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Better Health. Better Environment. Sustainable Choices.

Environment and health in Europe: status and perspectives

ABSTRACT

The status and perspectives of environment and health in the Member States of the WHO Regional Office for Europe is the subject of discussion at the Sixth Ministerial Conference on Environment and Health, entitled 'Better health. Better environment. Sustainable choices'. Well-known risk factors, such as a lack of access to safe water and sanitation or air pollution, continue to adversely impact Europeans' health, as do other, less well-known factors, such as improper waste management, contaminated sites, and countless dangerous chemicals. The global context for all of this is one which recognises the severe deterioration of Earth's biosphere and climate change, with far-reaching implications for the practice of environment and health and public health at large. Between countries, heterogeneity, in terms of environmental factors, health impacts, policies and governance, remains significant. However, Member Sates continue to share important common agendas on sustainable development, cities as key places for health, environmental health inequalities and other issues where coordinated international collaboration and action are necessary.

Keywords

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Contents of this document result from a series of consultations organised by WHO as a follow-up to the Fifth Ministerial Conference on Environment and Health, held in Parma, Italy, on 8–10 March 2010, beginning with the meeting 'Expert Consultation on Environment and Health Priorities for the European Region' held in Bonn, Germany, 3–4 July 2012, and building on the outcome of the 2015 Mid-Term Review meeting, held in Haifa, Israel, 28–30 April 2015.

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Professor George Morris drafted much of the text and managed comments and contributions through several versions. The text was finalised by the WHO secretariat.

Introduction

In April 2015, the Mid-Term Review (MTR) meeting in Haifa, Israel, provided the opportunity to consider progress since the Parma Conference of 2010, particularly in relation to the time-bound targets agreed in the Parma Declaration Commitments to Action. As background for the Mid-Term Review meeting, WHO prepared the report 'Improving environment and health in Europe: How far have we gotten?' (WHO Regional Office for Europe, 2015) and provided updated information and data on the priority topics of the Parma agenda, including its time-bound targets. A variety of issues of relevance to environment and health in Europe and the European Environment and Health Process (EHP) were addressed in the report, and those revisiting it today will find many of the facts to still be relevant in 2017, particularly because the report's data depicts long-term, slow processes with delayed and long-term impacts. The Mid-Term Review also allowed space for a wider reflection of the factors which were most demonstrably shaping Europe's environment and health challenges. A particularly exciting development taking place at that time was the adoption of the 2030 Agenda for Sustainable Development with its 17 Sustainable Development Goals (SDGs). Formally adopted in September 2015, the SDGs and their associated targets, together with Health 2020 – the WHO European policy for health and well-being to deliver a healthier, more equitable and sustainable future for the European Region's citizens – create an exciting and harmonized policy consensus on development, and on health and well-being, in which the next iteration of the EHP can be taken forward. (United Nations, 2015; WHO Regional Office for Europe, 2103a)

In the light of such recent developments, and nearly thirty years after its inception, the EHP gathers in Ostrava, both to take stock of progress since Parma and also to undertake a fundamental review of the status and perspectives of environment and health in Europe under very different factual, political and scientific conditions. This background document provides a cross-cutting overview of the main environment and health challenges that affect the WHO European Region and offers an analysis of the main factors that shape the environment and health status and policy environment in Europe.

Environment and health in the WHO European Region in 2017: Proximal and distal concerns

How we manage and protect the environment is critical for humanity's prospects. Progress in the biomedical, epidemiological, social and environmental sciences has undoubtedly conferred a much richer and more complex understanding of the interacting determinants of health and well-being, and of the dimensions of the environment and health challenge. The environment is recognised as one of a number of interacting factors, which, in combination with the characteristics of individuals and communities, generate or harm health and well-being, and redress or perpetuate inequalities.

The environment has long been regarded as a set of physical factors, localised in time and space. However, simply because individuals live in the same location, this does not imply that their exposure to or experience of aspects of the environment are the same. Contextual factors in that location, or factors specific to the individual, such as socio-cultural, demographic, economic, and state of health, have a significant bearing on the nature of individual environmental exposure and also on whether a person, following exposure, experiences an impact on their health and well-being, positive or negative.

These contexts, and our understanding of them, have been widening. Perhaps the most striking case of an evolving context for environmental health activity in Europe, as well as globally, is the fact that the generations alive today are the first to be presented with the incontrovertible evidence of the capacity of humans to fundamentally change planetary processes and systems in ways which are not only damaging to health and well-being, but present a real and foreseeable existential threat for our species. Climate change is only one manifestation of a developing crisis which implicitly questions society's capacity to deliver health, well-being, health care and equity in any of these global conditions in the medium- to long-term. It is now clear that humans are an inextricable part of a larger ecosystem, which we nowadays have the capacity to alter like never before.

Environment and health theory and practice must now be framed on a vastly extended temporal and geographical scale. This implies that, for national governments and agencies, the task can no longer be solely about protecting and improving the quality of the environment for the everyday benefit of local citizens – rather, it needs to be about thinking and acting globally in concert with everyone else. Responsible governments must now also consider the impacts that a country and its population have, through action or inaction, on the health and well-being of communities living far beyond its borders and on generations yet to be born.

The prerequisites for a healthy community, such as material goods, social relations, security, freedom of choice and, of course, health itself, can be critically undermined. The need to be aware of this full picture, and the inherent inequity of such a situation, fundamentally characterizes the environmental health landscape of the WHO European Region today. Moreover, any sense that Europe and the developed

world will remain isolated from the global or distant ecosystem damage generated by its activities is likely to prove illusory. In a world connected economically, socially and ecologically, damage to ecosystem services, wherever it occurs, can be tracked back through mechanisms, such as the mass migration of people and other species, or food insecurity, to the impact on the health and well-being of Europeans (Adger et al, 2009; Morris et al, 2015; Reis et al, 2015).

