

Healthy people, healthy planet

The role of health systems
in promoting healthier lifestyles
and a greener future







As the G7 economies continue their recovery from the Great Recession, the stress on their environmental resources is likely to grow, unless appropriate policy measures are taken. Air pollution, an important source of environmental stress, affects health outcomes directly, for example as a risk factor for respiratory and cardiovascular conditions, or indirectly, such as through the impacts on climate change and higher probability of extreme weather events. Many sources contribute to environmental pollution, including the overconsumption of food, unhealthy diets and food waste, unsustainable city growth, as well as overreliance on private motorised vehicles as a means of transportation. Each of these factors can also have a direct negative effect on various dimensions of health. Indeed, as was emphasised in the recent declaration of the Sixth Ministerial Conference on Environment and Health that was held in Ostrava, Czech Republic, there are complex links between development, population health and the environment, and helping promote a healthier environment can also bring a number of population health-related benefits.

This document, produced to inform the 2017 meeting of the G7 Ministers of Health, provides a broad overview of the main policy issues and some of the policy actions that G7 Health authorities can put in place to improve population health, while at the same time decreasing the human footprint on the environment. In particular, this document discusses three areas in which health systems can provide a substantial contribution, namely: i) promoting a healthier diet for a greener environment; ii) contributing to the development of sustainable cities; and iii) supporting active travel policies. This list is in no way exhaustive; these policies were selected on the basis of the link between the most prevalent environmental hazards and health, as well as based on the potential role that health systems can play in addressing these hazards. More broadly, health care systems could also upscale their efforts to promote a Health in all Policies approach and make the case for including health considerations in policy-making across different sectors that influence health (WHO, 2014).

Policy recommendations

- Support the development and implementation of nutritional guidelines promoting healthier food consumption – as this can lead to less stress on the environmental resources used in food production – as well as reduce the environmental footprint in hospitals and in nursing homes by encouraging healthier food consumption, waste reduction and cleaner energy generation;
- Create partnerships with various national and local stakeholders, including local city authorities and ministries of industry, environment, transport, and agriculture, in order to incorporate health and environmental considerations into urban planning schemes;
- Implement public health actions encouraging more physical activity and greater reliance on active modes of transportation, such as through physical activity-promoting mass media campaigns, bike sharing schemes and creating low-emission zones.



Air pollution and climate change are growing public health problems

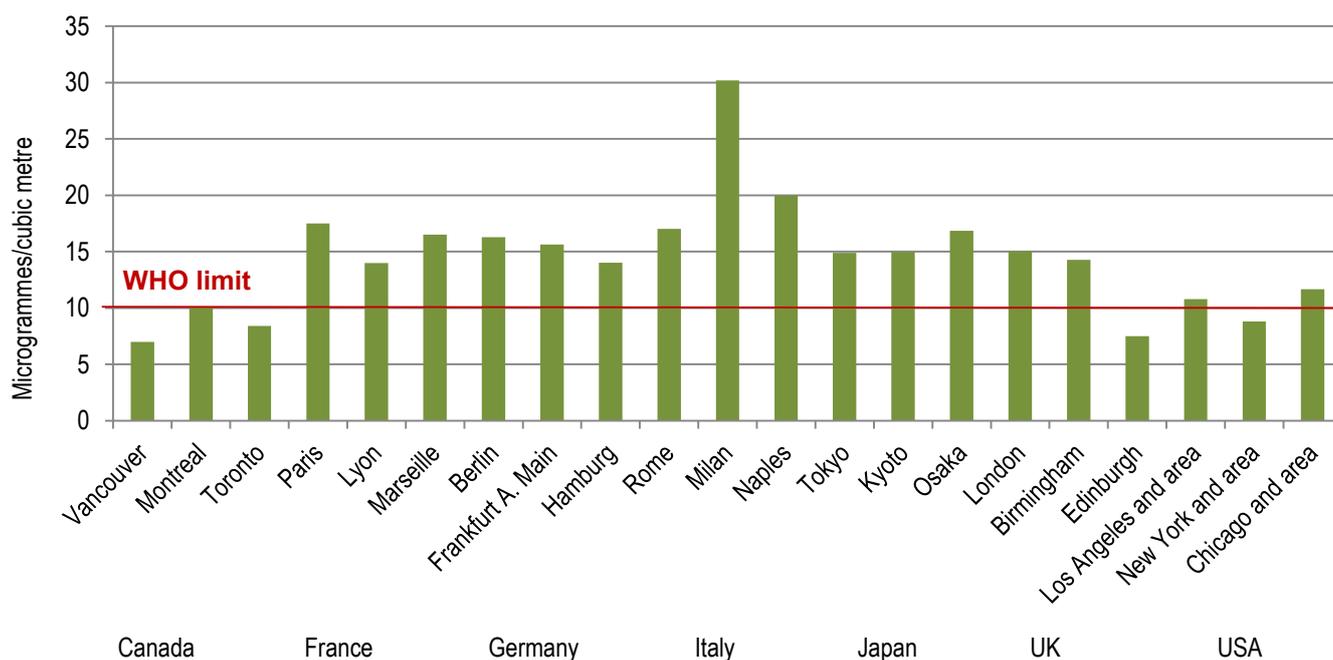
Tackling air pollution is a key priority, particularly in cities

Growing economic activity, food production and energy demand are leading to a significant rise in global emissions of air pollutants. The OECD has calculated that for most air pollutants, emissions are projected to increase strongly in the coming decades (OECD, 2016a). For instance, emissions of nitrogen oxides and ammonia are expected to grow by 82% and 56% respectively by 2060 (OECD, 2016a). Cities are a particularly important contributor to air pollution (Figure 1), as they already consume approximately three quarters of the world's primary energy and emit up to 60% of the world's total greenhouse gases (UN Habitat, 2017). Cities are also expected to greatly affect air pollution in the future. By 2050, 66% of the world's population is predicted to live in urban areas, compared to 54% today (United Nations, 2014). Major sources of urban air pollution include pollutants emitted from residential, retail and industrial buildings. Private vehicles (cars and motorcycles), however, are the main contributors of CO₂ emissions in cities, representing about 80% of all urban emissions worldwide in 2015 (ITF, 2017). Yearly CO₂ emissions by private vehicles are also expected to increase by an additional 17% by 2050 (ITF, 2017). Nitrogen oxide emissions, which contribute to secondary particulate matter (WHO, 2003), are also a persistent problem in cities. Nitrogen dioxide (NO₂) is predominantly emitted by vehicles (62% of NO₂ in Paris, France), which is why reducing motor vehicle emissions in densely populated areas could make the greatest impact on NO₂ exposure, which has larger health effects than those of CO₂ emissions (OECD, 2017a).

What is air pollution?

Air pollution is defined as the contamination of the environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. Air pollution can be either outdoor (ambient), or indoor. Outdoor pollutants of major public health concern include ozone, ammonia, nitrogen dioxide, sulphur dioxide and, especially, particulate matter (PM). Particulate matter is a mixture of very small particles and liquid droplets which are released into the air. PM₁₀ are particulates 10 micrometres or less in diameter, while PM_{2.5} are particulates 2.5 micrometres or less in diameter.

Figure 1. In many G7 cities, exposure of PM_{2.5} is above the WHO limit



Note: PM_{2.5} represents particulate matter with a diameter of less than 2.5 micrometres.

Source: OECD analysis based on the WHO Ambient Air Pollution database.

Climate change, with increasing temperatures and extreme weather events, is a public health threat

Rising temperatures associated with climate change not only cause heat exhaustion and heat strokes, but also cardiovascular diseases such as stroke and dysrhythmia, acute kidney injury (and eventually chronic kidney disease), and aggravated allergies (Hahn et al., 2016; Heung et al., 2016; PublicHealth, 2017). During the 2003 heat wave that swept across Europe, an excess 70,000 deaths were recorded (Robine et al., 2008). Similarly, extreme weather events, for instance tropical storms, hurricanes and floods, have public health implications, such as foodborne and waterborne diseases, food insecurity, drownings, mental health impacts and destruction of medical facilities (PublicHealth, 2017; WHO, 2017a). Throughout the 21st century, climate change is expected to increase the frequency and intensity of both droughts and extreme precipitation at a regional and global scale (IPCC, 2014a). It is estimated that weather-related disasters could affect two-thirds of Europeans annually by the year 2100 and cause around 150,000 extra deaths per year, while disproportionately affecting southern Europe (Forzieri et al., 2017). Extreme temperatures are expected to rise in the United States, which will contribute to an additional 13,000 deaths in 2100 (EPA, 2015). Some groups are more vulnerable to the health impacts from climate change. For instance, infants, children, pregnant women, elderly persons, people with chronic medical conditions, persons of low socioeconomic status and outdoor workers are more vulnerable to heat stress (WHO/PAHO, 2012).

