

Review article

Health and Environmental Sustainability: Public health issues for present and future

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Abstract:

The medical definition of environmental causes of diseases would be all those factors that are not genetic. Environmental factors include all those factors those affect human health mediated by social conditions and individual choice or environment. 'Sustainable' includes the environmental issues and 'development' includes the economic issues. Climate change alters or disrupts natural systems, making it possible for vector, water, and food-borne diseases to spread or emerge. Climate change can affect the incidence of diseases associated with air pollutants and aeroallergens. Clean air is considered to be a basic requirement of human health and well-being. Poverty increases vulnerability to climate-sensitive health outcomes directly by reducing the capacity to adapt to changing conditions. For countries in the early stages of development the major environmental hazards to health are associated with widespread poverty and severe lack of public infrastructure, such as access to drinking water, sanitation, and lack of health care as well as emerging problems of industrial pollution and also urban waste based pollution. A healthy population is a prerequisite for a productive and creative society, which in turn is needed to sustain national development. Social determinants affect the environmental conditions of an individual and may contribute to the fact that specific individuals or population groups more often experience less adequate or potentially harmful environmental conditions; may directly affect exposure beyond and in addition to the exposure. Enhancing environmental sustainability, through reducing carbon emissions, curtailing waste, and managing resources efficiently, will deliver healthy outcome, and provide broader social and economic benefits.

Key words: Environment, Sustainability, Public Health.

Introduction:

The strict medical definition of environmental causes of diseases would be all those factors that are not genetic. This is the classic dichotomy between "nature" and "nurture," in which environmental factors include all those that affect the organism after conception regardless of whether they are mediated by social conditions and individual choice or through environmental media. Even mutation, natural selection, and other mechanisms of evolution have changed the genetic composition of humanity according to environmental conditions existing in the past.¹

The term sustainable development, as originally conceived by the 1987 World Commission on Environment and Development (the "Brundtland Commission"), was meant to entail "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs". It was coined as part of an effort to bring "environmental" issues into the mainstream of development, recognizing that in order to address the escalating problems related to the environment, the root causes which lay in the broader development process and the global economic system needed to be addressed.²

As originally articulated, 'sustainable' captures the

environmental issues (assumed to centre on the needs of *future* generations), while 'development' captured the economic/poverty issues (assumed to centre on the needs of the *present* generation). The concept has since been broadened, in recognition of the non-environmental aspects of sustainability, and the non-economic aspects of development.³

Effects of Climate change:

Climate change can affect health directly and indirectly. Directly, extreme weather events (floods, droughts, windstorms, fires, and heat waves) can affect the health of people and cause significant economic impacts. Indirectly, climate change can alter or disrupt natural systems, making it possible for vector, water, and food-borne diseases to spread or emerge in areas where they had been limited or not existed, or for such diseases to disappear by making areas less hospitable to the vector or pathogen. Climate change can also affect the incidence of diseases associated with air pollutants and aeroallergens. The cause-and-effect chain from climate change to changing patterns of health outcomes is complex and includes factors such as initial health status, financial resources, effectiveness of public health programs, and access to medical care. Therefore, the severity of future impacts will be determined by changes in climate as well

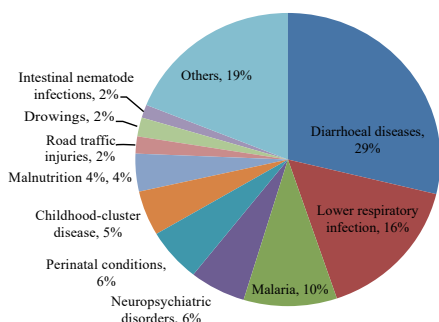
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as by concurrent changes in non-climatic factors and by adaptations implemented to reduce negative impacts.⁴ There is increasing recognition that environment and health impacts require economic assessment in order to receive adequate consideration in policy. Studies confirm that approximately one-quarter of the global disease burden, and more than one-third of the burden among children, is due to modifiable environmental factors.