Environmental determinants of health in the WHO European Region in 2017

For any population, there are both proximal and distal pathways through which macro-level driving forces shape the physical world, ultimately affecting human health and well-being. Environment and health activity in the 21st century must address both of these dimensions and, in parallel, the challenge of environment and health inequalities. We refer to these concepts when discussing some key components of the environmental health picture below – namely, water and sanitation, indoor and outdoor air pollution, waste and contaminated sites, chemical safety and climate change. Although not exhaustive, these themes, identified by Member States in the last cycle of the EHP, reflect very well the diversity of contemporary challenges in environment and health throughout the region.

Unfinished business

A number of environmental health issues which have been recognised throughout much of the world remain a part of the European environmental health picture, representing what might be called 'unfinished business'. For example, nearly thirty years into the EHP, it is enduringly frustrating that, while more than 90% of the population of the region has access to improved sources of drinking-water and sanitation facilities, progress with filling the remaining gap is slow and the figure masks disturbing gaps and disparities. In addition to undermining quality of life and dignity for those affected, this very proximal environmental health issue generates a significant annual burden of disease and around 10 diarrhoea deaths per day in the region (Prüss-Ustün et al, 2014). Water Sanitation and Hygiene (WASH) also involves marked inequalities with clear evidence that those in rural areas, the poor and the disadvantaged are the most negatively affected (WHO & UNICEF, 2014). Against a backdrop of disappointing progress in dealing with this problem, perhaps the most powerful observation is that diarrhoeal diseases are preventable and that, for every Euro spent improving sanitation, an economic return possibly exceeding €4.5 can be anticipated through reduced health costs, improved productivity and time savings (Hutton, 2012) – thereby securing the focus of WASH in the European environmental health agenda.

Another proximal threat is the quality of indoor air in the region, which is estimated to be related to approximately 120 000 premature deaths per year (WHO, 2014). Unfortunately, only limited data is available on exposures to indoor air pollutants in homes. Nonetheless, dampness and mould, the presence of pollution from cooking and space heating, and the many chemicals introduced from furnishings and products used in the home suggest that the domestic environment has a significant potential to negatively impact the health of its occupants if not adequately controlled. When considered alongside the extended periods spent in the home, particularly by the young, old and those vulnerable due to pre-existing illnesses, the indoor environment qualifies as an important part of the environmental health picture. The school environment, in which children, as a vulnerable population, spend significant time, is a particular concern. Preliminary findings from a number of studies in schools (Michelet et al, 2013; REC, 2014; EC, 2014) present a picture of poorly ventilated buildings where exposure to mould and dampness are widespread and chemical contaminants, such as formaldehyde and benzene, accumulate. As with WASH issues, the frustration lies in the fact that simple, common sense measures can transform the health and well-being of many of the region's citizens when introduced through policy and properly enforced, while removing a major determinant of environment and health inequality. Such measures include the use of low emission materials, good ventilation practices, proper maintenance and heating and energy efficiency. Although the scale and specifics of this threat are less well-documented than in the case of WASH, the message is, again, that this unfinished business can be successfully addressed if there is adequate focus and determination.

Recognised hazards – heightened concerns

Two topics meriting particular mention are air quality, and waste and contaminated sites. Each is an important health issue that is relevant to all Member States. Both have significant equity impacts and combine proximal and distal dimensions.

Ambient (outdoor) air quality accounts for approximately 482 000 premature deaths annually in the WHO European Region, making it the single greatest environmental threat to health which affects every Member State, albeit to differing degrees (WHO, 2014). A few decades ago the health threat from air pollution, which had been responsible for significant mortality and morbidity across the industrialised world since the mid-19th century, had largely receded in Europe in response to clean air legislation and reduced domestic and industrial coal burning.

However, urban populations are now exposed to an

insidious and health-damaging cocktail of primary and secondary pollutants from the combustion of fossil fuels in petrol and diesel vehicles, and heating and industrial sources. Society's reliance on fossil-fuel-based vehicles changed the proximal environmental state through, amongst other ways, introducing the toxic by-products of fossil fuel combustion which pollute the ambient air to differing degrees, according to location. Moreover, social patterns in both exposure and vulnerability mean that air pollution results in significant environment and health inequalities. Air pollution holds the potential to affect health through both proximal and distal pathways because the use of fossil fuels is also a major source of carbon dioxide (CO2), which is a powerful long-lasting greenhouse gas. The opportunity lies in the fact that actions which reduce society's reliance on fossil fuels can have potential to deliver the triple benefit for health, equity and sustainability.

The WHO European Region is littered with active and abandoned waste and industrially contaminated sites, and the management, treatment and disposal of solid and hazardous wastes cannot be achieved without a marked environmental impact. Some sites are active and others are no longer in use, or have been left abandoned or redeveloped for other purposes – the legacy of intense urbanization, economic development and industrialization processes in the Member States in the WHO European Region since the mid-nineteenth century. As many as 2.5 million potentially contaminated sites can be found in the 27 EU Member States alone, of which at least 340 000 need remediation, where past or current activities have resulted in environmental degradation and present a significant, although not well known, challenge to public health (Van Lidekerke et al, 2014). They include a wide range of sites such as: a single gas station or a garage disposing toxic oils; waste disposal areas and facilities associated with the mining or chemical industries; sites used for nuclear tests; and areas affected by industrial accidents. The exposure of the surrounding human populations to toxins in the air, soil, water and food has been linked to a range of health outcomes, such as cancers, cardiovascular diseases, respiratory conditions and congenital malformations. The poor management of hazardous waste, including medical and biological waste, may also create a risk of infection. More recently, it has been recognised that waste management facilities, especially if they are poorly managed, and contaminated sites undermine the quality of life of, and engender stress in, surrounding communities to the detriment of mental and physical well-being. In addition, results include environmental degradation, a disruption of ecosystem services, and a decrease in the economic value of land and property.