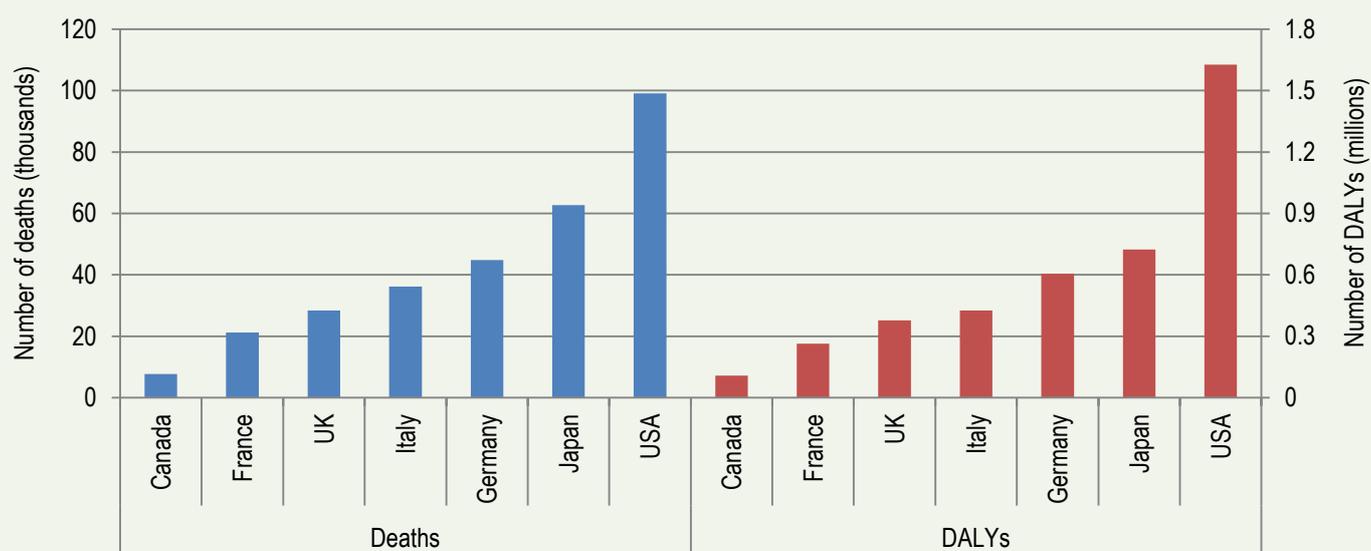
Nearly 300,000 deaths in G7 countries were attributable to air pollution in 2015

Air pollution, and PM_{2.5} in particular, is recognised as a cause of cardiovascular diseases such as ischaemic heart disease and stroke, as well as cancer, respiratory infections and chronic obstructive pulmonary disease (COPD).

- Within G7 countries, just under 300,000 deaths in 2015 were estimated to be attributable to air pollution (Figure 2).
- The majority of these deaths were caused by ischaemic heart disease (43%) and COPD (19%) (Figure 3).
- If no effective action is put in place, the OECD has calculated that the number of premature deaths due to outdoor air pollution in G7 countries will increase by about 21% between 2010 and 2060 (OECD, 2016a).

Air pollution affects the quality of life of an even greater number of people. The number of years of healthy life lost attributable to air pollution in G7 countries were estimated to amount to a total of 4 million disability adjusted life years (DALYs) (Figure 2).

Figure 2. Burden of disease attributable to air pollution in 2015



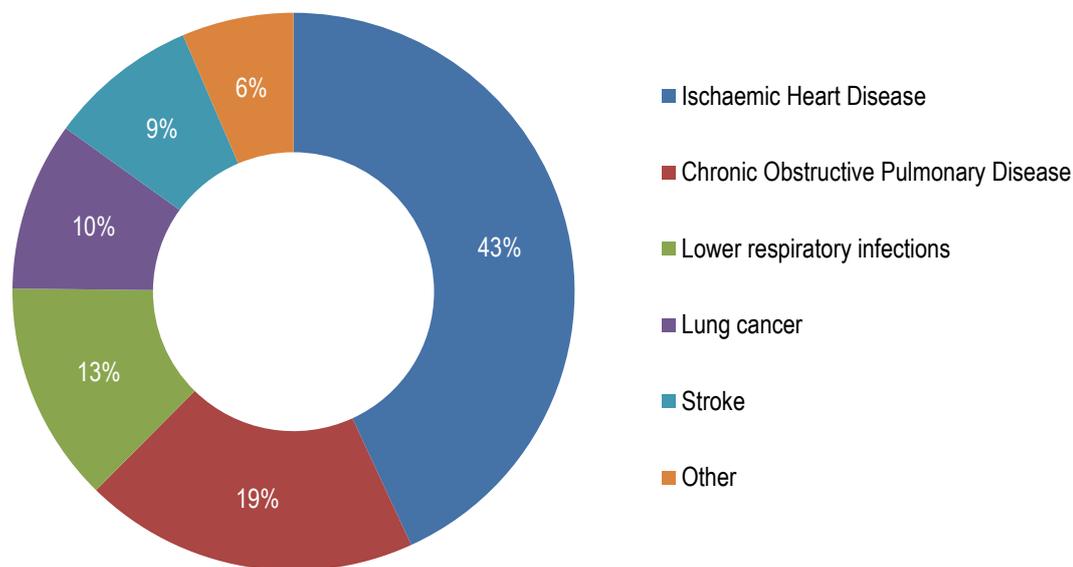
Source: Institute for Health Metrics and Evaluation (2016).

Without any change, the macroeconomic impact of outdoor air pollution – including increased health care costs, lower agricultural production and decreased labour productivity – is projected to account for 0.03% to 0.06% of GDP in G7 countries (OECD, 2016a). When the welfare costs of premature deaths, pain and suffering are also taken into account, ambient air pollution is estimated to cost:

- 3.8% of GDP across G7 countries
- Up to 2% of GDP in Canada and 5.7% in Italy (Figure 4)

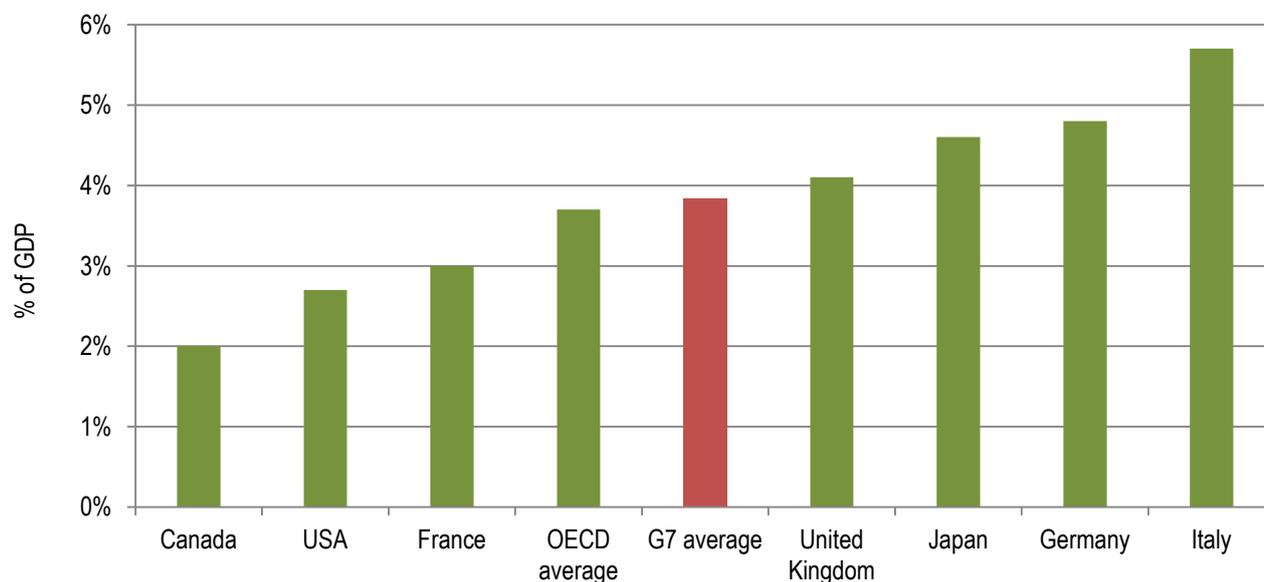
In these estimates, premature mortality, accounted for by placing a monetary value on years of life lost, accounts for more than 90% of the total impact on GDP.

Figure 3. Share of deaths attributable to air pollution by disease in G7 countries in 2015



Source: Institute for Health Metrics and Evaluation, 2016.

Figure 4. Cost of premature deaths due to ambient air pollution as compared to GDP



Source: Based on Roy, R. and N. Braathen (2017).

In the sections that follow, we discuss in detail **three proposed policy areas** in which health authorities can play an active role with direct consequences for both environmental and health-related concerns. These three areas include the promotion of: healthier diets for a greener environment; greener and more sustainable cities; and active travel to decrease motorised vehicle emissions.



A healthier diet for a greener environment

Despite the availability of sustainable methods of food production, some agricultural production techniques may put a strain on natural resources and on biodiversity. They may also pollute air and water sources, contributing to the spread of air-, water- and food-borne diseases. Under specific conditions, eating healthier diets could result in fewer calories consumed and less food waste, which can therefore promote a greener environment with the added benefit of tackling chronic diseases.

