CLIMATE AND HEALTH COUNTRY PROFILE – 2015

NEPAL

World Health Organization

United Nations Framework Convention on Climate Change

OVERVIEW

Nepal is a landlocked country with a range of climatic zones – ranging from the tropical Terai plains to the alpine mountainous region of the Himalayas. Nepal is passing through a transition following a 10-year conflict, but has made considerable progress in reducing poverty, advancing population health, improving literacy and increasing access to water (World Bank Country Overview, 2015). Despite being globally responsible for a very low proportion of greenhouse gas emissions, Nepal is currently and will continue to be disproportionately affected by climate change. Significant threats of climate change in Nepal include rising atmospheric temperature, changes in rainfall cycle and the impact of glacial lake outburst floods and landslides triggered by climatic extremes. Millions of Nepalese are estimated to be at risk from the impacts of climate change including reductions in agricultural production, food insecurity, strained water resources, loss of forests and biodiversity, reduced tourism and damaged infrastructure and their associated impacts on health (Nepal Climate Change Policy, 2011).

SUMMARY OF KEY FINDINGS

- In Nepal, under a high emissions scenario, mean annual temperature is projected to rise by about 6°C on average from 1990 to 2100. If global emissions decrease rapidly, the temperature rise is limited to about 1.6°C [see page 2].
- Nepal faces significant inland river flood risk. It is projected, that by 2030, an additional 199,300 people may be at risk of river floods annually as a result of climate change and 102,400 due to socio-economic change above the estimated 156,600 annually affected population in 2010 [see page 3].
- In Nepal, under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to about 53 deaths per 100,000 by 2080 compared to the estimated baseline of approximately 4 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in global emissions could limit heat-related deaths in the elderly to about 12 deaths per 100,000 in 2080 [see page 4].

OPPORTUNITIES FOR ACTION

Nepal has prepared a Health National Adaptation Plan entitled, Climate change and health strategy and action plan (2016–2020). A national assessment of climate change impacts, vulnerability and adaptation for health has also been conducted. Nepal is currently implementing projects on health adaptation to climate change and is taking action to build institutional and technical capacities in the area of climate change and health. Country reported data (see section 6) indicate there are further opportunities for action in the following areas:

1) Adaptation

- Ensure climate information is included in an Integrated Disease Surveillance and Response (IDSR) system, with early warning for climate-sensitive health risks.
- Implement activities to increase climate resilience of health infrastructure.
- Estimate the costs to implement health resilience to climate change.

2) Mitigation

- Encourage clean energy technologies in health care facilities.
- Conduct a valuation of the co-benefits to health of climate change mitigation policies.

DEMOGRAPHIC ESTIMATES	
Population (2013)[a]	27.8 million
Population growth rate (2013)[a]	1.2 %
Population living in urban areas (2013)[b]	17.9 %
Population under five (2013)[a]	10.5 %
Population aged 65 years or over (2013)[a]	5.3 %
ECONOMIC AND DEVELOPMENT INDICATORS	
GDP per capita (current US$, 2013)[c]	692 USD
Total expenditure on health as % of GDP (2013)[d]	6 %
Percentage share of income for lowest 20% of population (2012)[c]	8.3 %
HDI (2013, +/- 0.01 change from 2005 is indicated with arrow)[e]	0.540 ▲
HEALTH ESTIMATES	
Life expectancy at birth (2013)[f]	68 years
Under-5 mortality per 1000 live births (2013)[g]	39

a World Population Prospects: The 2015 Revision, UNDESA (2015)
b World Urbanization Prospects: The 2014 Revision, UNDESA (2014)
c World Development Indicators, World Bank (2015)
d Global Health Expenditure Database, WHO (2014)
e United Nations Development Programme, Human Development Reports (2014)
f Global Health Observatory, WHO (2014)
g Levels & Trends in Child Mortality Report 2015, The UN Inter-agency Group for Child Mortality Estimation (2015)

1 CURRENT AND FUTURE CLIMATE HAZARDS

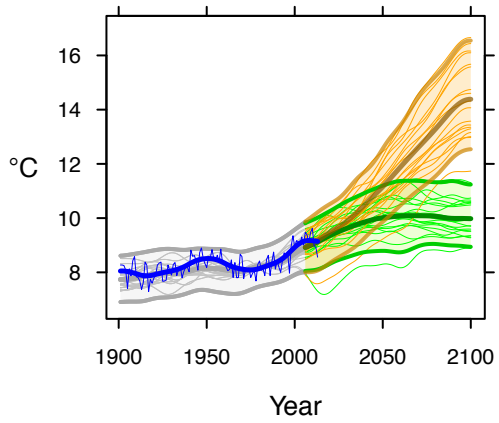
Due to climate change, many climate hazards and extreme weather events, such as heat waves, heavy rainfall and droughts, could become more frequent and more intense in many parts of the world.