Contamination of water, air and soil from waste is often the result of illegal, uncontrolled or poorly managed activities, involving exposures that damage the health of surrounding human populations. The clustering of waste disposal sites in areas of social deprivation alone makes waste and contaminated sites an important equity issue.

Looking beyond the proximal issues outlined above, how waste is managed is central to aspirations to create a circular economy – one which looks beyond the 'take, make, consume and dispose' extractive industrial model – and is designed to be restorative and regenerative, maximizing efficiency and economic gain while minimizing environmental and health impacts. Any effort to address illegal waste trafficking and to secure the rigorous management of waste and contaminated sites is a significant challenge, but it can offer significant benefits for health, well-being, equity, economy and environmental sustainability.

Unquantified (or unquantifiable) risks

Perhaps the most striking example of an issue where the risk to health from environment is currently unquantified, and probably unquantifiable, is chemicals in the environment. The production of chemicals doubled from 2005 to 2015, a trend which is expected to continue, particularly in low-income countries with economies in transition. Somewhere in excess of 140 000 chemicals are in use today (UNEP, 2013), and only a small proportion of them are tested for toxicity. This suggests increases in both acute and chronic exposure by human populations to a diverse range of individual chemicals and combinations of chemicals with a significant potential for negative health effects. The Parma Declaration included a commitment to work towards identifying, reducing or eliminating the risks of the most hazardous chemicals. These include persistent organic pollutants, carcinogens, mutagens, reproductive toxicants and endocrine-disrupting chemicals. Through a variety of activities, Member States have begun to fulfil the Parma commitment and their efforts have led to a reduction in population exposure to chemicals of major public health concern (WHO Regional Office for Europe, 2013 b). The double challenge of complexity mixed with considerable scientific uncertainty characterises the scientific and policy challenge of soundly managing chemicals. Often cast as a proximal issue, chemicals carry a clear distal dimension as well. Certain chemicals, including radionuclides, persistent organic pollutants and heavy metals, have additive and synergistic effects on biological organisms. These effects, which may be irreversible, may reduce fertility and cause permanent genetic damage. While the effects are often hard to quantify, it is recognized that sub-lethal uptakes are already drastically reducing, for example, cognitive development in exposed children.

Climate change and health

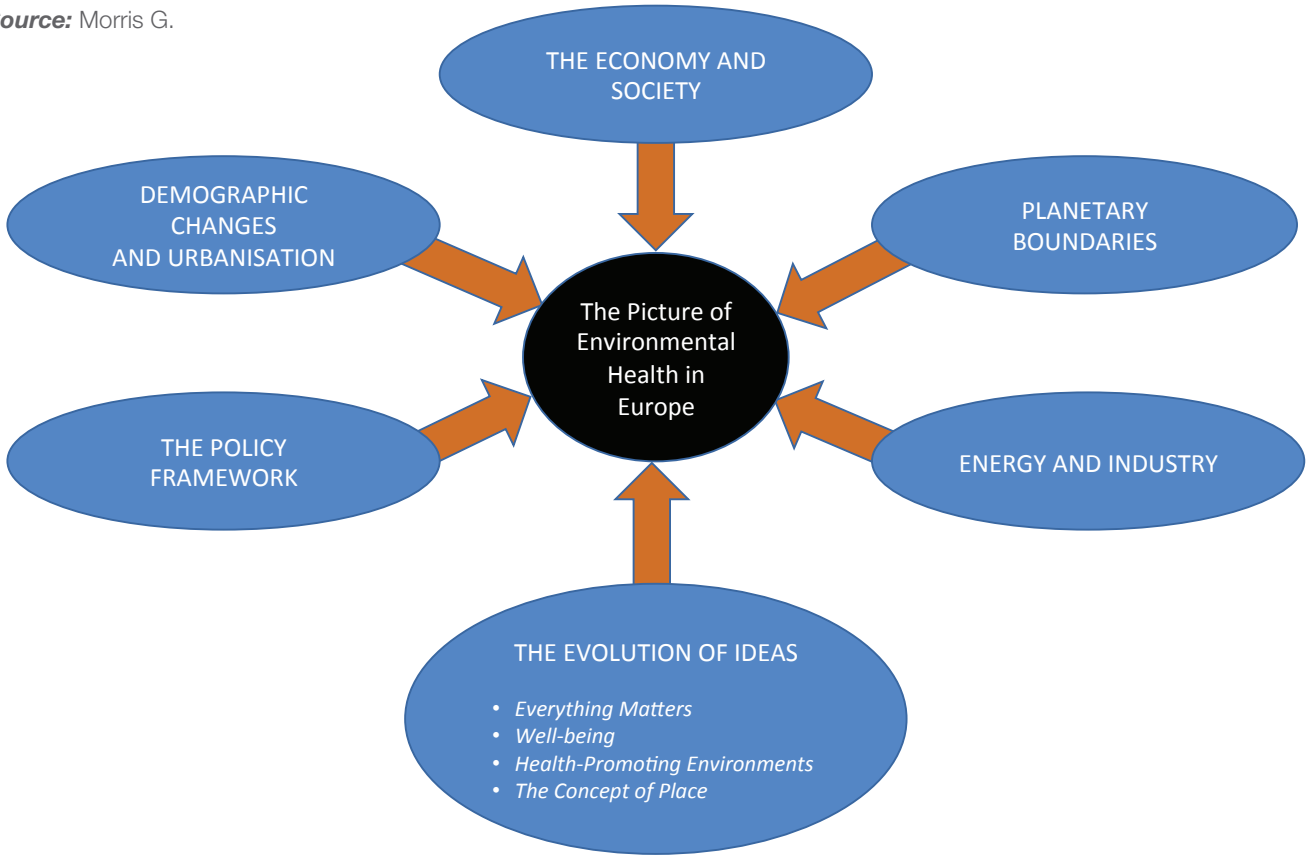
Climate change is arguably the most pressing societal challenge among the Earth's global environmental changes. The latest report of the International Panel on Climate Change Working Group II (IPCC, 2014) demonstrates that the effects of climate change, including on human health and well-being, are already being felt across the WHO European Region, and that urgent action is now required to reduce global emissions of greenhouse gases if we are to avoid the most extreme impacts in the not-so-distant future. Climate-related changes to the environment that have been predicted for the region include: sea level rise, with associated flooding and coastal erosion; inland flooding due to increased heavy rainfall; stronger, more frequent heat waves and other extreme weather events; and reductions in water availability in southern Europe. These changes to the proximal environment in Europe carry numerous direct and indirect risks for health and well-being. It is also predictable that climate-driven changes occurring beyond Europe will undermine health and well-being in the European region through various mechanisms. Only by considering both the proximal and distal pathways is it possible to gain a sense of the true landscape of risks to health, well-being and equity posed by climate change for those living in the European Member States. The Fifth Ministerial Conference in Parma in 2010 produced a commitment by all Member States of the WHO European Region to protecting health and well-being, natural resources and ecosystems, and to promoting health equity, health security and healthy environments in a changing climate (WHO Regional Office for Europe, 2010). Thus, WHO Member States are committed to climate change mitigation and adaptation in the interests of health. Addressing all of these challenges requires the identification of actions which simultaneously protect ecosystems and human health and well-being in ways which are socially inclusive, sustainable and equitable, both globally and across multiple generations (Morris et al, 2015; Reis et al, 2015).