Food waste and overconsumption of food affect the environment

As the world population grows, so does the need for increased food production. Food waste and overconsumption of food place an additional strain on available natural resources. Although sustainable methods are emerging, unsustainable agricultural and livestock production practices can pollute air and sources of water, contributing to the spread of a range of diseases. They can also increase waste and contribute to soil degradation and desertification, potentially resulting in the release of harmful particulates into the atmosphere. For example, land use for agriculture results in large losses of stored organic carbon from soil (Sanderman et al., 2017). Raising livestock accounts for 14.5% of total greenhouse gases, which is more than all forms of transportation combined (FAO, 2013). Overfishing leads to changes in ecosystems, while unsustainable intensive farm fishing can release organic waste and chemicals into water sources (Worm et al., 2006; Science for Environment Policy, 2015). Excessive and inappropriate use of antibiotics in livestock and fish farming can also contribute to terrestrial and aquatic contamination. This in turn can adversely affect surrounding ecosystems and lead to the development of antimicrobial resistance in both livestock and humans (Kemper, 2008; FAO, 2016). Furthermore, agriculture accounts for more than 80% of deforestation at the global level, leading to a reduction in the number of trees available to absorb carbon and other pollutants (Kissinger et al., 2012). The fires used to clear forests also increase air pollution levels by releasing particulate matter (Reddington et al., 2015).

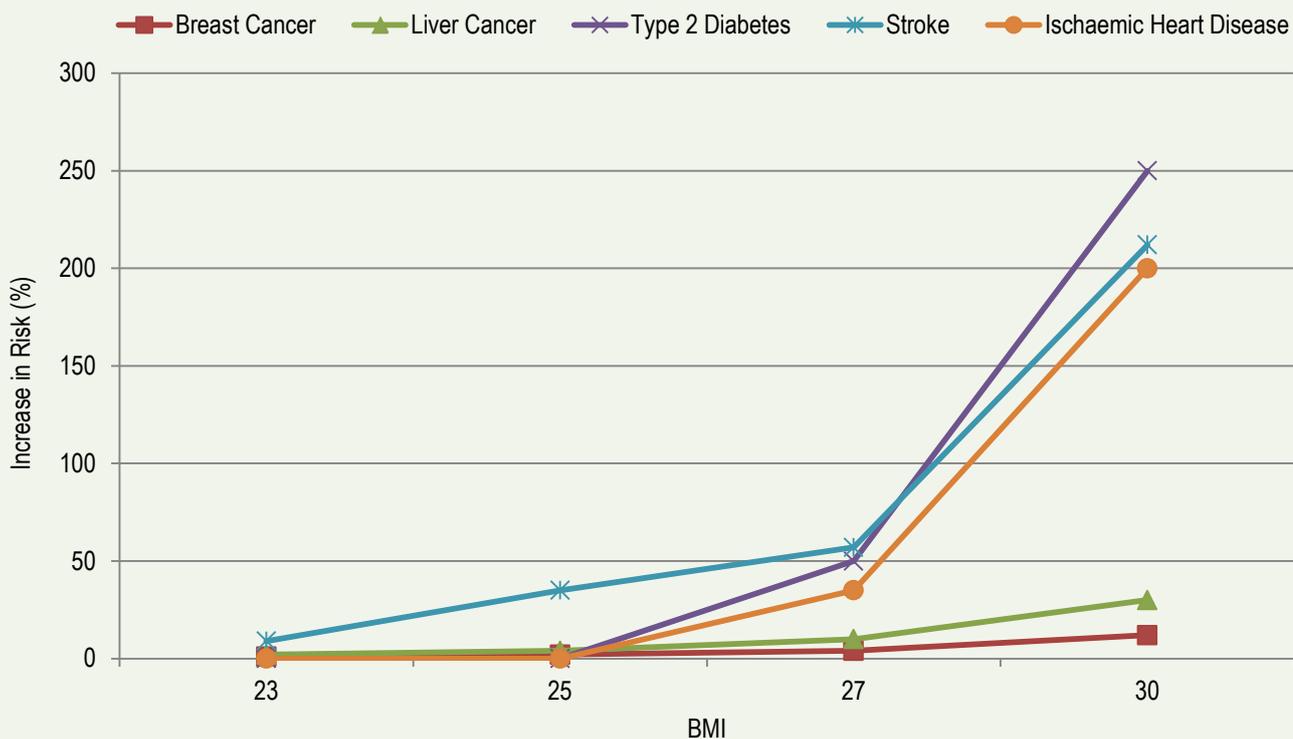
There is an increasing trend of consuming too many calories and unhealthy foods

The average individual living in a high-income country typically eats twice as many calories as recommended by international guidelines (Wellesley et al., 2015). Overconsumption of meat and sugar is one of the key drivers of excessive caloric intake. For example, people living in the European Union consume on average 66.5 kilograms of beef, pork, and poultry per capita per year, while individuals in the United States consume almost 30 kilograms more (OECD, 2017b). Similarly, many adults and children are consuming more than the recommended amount of sugar. The WHO recommends that for a 2,000 calorie diet, no more than 50 grams of sugar should be from added or natural sugars (WHO, 2015b). In the United States, however, the average American consumes 82 grams per day, or 30 kilograms of added sugar per year (Ervin and Ogden, 2013; USDA 2012). The numbers are lower in the United Kingdom, where adults just about meet the WHO guidelines by consuming 50.2 grams per day. Conversely, children consume 68.1 grams of added sugar daily and thus significantly exceed the recommended threshold (UK Food Standards Agency, 2014).

An unhealthy diet is a key driver of major chronic diseases

Among several other factors, caloric imbalance due to excessive food consumption and lack of physical activity can lead to an increase in overweight and obesity, which are leading risk factors for major chronic conditions such as cardiovascular diseases, type II diabetes and some cancers (Figure 5). In addition to the effect mediated by obesity, certain foods have a direct effect on human health. For example, eating too much red meat has been linked with an increase in the risk of cancer, heart disease, stroke, and type II diabetes (Micha et al., 2010; Micha et al., 2012; Pan et al., 2011; Kaluza et al., 2012; Chen et al., 2013; Bouvard et al., 2015). A sugar-heavy diet is linked to a higher risk of heart disease, high cholesterol and liver disease (American Heart Association, 2015).

Figure 5. Higher body-mass index is associated with higher incidence of chronic diseases



* In men only

Source: Kurth et al. (2002); Rui et al. (2012); Ganz et al. (2014); Xia et al. (2014); World Obesity Federation (2017).

What can health systems do?

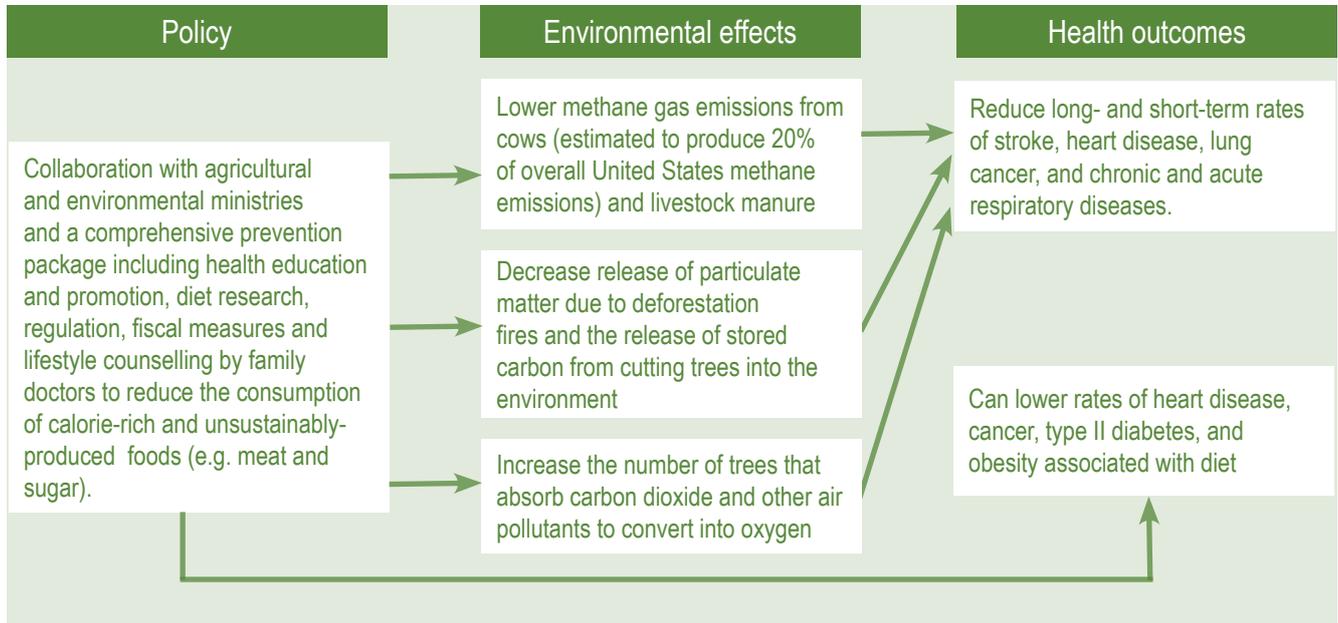
Many of the environmental issues due to food production practices are under the responsibility of environmental and agriculture authorities. Health authorities, however, can promote a broader implementation of health impact assessments in all areas of governmental policy making. Health authorities can also address negative environmental impacts by enacting policies directed towards changing food consumption behaviours, which could help switch food production towards more sustainable, climate-resilient, patterns.