Outlined here are country-specific projections up to the year 2100 for climate hazards under a 'business as usual' high emissions scenario compared to projections under a 'two-degree' scenario with rapidly decreasing global emissions. Most hazards caused by climate change will persist for many centuries.

COUNTRY-SPECIFIC CLIMATE HAZARD PROJECTIONS

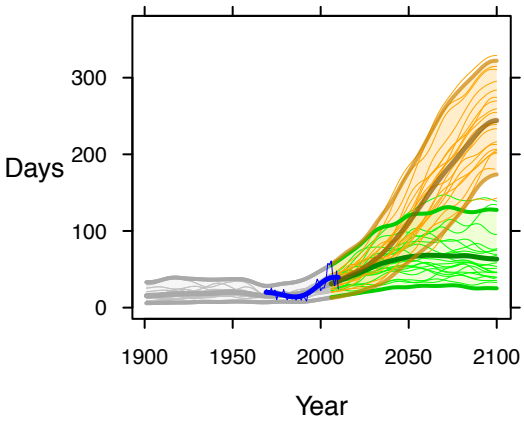
The model projections below present climate hazards under a high emissions scenario, Representative Concentration Pathway 8.5 [RCP8.5] (in orange) and a low emissions scenario, [RCP2.6] (in green).[a] The text boxes describe the projected changes averaged across about 20 models (thick line). The figures also show each model individually as well as the 90% model range (shaded) as a measure of uncertainty and, where available, the annual and smoothed observed record (in blue).[b,c]

MEAN ANNUAL TEMPERATURE



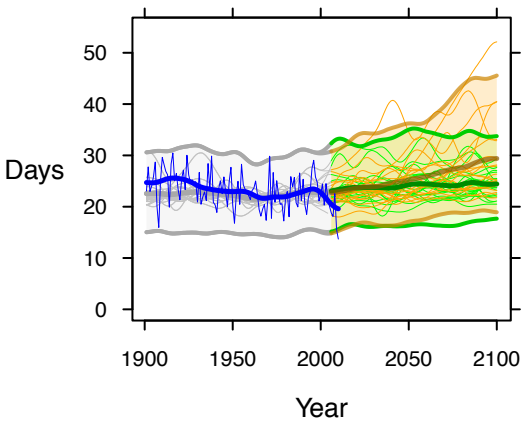
Under a high emissions scenario, mean annual temperature is projected to rise by about 6°C on average from 1990 to 2100. If emissions decrease rapidly, the temperature rise is limited to about 1.6°C.

DAYS OF WARM SPELL ('HEAT WAVES')



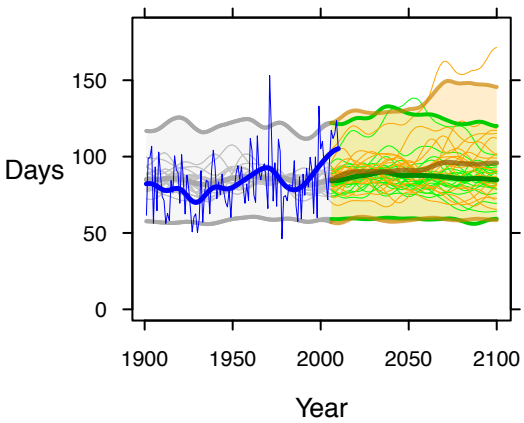
Under a high emissions scenario, the number of days of warm spell[d] is projected to increase from less than 20 days in 1990 to almost 245 days on average in 2100. If emissions decrease rapidly, the days of warm spell are limited to about 65 on average.