Main factors influencing environment and health in the WHO European Region

In seeking to understand and address the contemporary environmental health picture in Europe, it is necessary to consider the most important factors that influence it, and to map the underlying web of causes, co-causes and health effects (Figure 1). On that basis, governments at all level will be better equipped to design effective, equitable, evidence-informed actions and responses.

Figure 1: Factors shaping the European environment health picture in 2017.

Source: Morris G.



In this model, some of the factors directly or indirectly drive health-relevant changes in environmental compartments, while others influence the individual's degree of exposure to the environment in their locality. Socio-economic status or socio-cultural factors may be critical in this regard through their role in shaping behaviours or underlying health. Other factors which are more specific to the individual, such as life stage or health status, can dictate health outcomes following exposure.

Demographic changes and urbanization

Complex demographic factors have a significant bearing on environmental health and on the development of related, effective, progressive policies. Unlike in some other parts of the world, where population increase is anticipated to contribute to a global population of 9.7 billion by 2050, the population of this region is predicted to remain relatively stable at below 800 000 million. The population of 14 WHO European Member States is anticipated to decline by more than 10% by 2050. Furthermore, an expected overall fall in birth rate in the region is likely to be offset by migration from other regions (UN DESA, 2015).

Rising global populations increase pressures on planetary systems and processes driving water and land-use patterns and climate change. The increasing population density, regardless of its cause, drives health-related changes at the local level wherever it occurs and is an important feature of urban health, discussed below. More people in an area: place more pressure on water supplies, sanitation, housing and transport systems; consume more resources; and increase waste and pollution with implications for health, well-being and equity. Thus, population dynamics drive impacts on global ecosystems and also change the proximal environment, both of which are important for health, well-being and equity in Europe.

Despite a relatively stable overall population, the structural change in the European region's population is dominated by rapid ageing, caused by a reduction in crude fertility rates and the fact that the region's population is now living longer. This trend will continue with an anticipated 34% of the European population being over 60 years of age by 2050 (UNDESA, 2015). Age, alongside gender, ethnicity and health status, influences the nature and extent of an individual's exposure to, or experience of, health-relevant aspects of indoor and outdoor environments. Demographic variables also influence vulnerability which may be crucial in determining whether an individual experiences a change in health status following exposure to a pathogenic or potentially health-promoting aspect of the environment. Persons who are cognitively or physically impaired by advancing age are at particular risk from some exposures. Research is revealing a more complicated picture around the age-related effects of the environment. For example, exposure to a toxic agent before birth or in infancy may be uniquely damaging and can manifest as illness or diminished capacity only later in life. The concept of windows of vulnerability to environmental agents is a further reason why demographic structure has a bearing on the European environment and health picture. This concept and its implications are now much discussed in the context of air pollution (Royal College of Physicians, 2016).

The most significant societal challenge is to create a physical and social urbanized environment which is consistent with the needs of an ageing and long-living population. Protecting and improving health and well-being into old age can only benefit individuals and society as a whole. When disorders strike – such as musculoskeletal, cardiorespiratory or cognitive – the characteristics of the physical environment in the home or neighbourhood can be the key to enabling the elderly to retain independence and enjoy a good quality of life. Importantly, creating an environment which reflects the needs of an ageing population can reduce burdensome family and social care costs.