1. OECD analysis showed that the implementation of a comprehensive prevention package including health education and promotion, regulation (and in some circumstances fiscal measures), and lifestyle counselling by family doctors can be used to encourage the adoption of healthier diets. This comprehensive approach has been found to be effective and can potentially avoid millions of years of life lost due to cancer or cardiovascular diseases across OECD countries (OECD, 2012), while also contributing to a healthier environment. With an implementation cost of about 20-25 USD/capita in many G7 countries, this prevention package is a better investment than many medical treatments currently provided by OECD health care systems (OECD, 2010).
2. Governments can strengthen their efforts to ensure that healthy foods meeting nutritional guidelines are provided in hospitals, nursing homes and other health institutions. This would improve the health and wellbeing of patients and teach individuals about how to achieve a healthy diet. Policies can address the foods served to patients, within hospital restaurants and those available in vending machines. In 2014, the United Kingdom enforced mandatory hospital food standards through legally binding NHS contracts (UK Department of Health, 2014). As of 2016, half of NHS hospitals were fully compliant and more than 90% were fully or partly compliant (UK Department of Health, 2017). Similarly, more than 500 hospitals in the United States have launched initiatives to address the lack of healthy foods served in hospitals (Healthier Hospitals, 2012). Moreover, by making food healthier and more appealing, health care institutions can decrease the amount of food waste, which can range from 6% to 65% of food served in European hospitals (Williams and Walton, 2011). As a result, fewer greenhouse gases would be emitted by landfills as a part of natural decomposition processes (Papargyropoulou et al., 2014).
3. Health authorities can work together with various stakeholders such as environmental and agricultural groups to identify new approaches that encourage both a healthy diet and sustainable food production. Results from these collaborations can be used to update nutritional guidelines to better reflect new evidence and population needs. For instance, a number of initiatives carried out during the Milan World Expo moved in this direction and encouraged collaboration between different stakeholders. Such partnerships can help health authorities create and enact policies targeting the environmental and health effects of agricultural production and consumption.

Did you know?

According to one estimate, transitioning to more plant-based diets that are more in line with the standard dietary guidelines would result in the reduction in food-related greenhouse gas emissions by 29%-70% by 2050 (Springmann et al., 2016).

Figure 6. Public health interventions promoting eating only the necessary amount of calories and reducing consumption of calorie-dense food can tackle chronic diseases, with the added benefit of promoting a greener environment





Health systems as promoters of sustainable cities

City and building design can have major health and environmental implications. Health authorities can pursue various strategies that can positively affect both environmental and population health.

Cities and health infrastructures are not usually designed to be environmentally sustainable

The overall layout of cities influences air quality, as urban sprawl can encourage the use of motorised vehicles and decrease active travelling (Stone et al., 2007). Furthermore, cities that do not have much green space also lack trees to shade buildings and to physically reduce particulate matter levels (Heinze, 2011). These factors contribute to the urban heat island effect, which makes cities hotter than the surrounding rural areas (EPA, 2017a). Health care structures also contribute to air pollution. It has been calculated that the health care sector is responsible for 3 to 8% of total greenhouse gas emissions (WHO, 2015a) in many OECD countries and up to 10% in the United States (Eckelman and Sherman, 2016). Major sources of pollution are hospital care, physician and clinical services, drug production, as well as procurement and inefficient energy consumption (WHO, 2015a; Eckelman and Sherman, 2016).

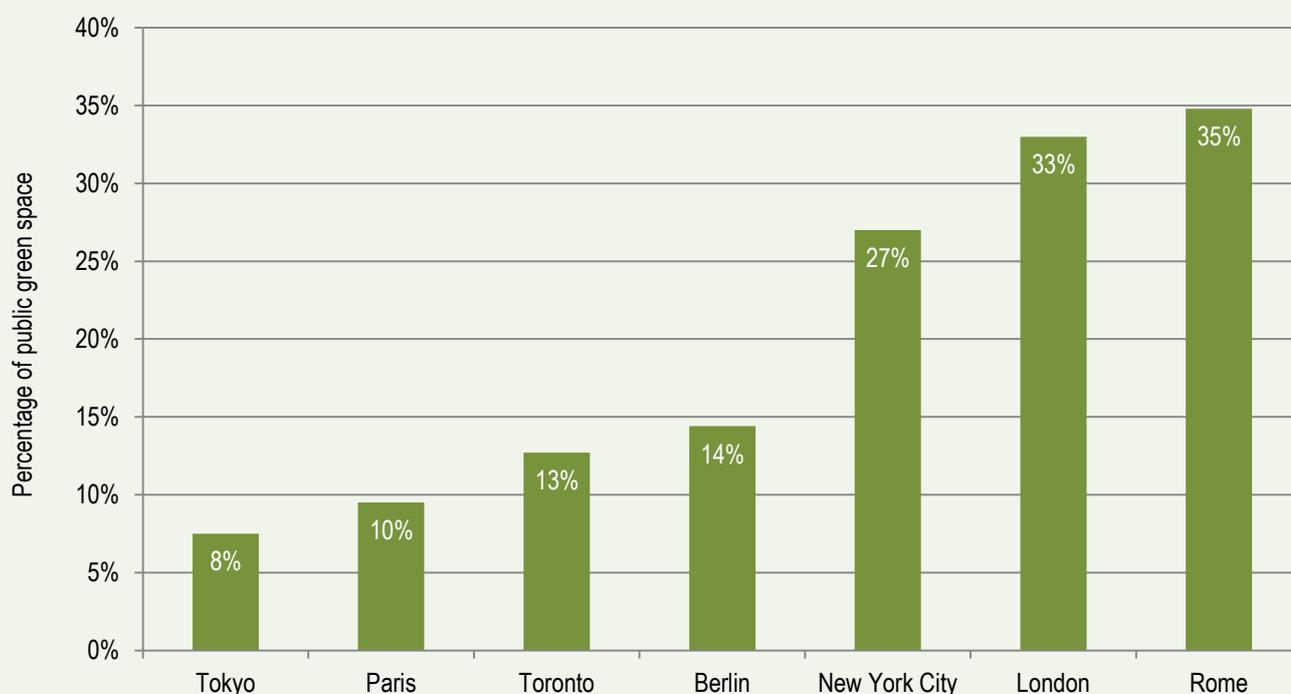
Pollution and heat waves increase morbidity and mortality

Increasing air pollution such as particulate matter from high energy consumption in cities increases the risk of developing acute and chronic cardiovascular and respiratory diseases (WHO, 2016a). Individuals living in urban heat islands are more likely to be affected by general discomfort, respiratory difficulties, heat cramps, exhaustion, non-fatal heat strokes, and heat-related mortality (EPA, 2017a). Urban heat islands also exacerbate the effects of heat waves. A study conducted in the United States found that above 37.4 °C, there was a 1.6% increase in hospital admissions per degree increase (Isaksen et al., 2016). Moreover, up to 8,000 premature deaths occurred in the United States from 1979 to 2003 due to excessive heat exposure (CDC, 2004). In the European heat wave of 2003, a study focusing on Paris estimated that of the 735 deaths due to the heat wave, around two-thirds were attributable to man-made climate change (Mitchell et al., 2016).

Cities are expected to become even more energy intensive; if no action is put in place, this will put a strain on both the environment and on human health

The energy sector is a predominant source of air pollution, accounting for 25% of global greenhouse gas emissions (IPCC, 2014b). The OECD estimates that energy demand in cities will increase by 57% between 2006 and 2030, contributing to 73% of the world energy demand (OECD, 2016b). This may lead to a rise in greenhouse gas emissions due to the greater use of fossil fuels to supply energy.

Figure 7. Percentage of public green space in densely populated G7 cities



Source: OECD analysis based on World Cities Culture Forum (2017). % of Public Green Space (Parks and Gardens). Available from <http://www.worldcitiescultureforum.com/data/of-public-green-space-parks-and-gardens>.

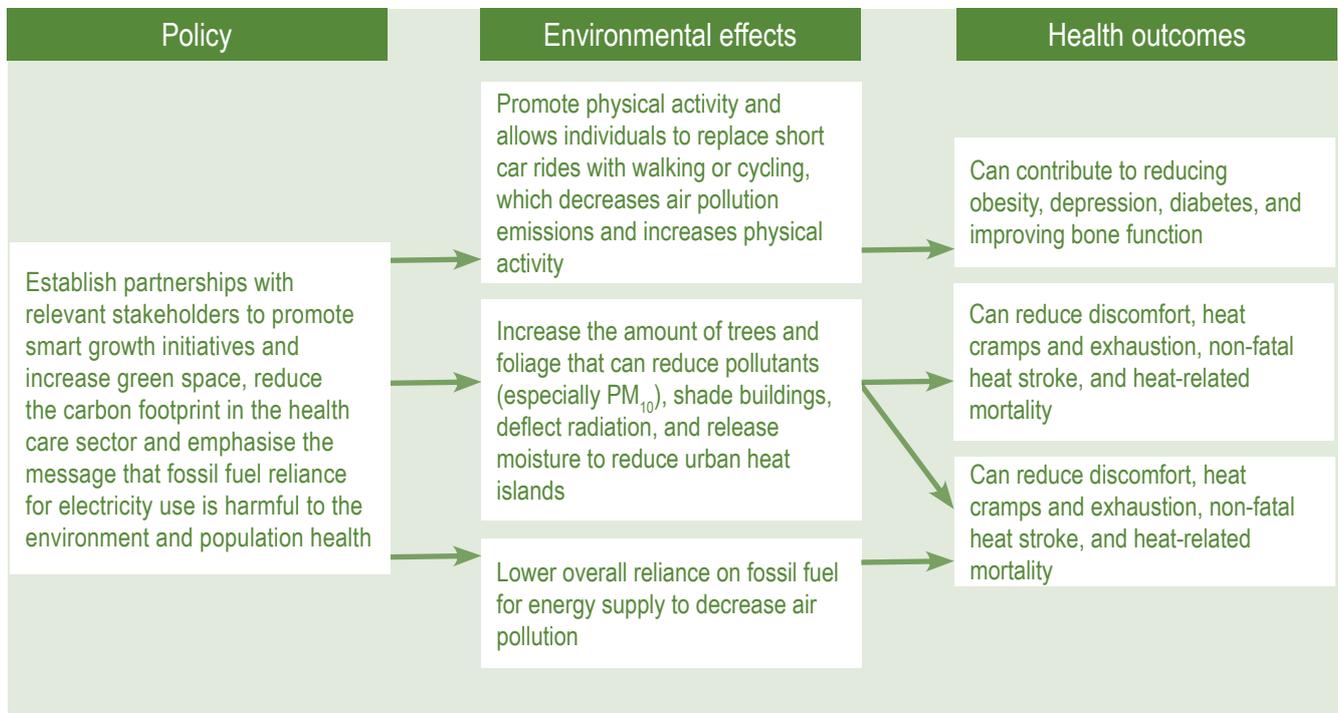
What can health systems do?

