issued a list of the 12 most important antibiotic-resistant bacteria, in addition to *Mycobacterium tuberculosis*, requiring urgent R&D.**

WHO is preparing proposals for a global development and stewardship framework to support the development, control, distribution, and appropriate use of new antimicrobial medicines, diagnostic tools, vaccines, and other interventions. In another welcome trend, several large fast-food chains have announced plans to source their meat, especially poultry, from farms that do not use antibiotics critically important in human medicine as growth promoters in animals. Such changes are a welcome consequence of the high level of political concern that crystallized during the 2016 UN meeting on antimicrobial resistance.



**This report is available on WHO's website**  
[www.who.int/publications/10-year-review/en/](http://www.who.int/publications/10-year-review/en/)