Global situation of Under five children disease burden



***Source: World Health Organization. Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease. Available online: http://www.who.int/quantifying_ehimpacts/publications/preventingdisease/en/index.html (accessed 24 September 2019).⁵

Clean air is considered to be a basic requirement of human

health and well-being. However, air pollution continues to pose a significant threat to health worldwide. According to a WHO assessment of the burden of disease due to air pollution, more than two million premature deaths each year can be attributed to the effects of urban outdoor air pollution and indoor air pollution (caused by the burning of solid fuels). More than half of this disease burden is borne by the populations of developing countries.⁶ Climate variability records suggest ambient temperature change will affect domestic water supply from surface water source. Therefore, it seems reasonable to speculate that global scale climate variability may influence water supply in river basins around the world. River basin managers seek tools to address climate variability.⁷ Poverty, which was identified as a risk factor, increases vulnerability to climate-sensitive health outcomes directly by reducing the capacity to adapt to changing conditions and is often positively correlated with increasing susceptibility to climate-sensitive health outcomes. Because the conditions associated with being poor may change over time, the future risk associated with being poor also may change. The degree of risk associated with being poor will reflect not only a changing climate but also changes in the number of people living in poverty and their associated standard of living, both of which are uncertain.⁸

Table 1: Mechanism by which above average rainfall can affect health

Event	Type	Description	Potential health impact
Heavy precipitation event	Meteorological	Extreme event	Increased mosquito abundance or decreased (if breeding sites are washed out)
Flood	Hydrological	River/stream over tops its banks	Changes in mosquito abundance, contamination of surface water
Flood	Social	Property or crops damage	Changes in mosquito abundance, contamination of surface water with faecal matter and rat urine (leptospirosis)
Flood	Catastrophic flood/ disaster	Flood leading to >10 killed, and/or government call for external assistance	Changes in mosquito abundance, contamination of surface water with faecal matter and rat urine and increased risk of respiratory and diarrhoeal disease deaths, drowning, injuries, health effects associated with population displacement, loss of food supply and psychosocial impacts.

***Source: Kovats R. El Niño and health. Geneva, Switzerland, World Health Organization 1999. Available from: URL: <https://www.who.int/globalchange/publications/climatechangechap5.pdf>⁹

Table 2: Mechanism by which below average rainfall can affect health

Event	Type	Description	Potential health impact
Drought	Meteorological	Evaporation exceeds water absorption, soil moisture decreases.	Changes in vector abundance if vectors breed in dried up river beds, for example
Drought	Agricultural	Drier than normal conditions leading to decreased crop production	Depends on socio-economic factors, i.e. other sources of food available and the means to acquire them.
Drought	Social	Reduction in food supply or income, reduction in water supply and quality.	Food shortage, illness, malnutrition, increased risk of infection.
Drought	Food shortage/famine/drought disaster	Food shortage leading to deaths >10 killed, and/or government call for external assistance.	Deaths (starvation), malnutrition (increases risk of infection) health impacts associated with population displacement.

***Source: Kovats R. El Niño and health. Geneva, Switzerland, World Health Organization 1999. Available from: URL: <https://www.who.int/globalchange/publications/climatechangechap5.pdf>⁹

Climate is a key determinant of health. Climate constrains the range of infectious diseases, while weather affects the timing and intensity of outbreaks. A long-term warming trend is encouraging the geographic expansion of several important infections, while extreme weather events are spawning 'clusters' of disease outbreaks and sparking a series of 'surprises'. Ecological changes and economic inequities strongly influence disease patterns. But a warming and unstable climate is playing an ever-increasing role in driving the global emergence, resurgence and redistribution of infectious diseases.¹⁰

However, huge economic development and population growth result in continuing environmental degradation. Intensification of agriculture, industrialization and increasing energy use are the most severe driving forces of environmental health problems. For countries in the early stages of development the major environmental hazards to health are associated with widespread poverty and severe lack of public infrastructure, such as access to drinking water, sanitation, and lack of health care as well as emerging problems of industrial pollution and also urban waste based pollution.¹¹

Since many of the key determinants of health and disease provide insights into the fundamental problems in health transition, whilst an epidemiological transition enhances our concepts of diseases that are continuously evolving in diverse ways with many scientific investigations and findings supported, refined and unfolded our progressive understandings in the influence of the eco-environments on human health. Consequently, ecological reasoning as a developing theme in the sciences and arts, which must apply to epidemiology for an appreciation of complexity in the enhancement of public health thinking that human and ecosystems health is interdependent.¹²

The emergence of the concept of sustainable development as a guiding principle for policy formulation, the adoption at the UN Conference on Environment and Development (UNCED) in 1992 of Agenda 21, and subsequent adoption of the Programme for the Further Implementation of Agenda 21, have been important stimuli at international, national and local levels, for innovative programmes of action to address current environment, health and development problems. The Rio Declaration, for example, states that, "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature." Further, Chapter 6 of Agenda 21 emphasizes the fundamental commitment within sustainable development to "protecting and promoting human health".³