1. Health authorities can establish partnerships with local agencies, regional and town planners and other stakeholders to incorporate health and environmental considerations into urban planning schemes. These collaborations can promote smart growth initiatives, including encouraging compact city design with mixed land use, easy access to health facilities, developing soft mobility as well as increasing the number and area of green spaces. For example, it was shown that investing 4 USD per resident to increase the number of trees in a city can reduce particulate matter-related mortality by 2.7% to 8.7% in 245 cities worldwide, due to having access to cleaner air (McDonald et al., 2016). Tree coverage can also reduce the urban heat island effect by blocking and absorbing radiation and heat, providing shade and releasing moisture into the air (EPA, 2017a).
2. The health sector could reduce its carbon footprint by reducing waste and lowering energy emissions through solar, wind or hybrid energy solutions. Health care structures can also start purchasing and serving sustainably grown and healthy food while supporting green and healthy hospital design and construction by avoiding the use of materials and products which emit pollutants inside buildings. More than 8,200 hospitals and health centres in 16 countries around the world have already pledged to reduce their own carbon footprint and to pursue both political and economic solutions that will protect public health from climate change (Global Green and Healthy Hospitals, 2015). More generally, health system decision makers can follow the comprehensive 2015 WHO Operational Framework to build climate-resilient health systems. This framework was designed to provide guidance on how to increase resiliency in health systems under climate change and has garnered a lot of positive international attention (WHO, 2015c).
3. Health authorities can also emphasise the message that reliance on fossil fuels in electricity generation is detrimental to both the environment and to population health. For instance, in the United States, the most common energy source for electricity production is fossil fuels, which is burned to create 35% of US carbon emissions (EPA, 2017b). Coal-based electricity generation also cause emissions of environmentally harmful substances such as SO₂, NO_x and mercury. Any cost-benefit analysis comparing fossil fuels with other sources of energy should take these externalities into account.

Did you know?

Since 2006, the New York City Department of Health and Mental Hygiene has been partnered with the American Institute of Architects New York Chapter to bring together architects, urban planners, designers, transportation professionals, and public health professionals to discuss how urban design and policy can address non-communicable diseases. This partnership culminated in the creation of urban design guidelines that have been integrated into city contracting procedures for construction (American Institute of Architects New York, 2017).

Figure 8. Sustainable development is key to meeting the growing need for space and resources while remaining as environmentally friendly as possible. To achieve this, developing a partnership with governmental bodies and city planners to put health and the environment at the forefront of building and infrastructure design is essential.





Promoting active travel to decrease motorised vehicle emissions

Private motorised vehicles are currently the predominant mode of transport in most OECD cities (ITF, 2017). Furthermore, the transport sector is a leading producer of greenhouse gas and urban air pollution while also contributing to less active lifestyles. Both of these factors are associated with an increased chronic disease burden. Therefore, policies encouraging switching from car use to more active modes of transportation may contribute to a healthier environment and healthier lives.

Motorised vehicles are driving up air pollution emissions and temperatures in urban centres

It is estimated that 27% of particulate matter emissions in Europe are due to road transport and diesel traffic (WHO, 2017c). In turn, higher levels of air pollution are associated with an increased risk for chronic diseases, including cardiovascular diseases, COPD and certain cancers (WHO, 2016b). Motorised vehicles also contribute to the urban heat island effect, as they emit heat that can be trapped in poorly ventilated urban spaces such as urban canyons and form urban smog (Louiza et al., 2015).

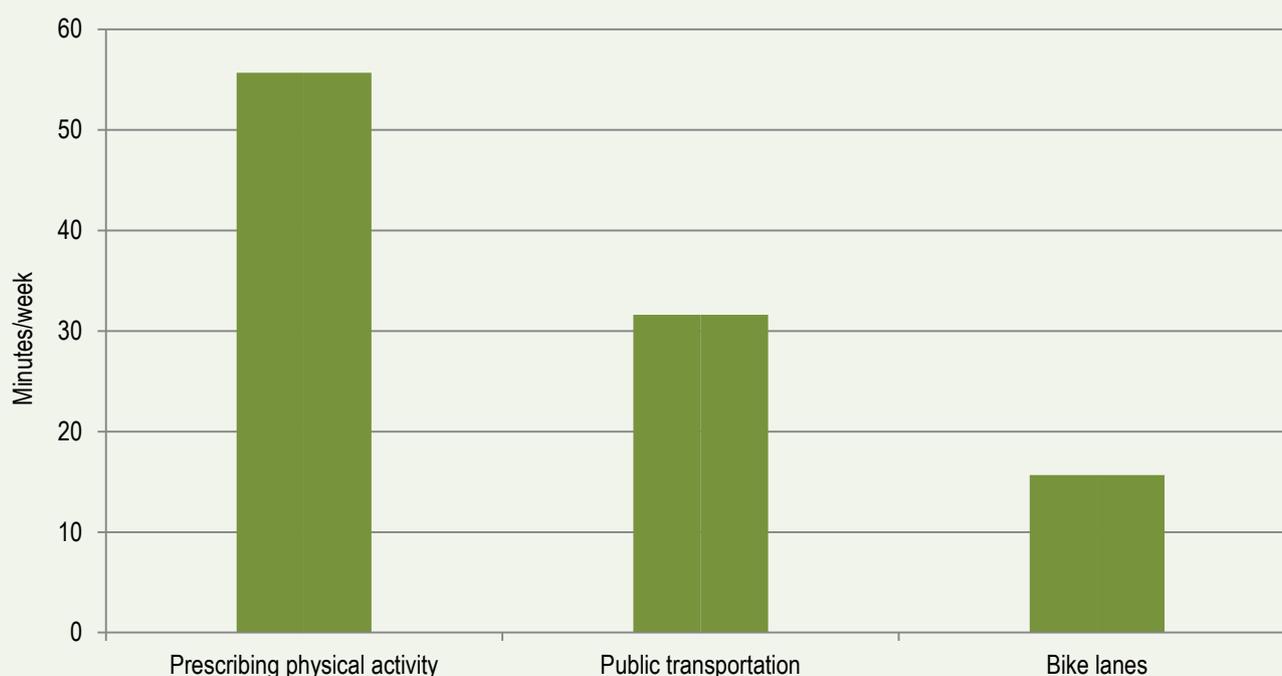
Private vehicular transport is associated with physical inactivity

Car ridership is also associated with physical inactivity, which is the fourth leading risk factor linked to global mortality (WHO, 2017b). Countries that rely less on cars have lower obesity rates (Bassett et al., 2008). Physical activity is further expected to decrease following the predicted increase in car use (Ng and Popkin, 2012). On the individual level, it has been shown that car owners generally accrue fewer minutes of physical activity than non-car owners (Shoham et al., 2015). Moreover, each additional hour spent in a car per day increases the likelihood of obesity by 6% (Frank et al., 2004).

Car use is expected to double by 2050, fuelling an increase in sedentary behaviours and in air pollution

With no interventions, road travel is estimated to double by 2050 (Dulac, 2013). Although most of this growth will be due to the privately owned light vehicles in developing countries, there will be even more pressure internationally to limit air pollution levels. By 2050, CO₂ emission levels from the transport sector are expected to increase between 16% and 79%, depending on the success of governmental policies and technology in shifting towards a lower dependency on carbon fuel (World Energy Council, 2011). Having said that, the Paris climate agreement has set the ambitious target of nations becoming carbon-neutral worldwide (i.e. greenhouse gases emitted by human activity restricted to the level that can be absorbed naturally by trees, ocean and soil) between 2050 and 2100.

Figure 9. Extra minutes of moderate physical activity per week resulting from public health interventions promoting active travelling



Source: OECD (2017c).