The significant movement of human populations from rural to urban areas, and from less prosperous countries and areas to more prosperous ones, is facilitated by the freedom of movement between the countries of the European Union. Globalisation also introduces an interesting ingredient to the demographic mix. More people in Europe make their homes in cities. Although urbanisation is occurring at a slower rate in this part of the world than elsewhere, 73% of the region's population were already city dwellers in 2014, and the trend is expected to continue (UNDESA, 2014). Cities are the engines of economic prosperity, but are also places where the greatest wealth sits alongside concentrations of real poverty, social deprivation and ill health. Urban living offers employment, education, social mobility, increased gender equality and an efficient distribution of goods and services, yet these opportunities are often tempered by the higher risks of social isolation, elevated living costs, fear from or threat of violence and crime and, disproportionately for the urban poor, a degraded and unhealthy indoor and outdoor environment. Addressing the health and well-being implications of progressive and, at times, rapid urbanisation, has been a defining concern of environmental health since the 19th century. By many measures, this activity has been highly successful.

The particular characteristics of urban living in Europe in the 21st century arguably make the city a key setting for environmental health. The urban environment should be prioritized from a health and health equity perspective because most Europeans interface with the physical environment entirely, or predominantly, in an urban setting. In addition, large peri-urban and even rural settings which are connected to cities are landscaped and designed by humans through

agriculture and other land uses. Cities shape and interact with their proximal and increasingly distant surroundings through the import of workers, food, materials, water and energy, while exporting waste, pollution and heat. This creates settings that are quite distinct from untouched nature and function as unique ecosystems (Whiston Spirn, 1984). It is also in our cities that the unhealthy and unsustainable way in which today's Europeans travel, live and consume is brought most sharply into focus. This places cities at the front line in the 21st century battle to simultaneously deliver improved health and well-being, greater health equity and environmental sustainability.

The priority accorded to cars and other fossil-fuelled vehicles in cities is the key focus of the challenge. Petrol- and diesel-powered cars, vans and buses create noise and contribute massively to airborne concentrations of particulate matter, nitrous oxides, greenhouse gases and ground-level ozone. Our contemporary dependency on cars in cities reduces opportunities for active mobility and diminishes the amount and quality of green and open spaces for recreation and physical activity (Maas et al, 2006; UNEP, 2012), thus promoting obesity and its significant contribution to the overall burden of non-communicable diseases.

If current levels of urbanisation persist, the growth in urban population will be matched by the growing demand for housing and the land on which to build residential buildings, roads and public and commercial buildings. This will thereby increase urban density and sprawl, with further pressure on green and open spaces, and an increased consumption of resources. More homes also mean increased volumes of waste and wastewater and water consumption that need to be safely managed. In addition, buildings are frequently energy-inefficient, consuming resources and contributing further to greenhouse gas emissions. Indeed, cities account for 60–80% of all greenhouse gas emissions, consume 75% of natural resources and account for 50% of all waste (UNEP, 2012).

The environmental problems described above are not unique to cities. Much of the environmental challenge has its origins in our 'take, make, consume and dispose' culture which underpins the economy. Urban living creates multiple pressures on the environment, which interact in complex ways with social and economic factors and individual characteristics, to undermine health and well-being and generate inequalities. Cities, and what happens within them, also affect the global environment and ecosystem services, most obviously through their emissions contributing to climate change.

While there is a tendency to view the urban environment and progressive urbanisation from an entirely negative perspective and as the origin of many public health and environmental sustainability problems, the benefits of urban living, not least for health and well-being, are established. Carefully chosen interventions – especially in the areas of housing, neighbourhood development and urban transport – can simultaneously address health and well-being, equity and sustainability. Such interventions offer a particular promise when they target behaviour and its many structural determinants in the urban context.

The economy and society

Socio-economic factors exert a crucial influence on environment and human health and on how their challenges are addressed. Socio-economic factors and developments in global, regional and local economies work in a variety of ways to drive health-relevant changes to the physical environment and influence an individual's exposure to, or experience of, the environment in ways which are important for mental and physical health and well-being. For example, deprived urban and rural settings are disproportionately associated with a greater concentration of environmental hazards and the absence of environmental 'goods' (Marmot & Bell, 2012; Prüss-Üstün et al, 2016). Social patterns in exposure to the physical environment – when compounded by the greater vulnerability to disease and linked to the cocktail of disadvantages affecting the poor – translate into inequalities in health and well-being.

Several aspects of the current economic context are now shaping the environmental health picture in the European region in combination with social trends and processes. The consumer society typically leads people to define themselves by what they own, as they purchase and consume goods and services well in excess of their basic needs. This is now an embedded feature in societies across the globe, fuelled by advertising and planned obsolescence. The threefold expansion of the global economy since 1970 has undoubtedly increased living standards for many while driving consumerism. Understandably, those in rapidly industrialising countries desire to share the fruits of prosperity and adopt a Western lifestyle. All this leads to huge pressures on the natural world, its processes and systems. The concept of the 'material footprint', a measure used to assess resource use by populations – specifically for housing, mobility, food, energy and water supply – shows that North America has the largest footprint at 25 tonnes per capita per year. Europe is second with 20 tonnes, Asia and the Pacific follow with 9–10 tonnes per capita, and Latin America and Africa use 3 tonnes per capita (UNEP, 2016). Nowadays, mankind uses the equivalent of 1.6 Earths to absorb its waste and provide the resources we need. It is estimated that it now takes the Earth 18 months to regenerate what we use in a year because of over-fishing and over-harvesting forests, and by emitting more carbon dioxide into the atmosphere than forests can sequester (Global Footprint Network, 2017).