DAYS WITH EXTREME RAINFALL ('FLOOD RISK')



Under a high emissions scenario, the number of days with very heavy precipitation [20 mm or more] could increase by about 6 days on average from 1990 to 2100, increasing the risk of floods. Some models indicate increases well outside the range of historical variability, implying even greater risk. If emissions decrease rapidly, the increase in risk is much reduced.

CONSECUTIVE DRY DAYS ('DROUGHT')



Under a high emissions scenario, the longest dry spell is indicated to increase by about 14 days from an average of about 80–90 days, with continuing large year-to-year variability. If emissions decrease rapidly, the anticipated changes in the length of dry spells are somewhat less.

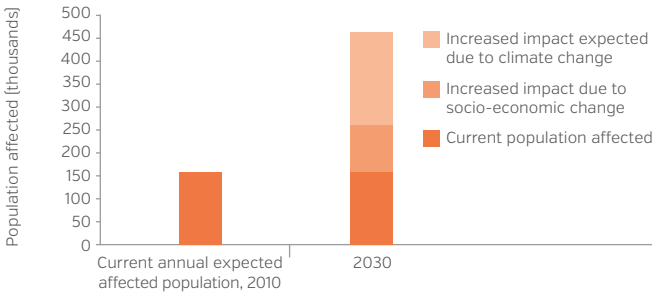
a Model projections are from CMIP5 for RCP8.5 [high emissions] and RCP2.6 [low emissions]. Model anomalies are added to the historical mean and smoothed.
b Observed historical record of mean temperature is from CRU-TSv.3.22; observed historical records of extremes are from HadEX2.
c Analysis by the Climatic Research Unit and Tyndall Centre for Climate Change Research, University of East Anglia, 2015.
d A 'warm spell' day is a day when maximum temperature, together with that of at least the 6 consecutive previous days, exceeds the 90th percentile threshold for that time of the year.

2 CURRENT AND FUTURE HEALTH RISKS DUE TO CLIMATE CHANGE

Human health is profoundly affected by weather and climate. Climate change threatens to exacerbate today's health problems – deaths from extreme weather events, cardiovascular and respiratory diseases, infectious diseases and malnutrition – whilst undermining water and food supplies, infrastructure, health systems and social protection systems.

ANNUAL EXPOSURE TO INLAND RIVER FLOODING BY 2030

(population affected in thousands)



Nepal faces significant inland river flood risk. It is projected, that by 2030, an additional 199,300 people may be at risk of river floods annually as a result of climate change and 102,400 due to socio-economic change above the estimated 156,600 annually affected population in 2010.[a]

KEY IMPLICATIONS FOR HEALTH

In addition to deaths from drowning, flooding causes extensive indirect health effects, including impacts on food production, water provision, ecosystem disruption, infectious disease outbreak and vector distribution. Longer term effects of flooding may include post-traumatic stress and population displacement.

INFECTIOUS AND VECTOR-BORNE DISEASES

Climate variability and climate change influence diseases such as diarrhoea, malaria, dengue and malnutrition. In 2014, the prevalence of undernutrition, stunting and wasting among children under five years is 30.1%, 37.4% and 11.3% respectively, and the percentage of children under age 5 with diarrhoea in the last 2 weeks was 12%.[b] The burden of malnutrition and diarrhoeal diseases in Nepal is expected to increase under climate change scenarios.[c] Currently, vector-borne diseases like malaria, dengue, chikungunya, Japanese encephalitis, viceral leishmaniasis, lymphatic filariasis are endemic in the lowland Terai and hills of Nepal with an estimated 80% of the population at risk.[d] The population at risk will likely increase in the future due to the shifting of disease vectors into highland areas, already detected at levels of 2000m above mean sea level in Nepal.[d]

KEY IMPLICATIONS FOR HEALTH

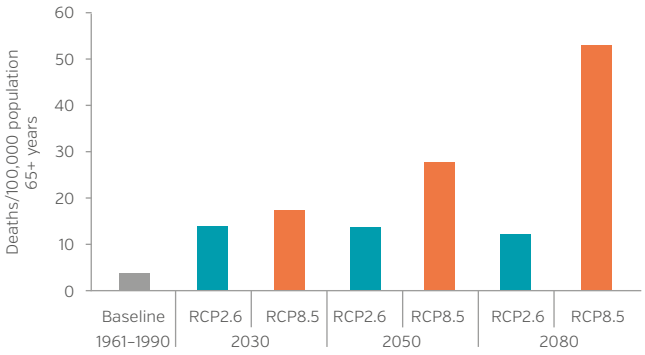
Some of the worlds most virulent infections are also highly sensitive to climate: temperature , precipitation and humidity have a strong influence on the life-cycles of the vectors and the infectious agents they carry and influence the transmission of water and food-borne diseases.[e]