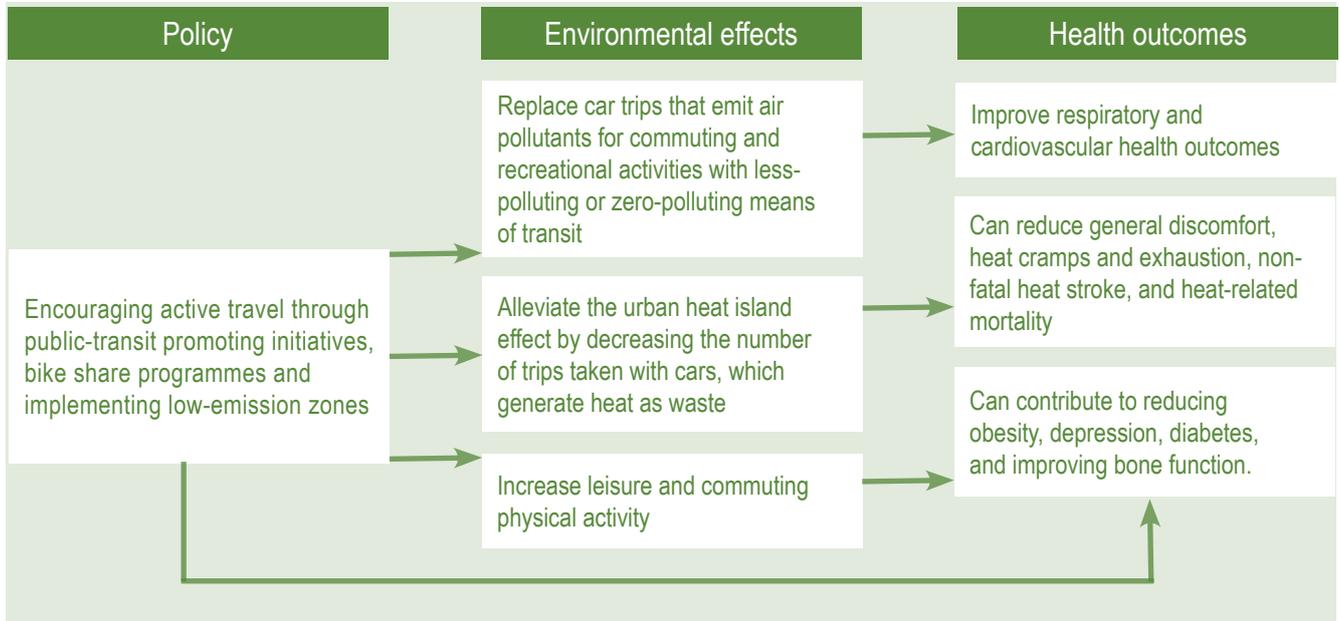
What can health systems do?

1. The OECD found that mass media campaigns to increase physical activity are both an efficient and effective means to tackle chronic diseases (OECD, 2017c). Mass media campaigns can increase the proportion of people who are at least moderately active by up to 36%. For example, the implementation of this strategy in Italy between 2018 and 2100 was estimated to lead to about 43,000 fewer cases of diabetes, 34,000 fewer cases of cardiovascular disease and 18,000 fewer cases of breast and colorectal cancer, at an annual cost of 1.54 EUR per capita (OECD, 2017c).
2. Health authorities can create partnerships with relevant national and local institutions and other stakeholders to increase physical activity and active transportation options. For example, bike sharing has been shown to increase physical activity and decrease the need for passenger vehicles. In five large OECD cities (Brisbane, London, Minneapolis, Melbourne and Washington DC), between 2% and 21% of the total distance that would have been taken by car was replaced by bike over a year (Fishman et al., 2014). In Barcelona, bike sharing reduced yearly CO₂ emissions by about 9,000 tonnes (Rojas-Rueda et al., 2011). Health authorities can also encourage local administrations, health facilities and companies to prepare action or mobility plans to facilitate the use of sustainable transport and to promote active travelling by staff, consumers and their families.
3. Health authorities can also partner with local transportation authorities to enact low-emission zones. Low-emission zones are areas within a city where vehicles with certain emission ratings cannot enter or are charged for entering. These zones have been implemented in over 200 cities and 10 countries in Europe to meet EU Air Quality Standards (Holman et al., 2015). In Germany, low-emission zones were shown to contribute to a reduction in nitrous oxide concentrations (Morfeld et al., 2014; Holman et al., 2015). The implementation of low-emission zones may also provide an opportunity of take stock of available transportation choices in a city and to develop more sustainable options such as public transportation, bicycle and pedestrian-friendly infrastructure.

Did you know?

The OECD found that constructing new light rail or bus rapid transit stations increases the amount of moderate physical activity (e.g. walking) by about 30 minutes per week, which is about a fifth of the time spent on physical activity recommended by the WHO (OECD, 2017c).

Figure 10. Active travelling should be promoted as part of an active lifestyle. Mass-media campaigns encouraging active travelling, public transit-promoting initiatives, bike share programmes and implementing low-emission zones can effectively promote an active lifestyle while reducing the number of cars on the road.



The OECD supports G7 countries in tackling environmental hazards through health policies

There is a complex association between development, population health and the environment. In addition, helping promote a healthier environment can bring a number of population health-related benefits. The role that the Ministries of Health can play in achieving better health and a greener environment was also recently acknowledged by the Sixth European Ministerial Conference on Environment and Health. The focus of this note is on the contribution of health systems to help address three specific sources of environmental hazards with potentially high population-wide impacts: unhealthy food consumption, unsustainable city design and excessive reliance on motorised means of transportation. These factors may negatively affect the environment in a number of ways, for example by increasing air pollution, by contributing to climate change and by leading to environmental degradation. These factors may also contribute to poor population health – either indirectly through environmentally-mediated links, or more directly, for example through the increase in the prevalence of harmful behaviours such as physical inactivity. However, a number of policy options exist that may simultaneously contribute to better environmental and population health.

Given its cross-sectoral expertise, the OECD is perfectly placed to support G7 countries in facilitating the sharing of country experiences, identifying suitable policy actions and supporting countries in the implementation of policies that present co-benefits by being simultaneously environmentally friendly and health-promoting. Building on its leadership in analysing the health and economic impacts of major chronic non-communicable diseases and in promoting green growth and sustainable development policies into structural reform agendas, the OECD can evaluate additional environmental benefits of public health actions addressing non-communicable diseases. Results from this work would be able to demonstrate the role and the potential contribution of G7 and OECD health systems to build a greener economy and a healthier tomorrow.



