

Exploring the climate-environment-health nexus: Insights for informed action

Harvey V. Fineberg

President of the Gordon and Betty Moore Foundation and member of the Veolia Institute's Foresight Committee



Harvey V. Fineberg has been the president of the Gordon and Betty Moore Foundation since 2015 and is a member of the Veolia Institute's Foresight Committee. He previously served as the president of the U.S. National Academy of Medicine (2002-2014) and was the Dean of the Harvard Chan School of Public Health (1984-1997). Prior to joining a philanthropic foundation, he devoted most of his academic career to the fields of health policy and medical decision-making. Dr. Fineberg has co-authored and co-edited several books and is the recipient of various honorary degrees and other awards, such as the Henry G. Friesen International Prize in Health Research.

Human health, the environment, and climate change are intricately linked. The environment, encompassing physical, biological, and social dimensions, profoundly influences our health. Climate change, as a pervasive force, impacts human health directly, for instance through extreme weather events, and indirectly through phenomena like air pollution from wildfires, and alterations to ecosystem services. Our understanding of health has evolved over time from ancient philosophical roots to modern scientific insights. While the environment was gradually integrated into this understanding, climate change remains a pressing concern that is often overlooked in health policies. Addressing climate-related health risks demands a multi-faceted approach, drawing also on practices from

Eastern and indigenous cultures that emphasize the interconnectedness of humans and the environment. Collective action and policymaking are essential to mitigate these risks, alongside individual contributions. Effective action entails adopting a preventive mindset and ambitious policies to reduce climate change drivers, mitigate impacts, and promote resilience in human populations. Overcoming the growing distrust of science through education and awareness is also crucial. As societies confront these challenges, it is imperative to envision a future where we not only survive but thrive as a society, embracing sustainability and resilience as guiding principles for a healthier and more equitable world.

FROM A BROAD PERSPECTIVE, WHAT ARE THE MAJOR FACTORS INFLUENCING HUMAN HEALTH, AND IN WHAT WAYS DOES THE ENVIRONMENT PLAY A ROLE IN THESE FACTORS?

To begin, it may be valuable to adopt a scheme that was first articulated more than 50 years ago by the Canadian Minister of Health Marc Lalonde. In his proposals, Mr. Lalonde outlined four sources of health and illness. First, our genetic endowment; second, our lifestyle or self-care, which includes the habits we adopt, the foods we eat, and whether we consume alcohol and drugs. Third, the medical care that we receive; and finally, the environment. 'Finally' does not mean the least

impactful; the environment is actually a profound source of influence on human health. Our environment encompasses a physical environment, a chemical environment, a biological environment, and a social environment. And all these dimensions have a profound impact on the life-chances, health, and well-being of each of us.

We have varying degrees of control over these four influences on health. Genetic endowment is regarded as a given; it sets the stage, it is the template upon which everything depends, it gives us the potential for the degree of health we can individually enjoy. In the not-too-distant future, even our

genetics might be subject to intervention. Among the first genetic treatments for a specific genetic disease – sickle cell anemia – has been approved by regulatory authorities both in Europe and in the United States. Although its current use is limited due to high costs, it represents a harbinger of a future class of interventions.

Today, we have the most direct control over our lifestyle choices. Yet even these choices are significantly conditioned by our environment. We believe we are choosing what we eat, but our food choices are embedded in the history, the culture, and the living conditions in which we were raised. So even things that we believe to be individual choices have their roots in our social and cultural environment and are shaped by geography and economics.

Medical care is another determinant, but on a population health basis, often less powerful than genetics, lifestyle, and environmental factors. For individuals with specific medical conditions, medical intervention can be critical and enhance the quality and duration of life.

One reason the environment plays a crucial role in our health is its pervasive nature. The environment surrounds us throughout our entire lives. It is the air we breathe, the water we drink, the food we consume, the interactions we experience, the stress, the joys, the exposures to chemicals or infections depending on our work or our place of living, and the susceptibility to homelessness or other sources of disruption in our lives. It is omnipresent and unavoidable. And improving the environment often depends on collective choice rather than individual action.

HOW DOES CLIMATE CHANGE AFFECT THE ENVIRONMENT, AND BY EXTENSION OUR HEALTH?

When considering climate change, we can differentiate between direct effects and indirect effects on human health. Climate change means that the planet is warming on average though impacts vary greatly by region. Consequently, we observe a series of extreme weather events that can be paradoxical, mixing both increasing droughts and risks of floods due to altered precipitation patterns. As the average temperature rises, these extreme events will become more frequent, directly impacting human health. For example, recent heatwaves in Europe had dire impacts on human health, causing heat exhaustion, heat strokes and death, especially among the elderly or otherwise vulnerable individuals for whom hotter temperatures can be detrimental, and even fatal.