As implied above, despite the tangible gains in health

and well-being that economic growth has brought to many countries, its benefits and costs are unequally distributed across the world and within societies. Little or no account has been taken of the external costs of economic growth that we have come to regard as normal and 'the only way'. External costs are environmental, such as the pollution of air, water, soil and the marine environment, urban squalor, deforestation, and the depletion of natural resources; as well as social, such as unemployment and deprivation in post-industrial societies where knowledge-based economic activity has not filled the void for those negatively affected by the globalisation of trade. Many of these costs have profound negative implications for health and well-being.

A significant impact of economic growth stems from its reliance on unsustainable 'take, make, consume and dispose' processes which: deplete natural resources beyond the rate of regeneration; create excessive waste and pollution (including CO2); require ever-increasing quantities of energy; and damage ecosystems and the services they provide. A continuation of these trends makes it unlikely that society will be able to deliver health, well-being and greater equity in the medium- to long-term. In extremis they represent an existential threat to mankind.

More positive influences on the European environmental health picture flow from active promotion of the 'green economy', the concepts of the 'circular economy', and energy conservation. In simple terms, a green economy is one in which policies and innovations enable society to generate more value each year, while maintaining the natural systems that sustain us (European Environment Agency, 2016a). By extension, this is the polar opposite of economic expansion which places ever greater demands on natural systems while generating waste and pollution, thereby exceeding nature's capacity to absorb and neutralise them. Greater resource efficiency is necessary but it remains insufficient to deliver the green economy on its own. Many other changes are required – from how businesses and commercial enterprises operate, to how cities are designed and built, to how we as individuals live, move and consume. The green economy will require a fundamental rethink of society, economy and environment as a single interwoven entity.

Progression to a circular economy involves looking beyond the linear 'take, make, consume and dispose' industrial model to creating an economy which is designed to be restorative and regenerative (European Environment Agency, 2016b). A circular economy is still industrial, but pursues greater resource efficiency to reduce waste and avoid pollution. Among other transformations, it demands a move away from fossil fuels and toward renewable energy sources. Such fundamental transitions will profoundly modify a host of distal and proximal health determinants. While human health stands to benefit overall, there will be winners and losers, as has been the case with other radical changes. The active and direct participation of the health sector is therefore essential to maximize health benefits and to ensure that they are equitably distributed.

Energy and industry

Energy generation, and the ways in which we use energy, have a huge bearing on our lives and profoundly influence our health and well-being. In various ways, energy has played a key role in shaping the environmental health picture in Europe for close to 200 years.

Readily available energy from abundant coal supplies enabled mankind to stimulate and sustain a transformational industrial revolution during the 19th century with well-documented health impacts. In the 20th century, the type of society which evolved in response to a seemingly limitless supply of cheap energy underlies some of our greatest environmental health challenges today.

A number of commentators have referred to an 'energy transition' (Grubbler, 1998; Rayner & Lang, 2012) beginning with the move from, primarily, renewable energy sources in the pre-industrial era – including water, wind, the combustion of biomass, and human and animal power – to energy generated by high-output fossil fuels – including coal, oil and gas, with an often controversial contribution from another mineral energy source, nuclear, emerging in the 20th century.

Today, the positive effects for society of abundant energy from high-output fossil fuel sources are readily seen in the speed and efficiency of travel, the warmth and comfort of our well-lit homes, the ease of our communications and, more generally, in the comfort and convenience of our everyday lives. In the European Union in 2015, 33% of energy was consumed by transport, 25% by industry, 25% by households, 14% by services and 2% by agriculture (EUROSTAT, 2017). Energy transition has been transformative for society and has brought great health benefits. Yet, the negative implications for health and society are also evident.

The burning of coal – directly for domestic heating, in industry or to generate electricity – remains the biggest pollution source, and contributes significantly to the burden of environmental disease across Europe through cardiovascular and respiratory conditions, cancers and neurological effects (Prüss-Ustün, 2016; Royal College of Physicians, 2016). The combustion of coal also creates acid rain and can scar landscapes because of, for example, open cast extraction or mining wastes. Where landscapes are ugly and damaged, this may impact on the psychological well-being of local populations.

The energy transition feeds indirectly back to health and well-being through its role in enabling exponential growth in the use of cars and light vehicles powered by fossil fuel-driven internal combustion engines. The toxic threat from vehicle pollution has its roots in the availability of high-output fossil-derived fuels, which are made available through giant direct and indirect subsidies. The global obesity epidemic would benefit from the substitution of shorter car journeys by active travel options. This represents a 'metabolic' feedback to health and well-being linked to energy transition which must form part of the 21st century environment and health picture.

Industry, with its goals focused primarily on economic growth, has a distinct influence on European environment and health through its use of energy. Industrialised society throughout Europe today is inextricably attached to the availability of abundant energy from fossil fuels. Industry can be viewed as an important conduit through which the energy transition has translated benefits for society: in the form of employment, wealth, consumer goods, and pharmaceuticals; or through nurturing and disseminating the innovative, technical and scientific skills which are the building blocks for continuing prosperity. Industry has fuelled medical advances, improvements in transport and communication and much more, while transforming the lives, health, well-being and prosperity of millions. Advances in logistics and the availability of cheap transport – largely because it is subsidised by taxpayers – have profoundly changed the ways goods are produced, making the globalisation of markets economically profitable. For example, where transport is inexpensive, production and processing can be de-localised and transferred to locations where costs are lower, often due to less stringent environmental or employment standards. This results in mixed socio-economic and environmental effects which include the creation of new employment opportunities in countries with developing industries. Another result is the export of environmental pollution to new production locations. Moreover, jobs are inevitably lost in countries where original production facilities have been forced to close down. Logistics and transport have also fundamentally changed food production, with manufacturing and distribution pathways impacting global diets, food availability, accessibility and prices.