References

- American Heart Association (2016), "Added Sugars Add to Your Risk of Dying from Heart Disease", http://www.heart.org/HEARTORG/HealthyLiving/HealthyEating/Nutrition/Added-Sugars-Add-to-Your-Risk-of-Dying-from-Heart-Disease_UCM_460319_Article.jsp#.WYrFBG997ct (accessed 23 August 2017).
- American Institute of Architects New York Chapter (2017), "Advocacy", <https://aiany.aiany.org/index.php?section=fitcity> (accessed 21 August 2017).
- Bassett, D. R. et al. (2008), "Walking, Cycling, and Obesity Rates in Europe, North America, and Australia", *Journal of Physical Activity and Health*, Vol. 5, pp. 795-814.
- Boden, T.A., G. Marland and R.J. Andres (2011), "Global, Regional, and National Fossil-Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center", Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A., http://dx.doi.org/10.3334/CDIAC/00001_V2011.
- Bouvard, V. et al. (2017), "Carcinogenicity of Consumption of Red and Processed Meat", *The Lancet Oncology*, Vol. 16, No. 16, pp. 1599-1600, [http://dx.doi.org/10.1016/S1470-2045\(15\)00444-1](http://dx.doi.org/10.1016/S1470-2045(15)00444-1).
- Brown, B. B. et al. (2016), "Changes in Bicycling Over Time Associated with a New Bike Lane: Relations with Kilocalories Energy Expenditure and Body Mass Index", *Journal of Transport & Health*, Vol. 3, No. 3, pp. 357-365, <https://doi.org/10.1016/j.jth.2016.04.001>.
- CDC (2017), "Extreme Heat: A Prevention Guide to Promote Your Personal Health and Safety", <https://www.cdc.gov/disasters/extremeheat/index.html> (accessed 21 August 2017).
- CDC (2004), "Extreme Heat: A Prevention Guide to Promote Your Personal Health and Safety", <http://www.ct.gov/agingservices/lib/agingservices/pdf/extremeheatguide.pdf> (accessed 21 August 2017).
- Chen, G. et al. (2012), "Red and Processed Meat Consumption and Risk of Stroke: A Meta-analysis of Prospective Cohort Studies", *European Journal of Clinical Nutrition*, Vol. 67, No. 1, pp. 91-95.
- Dulac, J. (2013), "Global Land Transport Infrastructure Requirements: Estimating Road and Railway Infrastructure Capacity and Costs to 2050", International Energy Agency, Paris.
- Eckelman, M. J. and J. Sherman (2016), "Environmental Impacts of the U.S. Health Care System and Effects on Public Health", *PLoS ONE*, Vol. 11, No. 6, <https://doi.org/10.1371/journal.pone.0157014>.
- EPA (2017a), "Heat Island Effect", <https://www.epa.gov/heat-islands> (accessed 21 August 2017).
- EPA (2017b), "Fast Facts on Transportation Greenhouse Gas Emissions", <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions> (accessed 21 August 2017).
- EPA (2016), "Using Trees and Vegetation to Reduce Heat Islands", <https://www.epa.gov/heat-islands/using-trees-and-vegetation-reduce-heat-islands> (accessed 21 August 2017).
- EPA (2015), "Climate Action Benefits: Extreme Temperature", <https://www.epa.gov/cira/climate-action-benefits-extreme-temperature> (accessed 23 August 2017).
- Ervin, R.B. and C.L. Ogden (2013), "NCHS Data Brief, No. 122: Consumption of Added Sugars Among U.S. Adults, 2005-2010", <https://www.cdc.gov/nchs/data/databriefs/db122.pdf> (accessed 21 August 2017).
- FAO (2016), "Drivers, Dynamics and Epidemiology of Antimicrobial Resistance in Animal Production", <http://www.fao.org/documents/card/en/c/d5f6d40d-ef08-4fcc-866b-5e5a92a12dbf/>.
- FAO (2013), "Tackling Climate Change through Livestock – A Global Assessment of Emissions and Mitigation Opportunities", Food and Agriculture Organization of the United Nations, <http://www.fao.org/3/i3437e.pdf>.
- Fishman, E., S. Washington and N. Haworth (2014), "Bike Share's Impact on Car Use: Evidence from the United States, Great Britain, and Australia", *Transportation Research Part D: Transport and Environment*, Vol. 31, pp. 13-20, <https://doi.org/10.1016/j.trd.2014.05.013>.
- Forzieri, G. et al. (2017), "Increasing Risk Over Time of Weather-Related Hazards to the European Population: A Data-Driven Prognostic Study", *The Lancet Planet Health*, Vol. 1, [https://doi.org/10.1016/S2542-5196\(17\)30082-7](https://doi.org/10.1016/S2542-5196(17)30082-7).
- Frank, L. D. et al. (2004), "Obesity Relationships with Community Design, Physical Activity, and Time Spent in Cars", *American Journal of Preventive Medicine*, Vol. 27, No. 2, pp. 87-96, <https://doi.org/10.1016/j.amepre.2004.04.011>.
- Ganz, M. et al. (2014), "The Association of Body Mass Index with the Risk of Type 2 Diabetes: A Case-control Study Nested in an Electronic Health Records System in the United States", *Diabetology & Metabolic Syndrome*, Vol. 6, No. 1, p.50.
- Gardner, G. (2010), "Power to the Pedals", *World Watch Magazine*, Vol. 23, No. 4.
- Global Green and Health Hospitals (2015), "Hospitals Worldwide Join Together in the Fight Against Climate Change", <https://practicegreenhealth.org/about/press/press-releases/hospitals-worldwide-join-together-fight-against-climate-change> (accessed 29 August 2017).
- Goodman, A., S. Sahlqvist and D. Ogilvie (2014), "New Walking and Cycling Routes and Increased Physical Activity: One- and 2-year Findings from the UK iConnect Study", *American Journal of Public Health*, Vol. 104, No. 9, E38-E46, <https://doi.org/10.2105/AJPH.2014.302059>.
- Hahn, K. et al. (2017), "Serum Uric Acid and Acute Kidney Injury: A Mini Review", *Journal of Advanced Research*, Vol. 8, No. 5, pp. 529-536, <http://dx.doi.org/10.1016/j.jare.2016.09.006>.
- He, D. et al. (2000), "Assessment of Traffic Related Air Pollution in Urban Areas of Macao", *Journal of Environmental Sciences*, Vol. 12, No. 1, pp. 39-46.
- Healthier Hospitals (2012), "What We Do", <http://healthierhospitals.org/about-hh/what-we-do>, (accessed 27 August 2017).
- Heinze, J. (2011), "Benefits of Green Space – Recent Research", Environmental Health Research Foundation, Chantilly, Virginia, <http://www.ehrf.info/wp-content/uploads/2011/09/BenefitsofGreenSpace.pdf> (accessed 28 September 2017).
- Heung, M. et al. (2016), "Acute Kidney Injury Recovery Pattern and Subsequent Risk of CKD: An Analysis of Veterans Health Administration Data", *American Journal of Kidney Diseases*, Vol. 67, No. 5, pp. 742-752, <http://dx.doi.org/10.1053/j.ajkd.2015.10.019>.
- Holman, C. et al. (2015), "Review of the Efficacy of Low Emission Zones to Improve Urban Air Quality in European cities", *Atmospheric Environment*, Vol. 111, pp. 161-169, <https://doi.org/10.1016/j.atmosenv.2015.04.009>.
- Institute for Health Metrics and Evaluation (2016), "Global Burden of Disease Study 2015 (GBD 2015) Results. Global Burden of Disease Study 2015", <https://http://vizhub.healthdata.org/gbd-compare/> (accessed 25 August 2017).

- Isaksen, T. B. et al. (2016), "Increased Hospital Admissions Associated with Extreme-heat Exposure in King County, Washington, 1990-2010", *Reviews on Environmental Health*, Vol 30, No. 1, pp. 51-64, <https://doi.org/10.1515/reveh-2014-0050>.
- IPCC (2014a), *Summary for Policymakers. In Climate Change 2014: Mitigation of Climate Change*, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- IPCC (2014b), *Climate Change 2014 Synthesis Report*, IPCC, Geneva, Switzerland.
- ITF (2017), *ITF Transport Outlook 2017*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789282108000-en>.
- ITF (2015), *ITF Transport Outlook 2015*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789282107782-en>.
- Kaluza, J., A. Wolk, and S. Larsson (2012), "Red Meat Consumption and Risk of Stroke: A Meta-Analysis of Prospective Studies", *Stroke*, Vol. 43, No. 10, pp. 2556-2560.
- Kemper, N. (2008), "Veterinary Antibiotics in the Aquatic and Terrestrial Environment", *Ecological Indicators*, Vol. 8, No. 1, pp.1-13.
- Kissinger, G., M. Herold and V. de Sy (2012), "Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ policymakers", The Government of the UK and Norway.
- Kurth, T. et al. (2002), "Body Mass Index and the Risk of Stroke in Men", *Archives of Internal Medicine*, Vol. 162, No. (22), pp. 2557-2562, <https://doi.org/10.1001/archinte.162.22.2557>.
- Louiza, H. et al. (2015), "Impact of the Transport on the Urban Heat Island", *International Journal for traffic and Transport Engineering*, Vol. 5, No. 3, pp. 252-263, [http://dx.doi.org/10.7708/ijtte.2015.5\(3\).03](http://dx.doi.org/10.7708/ijtte.2015.5(3).03).
- McDonald, R. et al. (2016), "Planting Healthy Air: A global Analysis of the Role of Urban Trees in Addressing Particulate Matter Pollution and Extreme Heat", The Nature Conservancy, www.nature.org/healthyair.
- Micha, R., S. Wallace and D. Mozaffarian (2010), "Red and Processed Meat Consumption and Risk of Incident Coronary Heart Disease, Stroke, and Diabetes Mellitus: A Systematic Review and Meta-Analysis", *Circulation*, Vol. 121, No. 21, pp. 2271-2283.
- Micha, R., G. Michas and D. Mozaffarian, (2012), "Unprocessed Red and Processed Meats and Risk of Coronary Artery Disease and Type 2 Diabetes – An Updated Review of the Evidence", *Current Atherosclerosis Reports*, Vol. 14, No. 6, pp. 515-524.
- Mitchell, D. et al. (2016), "Attributing Human Mortality During Extreme Heat Waves to Anthropogenic Climate Change", *Environmental Research Letters*, Vol. 11, No. 7, <http://dx.doi.org/10.1088/1748-9326/11/7/074006>.
- Morfeld, P., D. A. Groneberg and M. F. Spallek, (2014), "Effectiveness of Low Emission Zones: Large Scale Analysis of Changes in Environmental NO₂, NO and NO_x Concentrations in 17 German Cities", *PLoS One*, Vol. 9, No. 8, <http://dx.doi.org/10.1371/journal.pone.0102999>.
- Ng, S.W. and B. Popkin, (2012), "Time Use and Physical Activity: A Shift Away from Movement across the Globe", *Obesity Reviews*, Vol. 13, No. 8, pp. 659-680.
- OECD (2017a), *Green Growth Indicators 2017*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264268586-en>.
- OECD (2017b), "Meat Consumption" (indicator), <http://dx.doi.org/10.1787/fa290fd0-en> (accessed 21 August 2017).
- OECD (2017c), "The Role of Communication in Public Health Policies: The Case of Obesity Prevention in Italy" (forthcoming).
- OECD (2016a), *The Economic Consequences of Outdoor Air Pollution*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264257474-en>.
- OECD (2016b), "Resilient Cities", <http://www.oecd.org/cfe/regional-policy/resilient-cities-policy-highlights.htm>.
- OECD (2014), *The Cost of Air Pollution: Health Impacts of Road Transport*, OECD Publishing, Paris <http://dx.doi.org/10.1787/9789264210448-en>.
- OECD (2012), "Draft Summary of the 3rd OECD Food Chain Network Meeting", <http://www.oecd.org/site/agrfcn/DraftSummary3rdOECDFCN2012.pdf>.
- OECD (2010), *Obesity and the Economics of Prevention: Fit not Fat*, OECD Publishing, Paris <http://dx.doi.org/10.1787/9789264084865-en>.
- Pan, A. et al. (2012), "Red Meat Consumption and Mortality: Results From 2 Prospective Cohort Studies", *Archives of Internal Medicine*, Vol. 172, No. 7, pp. 555-563.
- Papargyropoulou, E. et al. (2014), "The Food Waste Hierarchy as a Framework for the Management of Food Surplus and Food waste", *Journal of Cleaner Production*, Vol. 76, pp. 106-115, <http://doi.org/10.1016/j.jclepro.2014.04.020>.
- Pazin, J. et al. (2016), "Effects of a New Walking and Cycling Route on Leisure-time Physical Activity of Brazilian Adults: A longitudinal Quasi-experiment", *Health & Place*, Vol. 39, pp. 18-25. <http://dx.doi.org/10.1016/j.healthplace.2016.02.005>.
- PublicHealth (2017), *Health Guides - Climate Change*, <http://www.publichealth.org/public-awareness/climate-change/>.
- Reddington, C. et al. (2015), "Air Quality and Human Health Improvements from Reductions in Deforestation-related Fire in Brazil", *Nature Geoscience*, Vol. 8, No. 10, pp. 768-771, <http://dx.doi.org/10.1038/ngeo2535>.
- Robine, J. M. et al. (2008), "Death Toll Exceeded 70,000 in Europe During the Summer of 2003", *Comptes Rendus Biologies*, Vol. 331, No. 2, pp. 171-178.
- Rojas-Rueda, D. et al. (2011), "The Health Risks and Benefits of Cycling in Urban Environments Compared with Car Use: Health Impact Assessment Study", *BMJ*, Vol. 343, <https://doi.org/10.1136/bmj.d4521>.
- Roy, R. and N. Braathen (2017), "The Rising Cost of Ambient Air Pollution thus far in the 21st Century: Results from the BRIICS and the OECD Countries", *OECD Environment Working Papers*, No. 124, OECD Publishing, Paris, <http://dx.doi.org/10.1787/d1b2b844-en>.
- Rui R. et al. (2012), "Excess Body Mass Index and Risk of Liver Cancer: A Nonlinear Dose-Response Meta-Analysis of Prospective Studies", *PLoS ONE*, Vol. 7, No. 9, <https://doi.org/10.1371/journal.pone.0044522>.
- Sanderman, J., T. Hengl and G. Fiske (2017), "Soil Carbon Debt of 12,000 Years of Human Land Use", *Proceedings of the National Academy Of Sciences*, <http://dx.doi.org/10.1073/pnas.1706103114>.
- Shoham, D. A. et al. (2015), "Association of Car Ownership and Physical Activity across the Spectrum of Human Development: Modeling the Epidemiologic Transition Study (METS)", *BMC Public Health*, Vol. 15, No. 173, <https://doi.org/10.1186/s12889-015-1435-9>.
- Springmann, M. et al. (2016), "Analysis and Valuation of the Health and Climate Change Cobenefits of Dietary Change", *Proceedings of the National Academy of Science of the United States of America*, Vol. 113, No. 15, pp. 4146-4151, <https://doi.org/10.1073/pnas.1523119113>.