The indirect effects of climate change are even more profound. One significant risk that has become evident, for example, is the increased frequency of wildfires, affecting every continent except Antarctica. From North to South America, from Europe to Asia, wildfires have become more and more prevalent. Wildfires are dangerous to a double extent: they cause direct damages, destroying lives, property, and natural

environments. And the smoke from wildfires, which generates severe air pollution as fine particulate matter, can be even more detrimental to human health. In many parts of the world, air pollution levels already dramatically exceed safe thresholds due to the burning of fossil fuels, impairing the quality and longevity of life by hastening pulmonary lung disease, heart disease, and other illnesses.

COULD YOU SAY A FEW WORDS ON THE ECOSYSTEMS AND THEIR ROLE FOR HUMAN HEALTH? HOW DOES CLIMATE CHANGE AFFECT THIS RELATIONSHIP?

In a broader context, the concept of ecosystem services encompasses the various ways in which human well-being is supported by the functions of a given ecosystem, such as ensuring air quality or cleaning and filtering water to make it safer for humans. However, these functions are altered by climate change, which indirectly impacts water quality by precipitating biological changes that, for example, lead to the proliferation of algal blooms, thereby compromising water safety.

Additionally, a significant effect of climate change is likely to arise from changes in the ecology of disease vectors. Warmer temperatures will promote spread of mosquitoes to new areas, allowing them to survive at higher elevations than in the past and bringing them into more frequent and extensive contact with human populations.

LOOKING AT THE HISTORY OF MEDICINE, HOW HAS THE UNDERSTANDING OF THE INTERRELATIONSHIPS BETWEEN HEALTH, THE ENVIRONMENT, AND CLIMATE CHANGE EVOLVED OVER TIME WITHIN MEDICAL THEORY AND PRACTICE?

Human understanding of disease and its origin varies across cultures and regions of the world. In the Western tradition, health can be traced back to Aristotle's concept of the four humors, which attributed health and illness to the balance or imbalance of bodily constituents. This paradigm profoundly influenced medical thinking until the Renaissance, when more modern thinkers, partly in arts but also in medicine, began to examine human bodies and understand the origins of pathologies by observing changes in organs and tissues.

Over the last few centuries, the significance of biological threats and environmental hazards emerged. By the mid-19th century, the concept took hold of miasma or amorphous vapors conveying disease. The term 'malaria' means 'bad air' in Italian, highlighting the idea that diseases were somehow conveyed by dangerous vapors. Though scientifically misguided, these notions of the environmental origin of illness laid the groundwork of the modern sanitation movement.

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Louis Pasteur (1822-1895) ↓

The field of epidemiology often traces its roots to the work of John Snow during the outbreak of cholera in London in the 1850s. Snow documented the temporal and spatial relation of cases to homes served by a particular source of water drawn from polluted sections of the Thames River. The exact nature of water contamination was not fully comprehended at the time, but it was clearly associated with disease.

The pioneering work of scientists such as Louis Pasteur and Robert Koch in the late 19th century began to identify microorganisms responsible for human and animal diseases. Infectious diseases impose a huge burden on humanity, and various infectious organisms can be transmitted through a wide variety of environmental exposures, including inhaled air droplets (tuberculosis, measles, SARS-CoV-2), food and unpasteurized milk (salmonella, campylobacter, E. Coli), contaminated water (cholera, shigella), sexual relations (HIV, syphilis), blood exposure (hepatitis), insect vectors (malaria), and direct penetration through the skin (hookworm).

“Because climate change is pervasive, its effects were so widespread that they went unnoticed; it was so obvious as to be unseen.”

Over the course of the 20th century, many other risk factors for disease came into focus, including prior conditions, such as high blood pressure, and lifestyle choices, such as tobacco use. Landmark studies such as the Framingham Heart Study established the connection between diet and risk factors like hypertension for cardiovascular disease. Other studies can be cited, such as the Nurses’ Health Study, which followed hundreds of thousands of nurses over time, investigating the relationship between lifestyle factors and outcomes in women’s health. The Six Cities Study, followed by the Twenty Cities Study, underscored the link between air pollution, especially small particulates, and life expectancy. The famous Whitehall studies in London examined the life course of civil servants and discerned a relation between social class and risk of premature death. This opened an important era of appreciation of the power of social determinants of health.

It has long been understood that climate and weather, along with other geographic features, affect the distribution of infections and other diseases. Climate change, and the new extremes it produces, has only more recently been recognized as a potent determinant of health. Because climate change is pervasive, its effects were so widespread that they went unnoticed; it was so obvious as to be unseen.