Despite the many benefits brought about by industrial and technological developments, there are countless examples where industry has negatively impacted the health and well-being of workers and the general population, particularly through chemical contamination of air, soil and water.

For example, production of chemicals is a large, rapidly growing economic sector – its global output grew from US$ 171 billion in 1970 to US$ 4.12 trillion in 2010 (UNEP, 2013). In the past 10 years, the 27 EU Member States produced 292–362 million tonnes of chemicals. Of those, 180–218 million tonnes were classified as toxic chemicals. A slow but steady decline in chemical production in the EU has been attributed to the introduction of effective legislation and the economic downturn, but it has been offset by increased imports and the migration of chemical production to developing countries. The overall use of chemicals, however, has not decreased; from 1988–2009, chemical shipments in Western Europe increased from US$ 503 billion to US$ 1.769 trillion, and in the rest of the region from US$ 46 billion to US$ 165 billion. These shipments accounted for one-third of the global total. Chemicals are not of concern for environmental health solely because of their toxic potential. In developing countries, the chemical industry is also the largest consumer of water and the largest emitter of CO2 in the manufacturing sector. Through the shift of production to developing nations, the EU Member States have been effectively exporting pollution and its negative environmental and health impacts elsewhere (UNEP, 2012).

Industrial activity has changed the social and physical characteristics of the places where we live, in ways which can have impacts on our health and well-being. Industrial facilities and associated waste and pollution are also unequally distributed across society, helping to create and sustain inequalities in health. Industry and the associated mechanisation of agriculture are probably the largest single drivers of migration to cities.

By any interpretation, both energy and industry are interrelated determinants of the contemporary environment and health picture in Europe. However, they are also areas where enlightened policies and practices can help secure improvements in health, well-being, sustainability and equity in the future.

Planetary boundaries

For most of the last 10 000 years, humans have inhabited a relatively stable and resilient planet which has been broadly conducive to human health and development and where a seemingly endless abundance of natural resources existed for supporting our lives. However, within the last 200 years, humans have become the predominant drivers of change at the planetary level. This issue and its implications were addressed by Steffen and colleagues (Steffen et al, 2015). Revisiting earlier work (Rockström, 2009), the authors reaffirmed their conviction that humans must live within nine specific limits or 'planetary boundaries' related to biophysical sub-systems and processes in order to keep the Earth hospitable. Four such boundaries had already been crossed by 2015: climate change; the loss of biodiversity; the addition of phosphorous and nitrogen to crops and ecosystems; and land use changes, including deforestation. The

authors contend that this breaches what they call a 'safe operating space for humanity', not least because the affected systems, which are in various ways connected, are very likely to respond in a non-linear fashion. This and other similar research emphasise, in the strongest terms, that a 'business-as-usual' approach is not a viable option for securing health, well-being or equity in the coming years. The situation has profound implications for the contemporary environmental health picture in Europe, starting with the necessity to dispel the notion that human beings, their economic and social activities, and their health and well-being are somehow independent and distinct from natural systems.

A fundamental rethink of society, economy and environment is necessary to regain and maintain a safe operating space for humanity, which the planetary boundaries attempt to delineate. For the WHO European Region, it is about accepting that the damage to global ecosystems, to which we all contribute, has impacts on the environment far beyond our boundaries, threatening the livelihoods, health and well-being of those who live there. Additionally, it means accepting that, in a world connected environmentally, economically and socially, environmental change elsewhere will impact on our own health through, for example, migration or food insecurity (Adger et al, 2009; Morris et al, 2015; Reis et al, 2015).

Anthropogenic damage to planetary resources and ecosystems demands that, wherever we are in the world, public health agencies must understand not only the proximal threats to health and well-being that have been the targets of public health intervention throughout the modern public health era. They also need to prevent, counteract and contain more distal threats to health and well-being. These derive from changes to environments which appear remote in space or time, or involve a complex interaction of social, environmental and economic influences.

To do so requires strengthening the capacity of public health actors to understand these interconnections. They should be prepared and empowered to use the growing body of scientific evidence to support a stronger role in advocacy and awareness-raising in a 'health-in-all policy', as well as in 'whole-of-government' and 'whole-of-society' approaches to health. The health sector should secure the enhanced capacity, role and legitimacy to engage actively in the prospective assessment of policy developments and their implications. This will take health actors beyond their traditional sphere of engagement, for example, giving them input to strategic economic decisions. The far-reaching implications for health and well-being can be made explicit when and where it matters only through such advanced engagement.

Evolving ideas

Whatever the model of choice, drawing the environment and health picture for the years to come will require novel ideas. Ideas or concepts concerning health, environment and their relationship, and the interventions that are appropriate and justifiable, evolve with time. The evolution of ideas in environmental health has typically been driven by: scientific and technological advances; research in medical, social and other sciences, including epidemiology; and socio-cultural influences.