- Stone, B. et al. (2007), "Is Compact Growth Good for Air Quality?", *Journal of the American Planning Association*, Vol. 73, No. 4, pp. 404-418, <http://dx.doi.org/10.1080/01944360708978521>.
- Science for Environment Policy (2015), "Sustainable Aquaculture. Future Brief 11. Brief produced for the European Commission DG Environment by the Science Communication Unit", UWE, Bristol, <http://ec.europa.eu/science-environment-policy>.
- Tan, J. et al. (2009), "The Urban Heat Island and its Impact on Heat Waves and Human Health in Shanghai", *International Journal of Biometeorology*, Vol. 54, No. 1, pp.75-84.
- UK Department of Health (2014), "Hospital Food Standards: Sustain Campaign", <https://www.gov.uk/government/news/hospital-food-standards-sustain-campaign> (accessed 21 August 2017).
- UK Department of Health (2017), "Compliance with Hospital Food Standards in the NHS", <https://www.gov.uk/>.
- UK Food Standards Agency (2013), "National Diet and Nutrition Survey - Results from Years 1, 2, 3 and 4 (combined) of the Rolling Programme (2008/2009 – 2011/2012)", https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/311001/NDNS_Appendices_and_tables.zip (accessed 22 August 2017).
- UN Habitat (2017), "Energy", <https://unhabitat.org/urban-themes/energy/>.
- United Nations (2017), "World Population Prospects: The 2017 Revision, Key Findings and Advance Tables", Working Paper No. ESA/P/WP/248.
- United Nations (2014), "World Urbanization Prospects", United Nations, New York.
- USDA (2012), "USDA Sugar Supply: Tables 51-53: US Consumption of Caloric Sweeteners", <https://www.ers.usda.gov/data-products/sugar-and-sweeteners-yearbook-tables.aspx> (accessed 21 August 2017).
- US Energy Information Administration (2017), "How Much of U.S. Carbon Dioxide Emissions are Associated with Electricity Generation?", <https://www.eia.gov/tools/faqs/faq.php?id=77&t=11> (accessed 21 August 2017).
- Wellesley, L., A. Froggatt and C. Happer (2015), *Changing Climate, Changing Diets: Pathways to Lower Meat Consumption*, Chatham House, London.
- WHO (2017a), "Factsheet on Climate Change and Health", <http://www.who.int/mediacentre/factsheets/fs266/en/>.
- WHO (2017b), "Physical activity", http://www.who.int/topics/physical_activity/en/.
- WHO (2017c), *Air Pollution. Health and Sustainable Development*, World Health Organization, Geneva, Switzerland, <http://www.who.int/sustainable-development/transport/health-risks/air-pollution/en/>.
- WHO (2016a), "Economic Cost of the Health Impact of Air Pollution in Europe", http://www.euro.who.int/_data/assets/pdf_file/0004/276772/Economic-cost-health-impact-air-pollution-en.pdf (accessed 21 August 2017).
- WHO (2016b), "Ambient (outdoor) Air Quality and Health", <http://www.who.int/mediacentre/factsheets/fs313/en/> (accessed 21 August 2017).
- WHO (2015a), "Climate and Health Country Profile – 2015: France", World Health Organization, Geneva, Switzerland.
- WHO (2015b), "Sugars Intake For Adults and Children" http://www.who.int/nutrition/publications/guidelines/sugars_intake/en/ (accessed 21 August 2017).
- WHO (2015c), *Operational Framework for Building Climate Resilient Health Systems*, World Health Organization, Geneva, Switzerland.
- WHO (2014), "Health in All Policies: Helsinki Statement – Framework for Country Action", World Health Organization, Geneva, Switzerland.
- WHO (2003), "Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide", Report on a WHO Working Group, Bonn, Germany.
- WHO/PAHO (2012), *Protecting Health from Climate Change: Vulnerability and Adaptation Assessment*, World Health Organization, Geneva, Switzerland.
- Williams, P. and K. Walton (2011), "Plate Waste in Hospitals and Strategies for change", *e-SPEN, the European e-Journal Of Clinical Nutrition and Metabolism*, Vol. 6, No. 6, <http://dx.doi.org/10.1016/j.eclnm.2011.09.006>.
- World Cities Culture Forum (2017), "% of Public Green Space (Parks and Gardens)", <http://www.worldcitiescultureforum.com/data/of-public-green-space-parks-and-gardens>.
- World Energy Council (2011), *Global Transport Scenarios 2050*, World Energy Council, London, https://www.worldenergy.org/wp-content/uploads/2012/09/wec_transport_scenarios_2050.pdf.
- World Obesity Federation (2017), "Estimated Relative Risk of Disease by BMI Category: Overweight and Obesity", <http://www.worldobesity.org/what-we-do/policy-prevention/projects/eu-projects/dynamohiaproject/estimatesrelativerisk/>.
- Worm, B. et al. (2006), "Impacts of Biodiversity Loss on Ocean Ecosystem Services", *Science*, Vol. 314, No. 5800, pp. 787-790, <http://dx.doi.org/10.1126/science.1132294>.
- Xia, X. et al. (2014), "Body Mass Index and Risk of Breast Cancer: A Nonlinear Dose-Response Meta-Analysis of Prospective Studies", *Scientific Reports*, Vol. 4, No. 7480, <http://doi.org/10.1038/srep07480>.

Acknowledgements

Christina Xiao, Yevgeniy Goryakin, Sahara Graf and Michele Cecchini prepared this document. At OECD, authors would like to thank Francesca Colombo, Stefano Scarpetta, Mark Pearson, Nils Axel and Michael Ryan for their contributions and suggestions during the compilation of this report. Lucy Hulett provided editorial support. The work also benefited greatly from the inputs and comments received from national experts and delegates to the Health Committee of G7 countries.

Image credits

Cover page © Shutterstock/Jacek Chabraszewski
 Inside cover © Shutterstock/Halfpoint
 Page 4 © Shutterstock/ineng
 Page 8 © Shutterstock/Africa Studio
 Page 11 © Shutterstock/Morinka
 Page 12 © Shutterstock/elwynn
 Page 15 © Shutterstock/Danila Shtantsov
 Page 16 © Shutterstock/LanaElcova
 Page 19 © Shutterstock/Stas Walenga
 Page 20 © Shutterstock/szeferi

As the G7 economies continue their recovery from the Great Recession, the stress on their environmental resources is likely to grow, unless appropriate policy measures are taken. Air pollution, an important source of environmental stress, affects health outcomes directly, for example as a risk factor for respiratory and cardiovascular conditions, or indirectly, such as through the impacts on climate change and higher probability of extreme weather events. Many sources contribute to environmental pollution, including the overconsumption of food, unhealthy diets and food waste, unsustainable city growth, as well as overreliance on private motorised vehicles as a means of transportation. Each of these factors can also have a direct negative effect on various dimensions of health.

This document, produced to inform the 2017 meeting of the G7 Ministers of Health, provides a broad overview of the main policy issues and some of the policy actions that G7 Health authorities can put in place to improve population health, while at the same time decreasing the human footprint on the environment.