Socioeconomic development and health interventions are driving down burdens of several infectious diseases. However, climate conditions are projected to become significantly more favourable for transmission, slowing progress in reducing burdens, and increasing the populations at risk if control measures are not maintained or strengthened.[f]

a World Resources Institute, http://www.wri.org. Aqueduct Global Flood Analyzer. Assumes continued current socio-economic trends (SSP2) and a 10-year flood protection.
b Central Bureau of Statistics. (CBS). 2015. Nepal Multiple Indicator Cluster Survey 2014, Key Findings. Kathmandu, Nepal: Central Bureau of Statistics and UNICEF Nepal.
c MoH and WHO 2015: Vulnerability and Adaptation Assessment of the health sector in Nepal (unpublished).
d Dhimal et al. (2015). "Climate Change and Spatiotemporal Distributions of Vector-Borne Diseases in Nepal – A Systematic Synthesis of Literature." PLoS One 10(6): e0129869.
e Atlas of Health and Climate, World Health Organization and World Meteorological Organization, 2012
f Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014.

HEAT-RELATED MORTALITY

Heat-related mortality in population 65 years or over, Nepal (deaths / 100,000 population 65+ yrs)



Under a high emissions scenario heat-related deaths in the elderly (65+ years) are projected to increase to about 53 deaths per 100,000 by 2080 compared to the estimated baseline of approximately 4 deaths per 100,000 annually between 1961 and 1990. A rapid reduction in global emissions could limit heat-related deaths in the elderly to about 12 deaths per 100,000 in 2080.

Source: Honda et al., 2015.[a]

KEY IMPLICATIONS FOR HEALTH

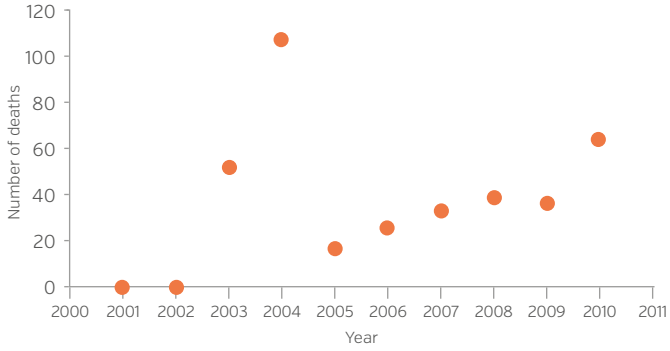
Climate change is expected to increase mean annual temperature and the intensity and frequency of heat waves resulting in a greater number of people at risk of heat-related medical conditions.

The elderly, children, the chronically ill, the socially isolated and at-risk occupational groups are particularly vulnerable to heat-related conditions.

COLD WAVES

A cold wave is a comparatively new weather phenomenon in Nepal, which is distinguished by a rapid fall in temperature (10-15°C) during the winter season. Although not comprehensively studied, this phenomenon was first noticed in 1990 and is believed to be increasing in duration and frequency with a peak event occurring in 2004. These cold waves are characterized by a stagnant blanket of thick smoke and fog ('smog') that covers the low terai belts of Nepal (approximately 1500 square kilometres) and plains of North India and Bangladesh. It is believed that these are not natural phenomena but the result of human activities leading to 'smog' formation including: the use of fuels; toxic fume production from industry; the use of brick kilns; burning crop stubble in open fields; and the burning of rubbish and swathes of irrigated land.[b]

Number of deaths associated with cold wave events, Nepal 2001-2010



Cold waves in Nepal may have a significant impact on human health and livelihood. During the period of 2001-2010, it is believed that the impact of cold waves affected 1,793 people and were associated with 376 deaths and 80 injuries. On average, approximately 37 people died due to cold waves per year with the highest impact in 2004. Cold waves may also be responsible for the deaths of 662 heads of cattle.

Source: DesInventar, 2001-2010.