Today, one-half of the world's population is exposed to malaria on a daily basis. Deforestation, drug and pesticide resistance and inadequate public health measures have all contributed to a recent resurgence. Warming and extreme weather add new stresses. Dynamic models project that the warming accompanying the doubling of atmospheric CO₂ will increase the transmission capacity of mosquitoes some 100-fold in temperate zones, and that the area capable of sustaining transmission will grow from that containing 45% of the world's population to 60%.¹⁰

Since environmental health aims to protect not only present but also future generations, is very much in line with the concept of sustainable development, which is defined by the Brundtland Report as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs". This link between environmental health and sustainable

development needs to be emphasized, and national and global policies in these areas should be complementary and mutually beneficial. A healthy population is a prerequisite for a productive and creative society, which in turn is needed to sustain national development. Uncontrolled and unsustainable development that overexploits the natural environment and its resources, however, is a major cause of environmental health problems.¹³

The prevalence of human diseases and is increasing rapidly worldwide, as is the number of deaths from diseases. The ecology of increased disease is exceedingly complex because of the diversity of infectious organisms and the effects of environmental degradation on the prevalence of disease. The rapid expansion of human populations is a major factor in the rise of human diseases: Humans living in crowded, urban areas are in an ecosystem that is ideal for the resurgence and rapid spread of old diseases as well as for the development and spread of new diseases. The unprecedented increase in air, water, and soil pollutants, including organic and chemical wastes, further stresses humans and increases disease prevalence. In particular, widespread malnutrition enhances the susceptibility of humans to infectious pathogens and other diseases. Global climate changes enhance the development of some disease vectors, increase the susceptibility of food crops to some pests and intensify food shortages and malnutrition. A concurrent problem is the rapid expansion in the number of “environmental refugees”, living in poverty and desperate for food, flee their home areas in a search for survival. Their malnutrition, stress, and dislocation foster the resurgence of old diseases and the development of new ones.¹⁴

Several concurrent crises have either sprung up or accelerated during the last decade: crises in climate, biodiversity, fuel, food, water, and of late in the financial system and the economy as a whole. Accelerating climate-changing emissions indicate a mounting threat of runaway climate change, with potentially disastrous human consequences.¹⁵ Socio-economic status (SES) plays a role in the susceptibility of a population to air pollution; people with a lower SES appeared to have an increased risk of death from respiratory causes, particularly COPD. Compared with the general population, infants and young children appeared to be more susceptible.¹⁶

Protection of Environment:

Social determinants affect the environmental conditions of an individual and may contribute to the fact that specific individuals or population groups more often experience less adequate or potentially harmful environmental conditions; may directly affect exposure beyond and in addition to the exposure. Given the same exposure, (socially) disadvantaged groups could show more severe

health effects.¹⁷

Protecting and creating healthy environments is a critical component of sustainable development. Environmental health can be integrated into sustainable development by Improving environmental quality for the poorest populations with the greatest burden of environmental diseases, by reducing exposures to air pollution in homes and villages from biomass burning, and providing clean water and sanitation, identifying efforts to address environmental problems that can also provide health benefits. For example, creating environments that encourage biking and walking for transportation reduces greenhouse gas and toxic air pollution emissions (environmental benefit) and increases physical activity (health benefit) and above all recognizing that some policies, practices, and technologies designed to promote sustainability and economic development may have unintended adverse environmental health effects, and attempting to prevent or mitigate these before they are implemented.¹⁸

Conclusion:

Achieving environmental sustainability in health care is essential to improve the way health system functions. Enhancing environmental sustainability, through reducing carbon emissions, curtailing waste, and managing resources efficiently, will deliver better outcomes for patients, and provide broader social and economic benefits.¹⁹

The environmental health community can make three key contributions to achieving sustainable development objectives: 1) supporting efforts to reduce modifiable environmental exposures that continue to perpetuate poverty in low- and middle-income countries (LMICs); 2) characterizing the environmental impacts of existing industries, technologies, and land-use patterns that are harmful to human health and 3) foreseeing potential unintended health effects of “green” technologies, industries, and occupations that will evolve out of efforts to promote sustainability.²⁰

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