In 2007, the Intergovernmental Panel on Climate Change (IPCC) published a landmark report on climate change. There is unequivocal evidence of global warming. Most of the warming within the past 50 years is very likely attributed to increases in greenhouse gases. The physical and biological systems on all continents and oceans are already affected by global warming. The next few decades are likely to witness more warming. (1)The effect of emissions in the long term is becoming more evident.The worldwide effects of climate change are apparent from the evidence of global destabilization of natural systems. These effects include the melting of icecaps and glaciers, the early arrival of spring, the warming of oceans, rising sea levels, extreme weather patterns and the disintegration of coral reefs.

[中略]

Added to the climate change-driven increases in temperature are the effects of the urban “built” environment. In fact, cities and their climates are co-evolving in a manner that will amplify the effect of heat as well as the vulnerability of urban populations to heat-related deaths. For example, more than half of the planet's human population now lives in cities, up from 30% only 50 years ago. Urban areas are gaining an estimated 67 million people per year—about 1.3 million every week. By 2030, approximately 60% of the projected global population of 8.3 billion will live in the cities. This population increase will accompany rapid urbanization, quickly transitioning communities from native vegetation to an engineered infrastructure that increases thermal-storage capacity, known as the (2)Urban Heat Island (UHI) effect. The UHI effect can be a powerful force in the local climate. The combined effect of the high thermal mass provided by concrete and blacktop roads and the low ventilation ability of the urban “canyons” created by tall buildings extends the temperature increases created by climate change. Relative to the surrounding rural areas, UHI can add 2–10°F to ambient air temperature. More importantly, UHI absorbs heat during the day and radiates it out at night, raising nighttime minimum temperatures, which have been epidemiologically linked to excess mortality. With regard to heat waves, media attention on climate change tends to focus on mean changes in temperature. However, the extremes in temperature impact people more than mean temperature increases and in greater numbers. In 2003, heat waves (extreme temperature events) killed an estimated 29,817 to 30,617 people in Europe through heat stroke, and exacerbated cardiovascular, cerebrovascular and respiratory diseases. A large portion of these deaths occurred among the elderly and socially isolated; these are the segments of population most susceptible to extreme heat . According to the most recent studies, heat waves are projected to increase in frequency and in duration. UHI and the CO_2 dome will influence air quality through their impact on urban aeroallergens. Increased CO_2 levels and temperature will result in a longer growing season, leading to an increase in ragweed and pollen counts. For air quality in rural areas, forest fires present a major threat since climate change affects the hydrologic cycle and cause drier conditions. Young children, pregnant women, the elderly and people with preexisting respiratory and cardiac diseases are the most likely to be affected by poor air quality due to aeroallergens and/or smoke.

Increased frequency of intense rainfall (extreme precipitation events) is associated with an increasing severity of floods, landslides, debris and mud flows (12). This has already been witnessed in parts of Bangladesh, Nepal, and India. Increases in sea surface temperature have caused an increase in tropical cyclone intensity leading to an increase in the height of storm surges. Large populations live along South Asia's coastline, and they will face the brunt of increasing tropical cyclones. Increased frequency of extreme precipitation events will bring with it the increased risk of waterborne disease outbreaks. (中 略) Climate variability may impact the distribution and abundance of vertebrate host species, leading to an increase of vectorborne and zoonotic diseases .

(3)Climate forecast models suggest that vectors, which serve as bridges between animal and human hosts, are expected to increase in frequency and range. (中略) Yet the spread of diseases preceded by climatic factors must take into consideration the changing social, economic and epidemiological landscapes that facilitate disease transmission.

The breadth of potential health consequences due to climate change vary from the direct effects of temperature increases, such as heat waves and other severe weather events, to the indirect effects of population displacement and mental health issues. Strategies to minimize health-related burdens of climate change need to focus on improving responses to many ongoing issues that will occur with greater frequency, intensity and geographic range. Regional strategies are needed since the health and vulnerability of populations to climate change vary by location. Regional collaboration and integration also help to preserve already strained resources.

All strategies will need to include improved surveillance of environmental and health data systems already in place. Regional and city-wide needs must be assessed with public health services retooled so that these areas provide effective responses. Another important principle is the concept of co-benefits, or synergies between mitigation efforts and health in the form of adaptation measures. Climate change mitigation programs can provide opportunities to reduce greenhouse gas emissions while benefiting health at the same time.

To conclude, climate change is now a mainstream issue and must be framed as a public health concern. It is for this reason that the costs of not taking appropriate and timely action are high.

("Climate Change and Human Health" The American Clinical and Climatological Association, 120: 113-117.2009)

注釈

the Intergovernmental Panel on Climate Change (IPCC):気候変動に関する政府間パネル

greenhouse gases:温室効果ガス

°F:Fahrenheit:華氏、摂氏 0 度が華氏 32 度、摂氏 100 度が 212 度に相当する。

ragweed:ブタクサ、花粉症の原因になる

pollen:花粉

vector borne and zoonotic diseases:昆虫や動物によって媒介される感染症

mitigation:緩和

問１　下線部（１）について、温室効果ガスの排出増加による効果としてどのような現象が観測されると述べられているか。本文の記載に基づき 100 字以内で要約しなさい。

問２　下線部（２）について、ヒートアイランド効果の原因とヒトの健康への影響についてどのように述べられているか。本文の記載に基づき 300 字以内に要約しなさい。

問３　下線部（３）について、気象予報モデルはなぜそのような示唆を行っているのか。本文の記載に基づき 200 字以内で要約しなさい。

問４　下線部（４）について、なぜ筆者は適切かつ適時な対応をしないといけないと述べているのか。この関連についてあなたの考えも含めて 300 字以内で要約しなさい。