THIS OVERVIEW YOU GAVE US FOCUSES ON THE WESTERN WORLD. ARE THERE ANY SPECIFIC APPROACHES TO ENVIRONMENTAL HEALTH IN OTHER PARTS OF THE WORLD THAT OFFER VALUABLE LESSONS FOR US?

The Western medical tradition incorporates a notion of internal physiological equilibrium or homeostasis, as posited by Claude Bernard in the 19th century. However, other health and cultural systems in the East and in many indigenous communities in the Americas and Australia, emphasize the concept of human harmony with the environment. These communities have lived for eons in equilibrium with their environments, fostering a profound connection and appreciation of the environment as intrinsic to human existence, and seeing humans in connection with the environment. Many of these traditional practices offer thoughtful lessons for us today.

For instance, prescribed burns to reduce the risk of major, very hot wildfires are a traditional native practice aimed at maintaining forest health. Certain trees, when young, need sunlight to flourish, so a thinner wildland will be more conducive to the next generation’s growth than a dense, overgrown, and fuel-laden woodland. Another example is the traditional harvesting of wild rice in the Great Lakes region of Northern America. Native Americans used to limit their harvesting days and return some of the grains to the lake, seeding the next crop. Early Europeans traders wrongly regarded this practice as wasteful, failing to recognize it as a way of maintaining harmony with the environment by giving back to it.

Today, there is a growing recognition of the wisdom in many traditional practices. The outdated ideals of progress in Western civilization, from the Renaissance onward, which emphasized consumption, efficiency, productivity, and control are now reaching their limits in terms of human well-being. Non-Western ideas centered on health, overall well-being, resilience, and survival, have begun to influence the thinking of Western-oriented scholars, thinkers, and leaders in recent decades.

YOU SAID EARLIER THAT CLIMATE CHANGE “WAS SO OBVIOUS AS TO BE UNSEEN”. WHY HAS CLIMATE CHANGE BEEN A HEALTH BLIND SPOT FOR SO LONG? AND WHY DO WE, AS A SOCIETY, STRUGGLE TO ADDRESS IT AND TAKE APPROPRIATE ACTION?

I think there are at least four major reasons. First, while climate change is profound, measurable, and undeniable, its progression is very slow. It is not a matter of a sudden increase in average temperature, although the last decade has been the warmest ever recorded in history. But even that decade spans a full ten years. Throughout the same timeframe, certain individuals may have encountered cold spells in their communities, influencing them to perceive a colder climate despite global trends. Thus, the reality of the average global temperature does not penetrate individual perceptions. This situation echoes the traditional metaphor of the frog that, when put in water that is gradually heated, will not perceive the danger and move. But when put directly in hot water, the frog will immediately react and jump out.

A second reality is that the impacts we are discussing primarily exacerbate existing conditions. Climate change worsens phenomena that are already familiar rather than introducing dramatically different ones. We have always had hurricanes, floods, droughts, and wildfires. Therefore, it is easier to ignore or normalize the increase of these events over time as they do not seem entirely novel.

Third, there are significant political challenges in implementing targeted pain or harm for broader social benefits. For instance, efforts to reduce fossil fuel dependence will face substantial resistance because the global general good and long-term benefits are not perceived as immediately tangible compared to the focused harm faced by those directly affected.

Lastly, I would add that our political systems, for the most part, are designed to respond to crises and emergencies rather than being planful, proactive, and forward-thinking in policy adoption. Urgency and emergency tend to command immediate attention, overshadowing the importance of acting for long-term human value. Therefore, all these factors – slow movement, familiarity, targeted harm, and non-emergent character – contribute to relative neglect and make it challenging to capture public attention and influence policymaking.

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WHAT IS OUR REAL CAPACITY FOR ACTION, CONSIDERING THE IMPERCEPTIBILITY OF CLIMATE CHANGE AND THE COLLECTIVE NATURE OF ENVIRONMENTAL HEALTH?

Certain aspects of environmental health depend on collective actions, such as the quality of the air we breathe or the water we drink, which are more subject to collective control rather than individual choice. This underscores the importance of collective decision-making in influencing the health and wellbeing of each of us. Only through collective efforts can we diminish dependence on fossil fuels and establish the conditions for healthier air, cleaner water, and sustainable food sources.

