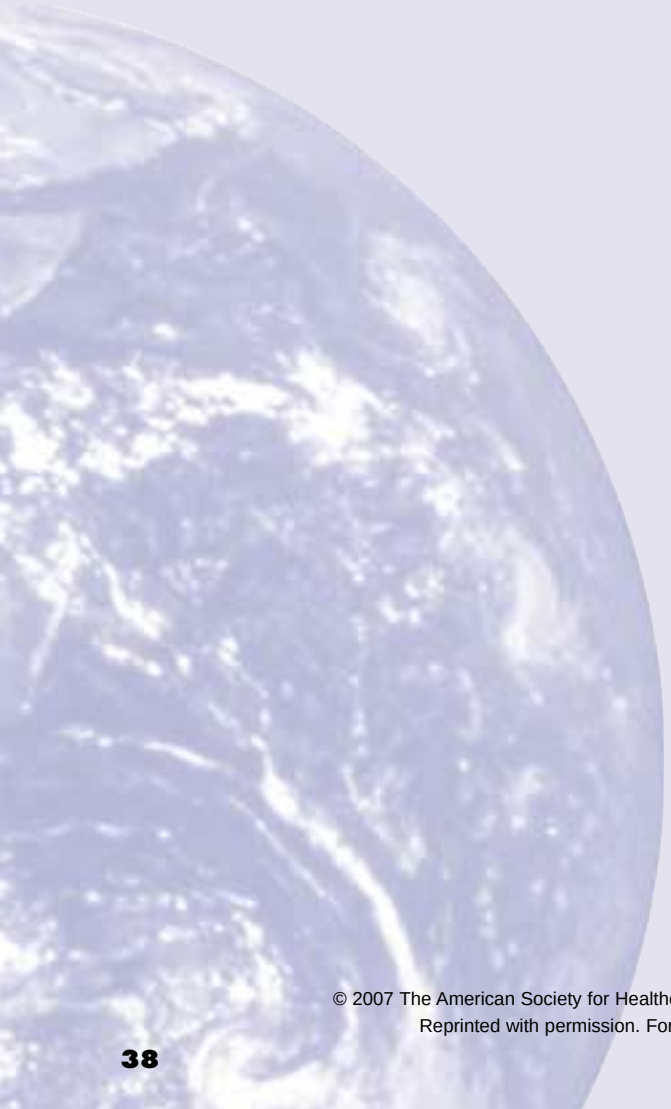
Integrating Climate Change into Your Future

Global temperatures are expected to continue to rise as human activities continue to emit greenhouse (or heat-trapping) gases into the atmosphere. Most of the United States is expected to experience an increase in average temperature, causing high summer heat, increased risk of storm surges from sea level rise, extreme precipitation events, and reduced winter cold stress, depending upon the region. Should healthcare engineers be thinking about this issue now? If so, how does one even begin? Integrating climate change into your future can mean thinking about it in three ways: reducing current greenhouse gas emissions (mostly carbon dioxide), adapting your existing facility to possible environmental impacts, and planning for patient surge events.

Greenhouse gas reduction

The latest assessment by the Intergovernmental Panel on Climate Change (IPCC), which is jointly sponsored by the United Nations and the World Meteorological Organization, projects the average surface temperature of the Earth is likely to increase by 2.5 to 10.4°F in this century. For comparison, during the Pleistocene, when the ice cap in eastern North America reached as far south as Pennsylvania, the world was about nine degrees cooler. Scientists believe the present carbon dioxide (CO_2) concentration may represent a warming rate unprecedented for at least the last 10,000 years. How much and how quickly the Earth's temperature will increase remains unknown given the uncertainty of future greenhouse gas emissions and the Earth's response to changing conditions. But reductions of CO_2 will decrease atmospheric warming and lessen environmental disruption.



Hospital Response

Increase energy performance. Reducing the burning of fossil fuels by increasing the energy performance of hospital facilities is one of the most cost-effective and profitable prevention strategies. Gains in energy efficiency of 10 to 30 percent above present levels are feasible with existing technologies and operational practices.

Design new high performance facilities. Minimize potential greenhouse gas emissions associated with your new facilities by setting definitive energy goals during the conceptual design phase. An energy consumption target provides direction for energy decisions throughout the design process, allowing you to evaluate which energy efficiency measures will achieve your energy and cost savings goals.

Set greenhouse gas reduction targets. Determine the emissions of your facility by benchmarking energy performance on the EPA's national energy rating system. Users can create a record of CO_2 emissions by printing a "Statement of Energy Performance".

Develop green purchasing criteria. Successful energy management programs adopt a procurement policy as a key element for their overall strategy. Instituting an effective policy can be as easy as asking procurement officials to specify ENERGY STAR® qualified products, such as office equipment, in their contracts or purchase orders.

Purchase green power. The increasing availability of affordable green power (such as solar, wind, geothermal) enables electricity customers to accelerate installation of renewable energy technologies. As more green power sources are developed—displacing conventional fossil fuel generation—greenhouse gas emissions associated with electricity generation will be significantly reduced.

Increase heat island reduction measures. Increasing city-wide albedo (reflectivity) by 10% or more through the use of lighter-colored surfaces can potentially modify an area's weather during hot summer months and lower the risk to public health from excessive heat. Installing reflective surfaces on rooftops, choosing pavement materials for parking lots that reduce surface temperature, and planting shade trees are strategies that can increase albedo, improve air quality, and decrease energy use.

Adapt Existing Facilities

Human-induced climate change has the potential to alter the prevalence and severity of extremes such as heat waves, cold waves, storms, floods and droughts. Facility managers should understand how these extreme events can affect building operations and begin to plan for ways to protect existing buildings, plants, and properties.