KEY IMPLICATIONS FOR HEALTH

A Ministry of Health Vulnerability and Adaptation Assessment Report (2015, unpublished) found that 262 cold waves were recorded in Nepal between 2001 and 2010 and with the exception of spikes in 2003 and 2004 an upward trend has been observed. In 2010 alone, cold waves were recorded in 58 different locations. It should be noted that although global climate models indicate that days of extreme cold (cold spell duration index) are expected to decline globally as a result of climate change, in this context, cold waves are thought to be formed by more localised influences such as smog formation which are not currently included in the global models.

It is believed that in recent years cold waves have become a major health threat to the people living in 23 terai districts of Nepal. Cold-related diseases like viral flu, coughs, "cold diarrhoea," fever and respiratory problems are common, as are asthma, common cold, and pneumonia. Cold waves may also exacerbate the cases of arthritis among the elderly. The poor and marginalized, especially the elderly, children, the ill, pregnant women and the disabled, are most vulnerable to the health impacts of a cold wave. Families which live in sub-standard housing also suffer, as do those who lack adequate clothing, food, and fuel wood.

a Country-level analysis, completed in 2015, was based on health models outlined in the Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization, 2014. The mean of impact estimates for three global climate models are presented. Models assume continued socioeconomic trends (SSP2 or comparable).

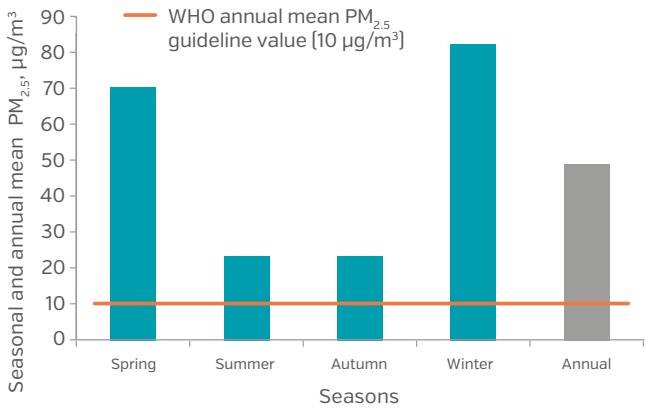
b www.thethirdpole.net, Dec. 8, 2015: New regional study to unravel winter smog over Himalayas

3 CURRENT EXPOSURES AND HEALTH RISKS DUE TO AIR POLLUTION

Many of the drivers of climate change, such as inefficient and polluting forms of energy and transport systems, also contribute to air pollution. Air pollution is now one of the largest global health risks, causing approximately seven million deaths every year. There is an important opportunity to promote policies that both protect the climate at a global level, and also have large and immediate health benefits at a local level.

OUTDOOR AIR POLLUTION EXPOSURE

Outdoor air pollution in Kathmandu Valley, Nepal, mean $PM_{2.5}$ µg/m³ 2015



KEY IMPLICATIONS FOR HEALTH

Outdoor air pollution can have direct and sometimes severe consequences for health.

Fine particles which penetrate deep into the respiratory tract subsequently increase mortality from respiratory infections, lung cancer and cardiovascular disease.

In Kathmandu Valley in 2015, mean seasonal $PM_{2.5}$ levels were highest in spring and winter and the annual mean $PM_{2.5}$ was above the WHO guideline value of 10 µg/m³.

Source: NHRC and MOH, Government of Nepal. 2015. Situation analysis of the ambient air pollution and respiratory health effect in Kathmandu Valley. Kathmandu: Nepal Health Research Council (NHRC).

HOUSEHOLD AIR POLLUTION

NEPAL

Percentage of population primarily using solid fuels for cooking (%), 2013

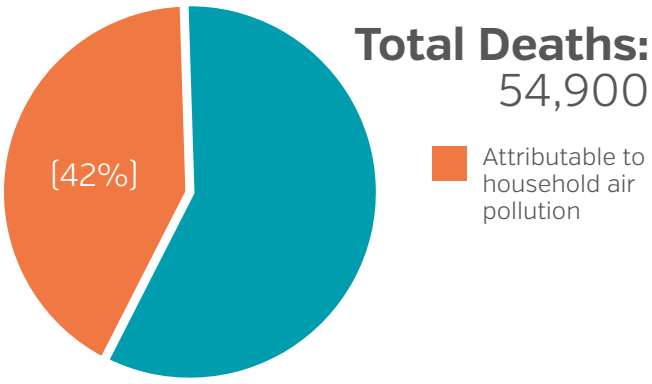
RURAL AREAS **91**

URBAN AREAS **29**

NATIONAL TOTAL **80**

Source: Global Health Observatory, data repository, World Health Organization, 2013.