But, at an individual scale, we also have the capacity to take meaningful steps. We can reduce personal reliance on fossil fuels, minimize our environmental footprint, and improve our nutrition while promoting sustainable food practices. On this

score, numerous initiatives aim to adapt food distribution mechanisms to ensure equitable access, particularly for those who are vulnerable to food insecurity. There is no reason, anywhere on the planet, to have starvation. This is fundamentally a human construct as global food production today

is capable of meeting everyone’s needs. Amartya Sen, Nobel Laureate in Economics and a former member of the Veolia Institute’s Foresight Committee, made a powerful argument regarding the choice of famine, emphasizing not the necessity, but the human-driven factors behind it.

Perhaps most importantly, we have the power to elect officials who will prioritize long-term environmental challenges and understand the far-reaching impacts of climate change. We can appoint representatives who are willing to be in the lead, not merely follow, and who will make the right choices, with foresight, for communities, nations, and humanity.

IN 2024, NEARLY HALF OF THE GLOBAL POPULATION WILL VOTE IN A NATIONAL ELECTION, MARKING A CRUCIAL YEAR FOR DEMOCRACY. AMID RISING CONSPIRACY THEORIES AND A SKEPTICISM TOWARD SCIENTIFIC CONSENSUS, HOW CAN WE ENCOURAGE PEOPLE TO ELECT OFFICIALS WHO SUPPORT SCIENCE?

You are delving into a very profound and underlying mega-challenge. By mega-challenge, I mean a huge issue, unbounded by national borders, often interconnected with other mega-challenges, and unsolvable except through multinational action. Climate change, poverty, and pandemics are all mega-challenges. What you are raising now is the public’s understanding of and confidence in science and evidence. The doubt becomes pervasive: individuals are questioning evidence and authority, showing skepticism toward science, leading to hesitation or resistance to vaccination and immunization efforts. People continue to doubt climate change and its reality.



This poses a crucial long-term educational and psychological challenge: we must help people understand why science is trustworthy, even amidst uncertainty. Paradoxically, the uncertainty of science is a source of trustworthiness, as it means science is subject to improvement based on evidence over time. We could trace origins of public skepticism in science to the power of social media in amplifying extreme and erroneous ideas and to the reliance of some authoritarian leaders on spreading the ‘big lie’ to persuade people: the ‘big lie’ is so outrageous that it must be true, because why else would they say it? These challenges of understanding and confidence are deeply interconnected with public attitudes toward climate change, and this constitutes a mega-challenge of our time.

GIVEN THE IMPORTANCE OF POLICYMAKING IN ADDRESSING COLLECTIVE APPROACHES TO HEALTH, HOW WOULD YOU ENVISION AN APPROPRIATE INTEGRATION OF CLIMATE-RELATED RISKS INTO HEALTH POLICIES?

When it comes to integrating climate-related risks into health policies, I would parse the possibilities into three major categories. The first is the imperative to reduce the drivers of climate change and environmental degradation and their impact on health. In other words, we must reduce fossil fuel use, not only because of its climate effect but also due to its dire impact on human health. This also involves tackling issues such as overfishing in the seas, deforestation for cattle and soy production, and degradation of mangrove ecosystems in coastal regions, all of which impact both climate and ecosystem vitality.

Second, we can mitigate the effects of climate change, which means finding ways to manage and control the impacts that are already present. This could include measures like better control of vectors through improved screening of all residences

in affected regions, enhanced water purification methods to reduce chemical exposures, and urban planning strategies to mitigate the impacts of wildfires or sea-level rise on urban coastal areas, protecting critical residential infrastructure.

And finally, we need to define and implement resilience strategies aimed at strengthening communities and cities’ ability to adapt, survive, and thrive in the face of inevitable change.

Thus, while health policy *per se* remains relatively unchanged by the impacts of climate change, our response to these challenges becomes increasingly urgent and consequential. Ensuring access to care and preventive services, as well as guaranteeing clean air, safe water, and food, become all-the-more vital considering climate change’s impacts on human health.

IN CONCLUSION, CONSIDERING OUR DISCUSSION, WHAT SHOULD BE OUR PRIORITY MOVING FORWARD AS A SOCIETY?

We urgently need to adopt a preventive mindset rather than a reactive and treatment-oriented one. Investing now to avert calamitous situations in the future is crucial. Framing prevention within the context of human security would be valuable, as it conveys the necessary sense of urgency. Whether we are facing a pandemic like Coronavirus or natural disasters such as floods and wildfires, human security is at risk. Taking action to prevent these threats and enhance security should be the framing that encourages political leaders to adopt policies that diminish the drivers of climate change, mitigate its impacts, and promote resilience in human populations. In doing so, we can ensure that in the future, we not only survive, but truly thrive as a society.



SAVE EARTH
SAVE
YOURSELF

THERE IS ONLY
ONE EARTH

SOS



PLANET