Some ideas emerging in recent decades have been particularly influential in changing the current environmental health picture. A very important such development in the field of public health – with significant implications for the understanding of environment and health in this region and globally – has been the emergence of socio-ecological perspectives, at times referred to as socio-ecological models of health (Dahlgren and Whitehead, 1992; Evans & Stoddart, 1994). The underpinning logic of the socio-ecological model, translated into a policy framework in Health 2020, is that health and well-being are invariably created, promoted, damaged and destroyed by a complex interaction of factors, including the physical environment, which act at the level of society in combination with characteristics specific to the individual. By extension, policies which address a single class of determinants, such as behaviour and lifestyle, or a particular aspect of the social or physical environment in isolation, are unlikely to achieve anticipated improvements in health, well-being or health equity. Success is more likely to be delivered by approaches which address a number of contributory factors in parallel.

Socio-ecological perspectives play a central role in understanding and addressing contemporary major public health issues, such as non-communicable diseases, obesity and diminished mental health and well-being, as well as outbreaks of communicable diseases, such as Ebola. As socio-ecological perspectives become embedded across public health, there is growing recognition that the most important contribution of the environment to health may often be as part of a cocktail of influences which exist in a particular location. Cities are an example of a complex setting where a variety of social, environmental and economic factors, both negative and positive, converge to shape health and well-being outcomes for urban dwellers. Despite many complex challenges which urban life presents for environmental health, healthy urban policies have significant potential to support health and well-being, tackle inequalities and promote sustainability – thereby benefitting the largest proportion of people in the WHO European Region today.

The policy framework

The European Environment and Health Process (EHP), itself being a policy creation, places reliance on a web of global, regional and national policies which provide mandates and areas of action for the health and environment sectors across the European region. Policies are emerging to become key features of the landscape within which the process operates and are shaping its future trajectory. The EHP must be harmoniously integrated with, and add value to, the relevant current global and international policy frameworks. Since the Parma Conference, three major policies have established themselves at the regional and global levels and now dominate the landscape. Each is innovative and profoundly relevant to environmental health. They create the ideal policy combination for driving a process tailored to the challenges of the 21st century.

Adopted by the WHO Regional Committee for Europe in 2012 as the policy for health and well-being of the European region, Health 2020 constitutes the first part of the policy environment (WHO Regional Office for Europe, 2013,a). Health 2020 is the most authoritative recognition, in policy to date, that neither chronic diseases nor growing health inequalities will ever be effectively addressed unless all sectors of government and wider society engage with the health sector to confront the challenges. The goal of Health 2020 is expressed as: improving the health and well-being of populations; reducing health inequalities; strengthening public health; and ensuring people-centred health systems that are equitable, sustainable and of high quality. In adopting 'resilient communities and supportive environments' as one of the four priority areas for action in the WHO European Region, Health 2020 makes the importance of environmental determinants explicit in the pursuit of its goal.

The second element of the new policy platform is contributed by the 2030 Agenda for Sustainable Development, formally adopted by the UN General Assembly in September 2015. Global in its reach and presented as "universal, integrated and transformative", the Agenda and its 17 Sustainable Development Goals (SDGs) build on the Millennium Development Goals. The purpose is to mainstream sustainable development in the UN system as a whole and in policies across all sectors and issues. The health goal, SDG3 – Ensure healthy lives and promote well-being for all at all ages – reflects a level of ambition found in all of the 17 goals, but it is abundantly clear that progress towards every one of them depends, to differing degrees, on progress towards SDG3. Underpinning the entire SDG process is also the statement that "no one will be left behind" – giving the 2030 Agenda for Sustainable Development a very explicit and essential commitment to address inequalities wherever they exist between and within regions and nations.

The third and most recent element of the new policy platform is represented by the New Urban Agenda (NUA) adopted by the UN Habitat III Conference in October 2016. It recognises the critical role of cities in achieving sustainable development, reiterating the commitment to inter-linked social, economic and environmental principles, and rethinking the way we build, manage and live in cities. The novel aspect of this NUA, however, is the recognition that, while national governments play a leading role in the definition and implementation of inclusive and effective urban policies and legislation for sustainable urban development, it is sub-national and local governments, as well as civil society and other relevant stakeholders, that have an equally important contribution to make (United Nations, 2016).

Figure 2: Factors shaping : Sustainable Development Goals and environment-health links.

Source: Prüss-Ustün A, Wolf J, Corvalan C, Niera M. Preventing disease through healthy environments. A global assessment of the burden of disease from environmental risks. Geneva: World Health Organization; 2016 (http://apps.who.int/iris/bitstream/10665/204585/1/9789241565196_eng.pdf?ua=1, accessed 2 May 2017).

Conclusions

In summary, environmental health is integral to key international policy instruments which, if effectivey implemented, can deliver the triple win of health and well-being, equity and sustainability for Europe as the 21st century unfolds. Together, these policies are the determining platform for the EHP and, in turn, the EHP is a key mechanism for their delivery.

It has been observed that environmental health, quintessentially interdisciplinary, has suffered most from a lack of progress in inter-sectoral collaboration (Prüss-Ustün et al, 2016). There is cause for real optimism that, by presenting the interconnectivity and mutual dependence of so many agendas with clarity, Health 2020 and the SDGs together may overcome the obstacles, vested interests and absence of true ownership that have dogged inter-sectoral collaboration since it was first advocated in public health (WHO/UNICEF Alma Ata Declaration, 1978).

The policy environment offered by the combination of Health 2020 and the Sustainable Development Goals provides the ideal framework to facilitate the recognition of the inter-connectivity and inter-dependencies which exist between environment, health, well-being and the socio-economic dimensions of development. It will also help the European region address what is humanity's most threatening 21st century challenge.

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The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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