Percent of total deaths from ischaemic heart disease, stroke, lung cancer, chronic obstructive pulmonary disease (18 years +) and acute lower respiratory infections (under 5 years) attributable to household air pollution, 2012.



Source: Global Health Observatory, data repository, World Health Organization, 2012.

KEY IMPLICATIONS FOR HEALTH

Air pollution in and around the home is largely a result of the burning of solid fuels (biomass or coal) for cooking.

Women and children are at a greater risk for disease from household air pollution. Consequently, household air pollution is responsible for a larger proportion of the of total number of deaths from ischaemic heart disease, stroke, lung cancer and COPD in women compared to men.[a]

In Nepal, 58% percent of an estimated 3,600 child deaths due to acute lower respiratory infections is attributable to household air pollution (WHO, 2012).

a Annu. Rev. Public. Health. 2014.35:185-206. http://www.who.int/phe/health_topics/outdoorair/databases/HAP_BoD_results_March2014.pdf?ua=1

4 CO-BENEFITS TO HEALTH FROM CLIMATE CHANGE MITIGATION: A GLOBAL PERSPECTIVE

Health co-benefits are local, national and international measures with the potential to simultaneously yield large, immediate public health benefits and reduce the upward trajectory of greenhouse gas emissions. Lower carbon strategies can also be cost-effective investments for individuals and societies.

Presented here are examples, from a global perspective, of opportunities for health co-benefits that could be realised by action in important greenhouse gas emitting sectors.[a]

Transport

Transport injuries lead to 1.2 million deaths every year, and land use and transport planning contribute to the 2–3 million deaths from physical inactivity. The transport sector is also responsible for some 14% (7.0 $GtCO_2e$) of global carbon emissions. The IPCC has noted significant opportunities to reduce energy demand in the sector, potentially resulting in a 15%–40% reduction in CO_2 emissions, and bringing substantial opportunities for health: A modal shift towards walking and cycling could see reductions in illnesses related to physical inactivity and reduced outdoor air pollution and noise exposure; increased use of public transport is likely to result in reduced GHG emissions; compact urban planning fosters walkable residential neighborhoods, improves accessibility to jobs, schools and services and can encourage physical activity and improve health equity by making urban services more accessible to the elderly and poor.

Electricity Generation

Reliable electricity generation is essential for economic growth, with 1.4 billion people living without access to electricity. However, current patterns of electricity generation in many parts of the world, particularly the reliance on coal combustion in highly polluting power plants contributes heavily to poor local air quality, causing cancer, cardiovascular and respiratory disease. Outdoor air pollution is responsible for 3.7 million premature deaths annually, 88% of these deaths occur in low and middle income countries. The health benefits of transitioning from fuels such as coal to lower carbon sources, including ultimately to renewable energy, are clear: Reduced rates of cardiovascular and respiratory disease such as stroke, lung cancer, coronary artery disease, and COPD; cost-savings for health systems; improved economic productivity from a healthier and more productive workforce.

Household Heating, Cooking and Lighting

Household air pollution causes over 4.3 million premature deaths annually, predominantly due to stroke, ischaemic heart disease, chronic respiratory disease, and childhood pneumonia. A range of interventions can both improve public health and reduce household emissions: a transition from the inefficient use of solid fuels like wood and charcoal, towards cleaner energy sources like liquefied petroleum gas (LPG), biogas, and electricity could save lives by reducing indoor levels of

Healthcare Systems

Health care activities are an important source of greenhouse gas emissions. In the US and in EU countries, for example, health care activities account for between 3–8% of greenhouse gas (CO_2-eq) emissions. Major sources include procurement and inefficient energy consumption. Modern, on-site, low-carbon energy solutions (e.g. solar, wind, or hybrid solutions) and the development of combined heat and power generation capacity in larger facilities offer significant potential to lower the health sector's carbon