The IPCC projects the following likely or very likely changes in extreme events and associated effects between now and 2100. The IPCC expects the severity and frequency of these impacts will increase in concert with global warming.

Projected Change	Projected Effects on Facility and Properties
Higher maximum temperatures; more hot days and heat waves over nearly all land areas	Increased cooling demand
Higher minimum temperatures; fewer cold days, frost days, and cold waves over nearly all land areas	Reduced heating demand Damage to infrastructure in Alaska resulting from permafrost melting
More intense precipitation events over many areas	Increased flood, landslide, avalanche, and mudslide damage Increased soil erosion
Increased summer drying over mid-continental areas and associated risk of drought	Decreased water resource quantity and quality Increased risk of forest fire
Increase in tropical cyclone (e.g. tropical storms and hurricanes) rainfall and peak winds over some areas	Increased risks to human life, risk of infectious disease epidemics and other risks; increased coastal erosion and damage to coastal buildings and infrastructure

Hospital Response

Electrical capacity. Higher maximum temperatures may mean increased cooling requirements. Periodically determine if peak load capacity of new or existing buildings needs to be adjusted. To prevent over sizing, expand HVAC system with modular additions. Consider adding an independent power source (such as a combined heat and power plant) on site to supply power if local grid becomes incapacitated during extreme weather event.

Impacts to operations. Night pre-cooling, in lieu of mechanical refrigeration cooling, can be an effective means of flushing internally generated heat out of a building in regions where nighttime temperatures are low. However, healthcare facilities that use this strategy may need to reevaluate its effectiveness due to increased nighttime temperatures.

Sewer pipes. Temperature rise could increase hydrogen sulfide formation in sewer pipes, leading to internal corrosion and eventual failure. Sea level rise also could cause more pipes in coastal areas to face the external risk of corrosive seawater. Determine if more frequent inspection or earlier replacement of existing pipes is needed. Investigate cost-effectiveness of switching to more corrosion-resistant pipe with plastic lining.

Siting assessment. The National Flood Insurance Program's maps identifying the historical 100-year floodplain and 500-year floodway may no longer provide a reliable basis for local building and zoning ordinances designed to minimize flood losses to life and property. Check with your local government to see if they are being updated and if the flood risk to existing buildings and property has changed. Site future buildings away from high risk areas like low-lying coastal zones, tornado alleys, and hurricane zones, if possible. For investment decisions in high risk areas, consider including an analysis of when and how to adapt facilities with expected lifetimes of 50 years or more, especially in coastal areas.

Building codes. Growing uncertainty concerning future temperature, precipitation, and sea levels might dictate a reassessment of existing standards and safety factors for ventilation, drainage, flood protection, facility siting, thermal tolerances, and resistance to corrosion. Consider asking for building designs that exceed current building codes.

Patient Surge Events

Given the complexity of the factors that influence human health, assessing health impacts related to climate change poses a difficult challenge. While studies of health effects linked to climate change remain sparse, the IPCC has concluded that, overall, negative climate related impacts are expected to outweigh positive health impacts during this century. What can we expect?

The extent to which climate change may affect the frequency and severity of these events, such as hurricanes and extreme heat and floods, is being investigated by the US Climate Change Science Program. An increase in the frequency of extreme events may result in more event-related deaths, injuries, infectious diseases, and stress-related disorders.

Climate change may increase the risk of some infectious diseases, particularly those diseases that appear in warm areas and are spread by mosquitoes and other insects. These "vector-borne" diseases include malaria, dengue fever, yellow fever, and encephalitis. Also, algal blooms could occur more frequently as temperatures warm—particularly in areas with polluted waters—in which case diseases (such as cholera) that tend to accompany algal blooms could become more frequent.

Though average U.S. and global temperatures are expected to continue to rise, the potential for an increase in the spread of disease will depend not only on climatic but also on non-climatic factors, primarily the effectiveness of the public health system.

Hospital Response

Increase surge capacity. Increase the dual-use of existing facility spaces to allow conversion to surge capacity in an emergency. Build for dual-use when undertaking new construction. Become involved in the construction and planning of public buildings, such as libraries, civic centers, or community centers so that these buildings can incorporate dual-use concepts into their construction plans.

Plan for surge hospital. Hospitals should prepare for the possibility that their facilities may cease functioning due to major damage sustained during (as well as after) a climate disaster. Surge hospitals would need to be set up, some of which may need to operate for prolonged periods until permanent facilities can be rebuilt.

Train staff in emergency response. Healthcare engineers should do advance planning in emergency response, coordinate resources, and be able to contact local, state, and federal agencies to ensure surge hospitals can be set up quickly during emergencies.

Some degree of future climate change will occur regardless of future greenhouse gas emissions. Adapting to or coping with climate change may therefore become necessary across the nation. Hospitals would be prudent to begin mobilizing now to better cope with possible climate change impacts in their region. The future health of your institution—and indeed of your community—is riding upon the decisions you make today. ASHE

Climate Change Resources

EPA's Climate Change Website offers comprehensive information on the issue of climate change at www.epa.gov/climatechange

State level information on climate impacts can be found by following the links at www.epa.gov/climatechange/effects/usregions

The Excessive Heat Event Guidebook is designed to help community officials and others plan for and respond to excessive heat events. Available at http://epa.gov/heatisland/about/heatguidebook

Surge Hospitals: Providing Safe Care in Emergencies, produced by JCAHO and its affiliate Joint Commission Resources, is available at www.jcrinc.com/generic.asp?durki=11627&site=11&return=18

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