Cities on the front line of a changing climate

Urban centres account for more than half of the world's population, most of its economic activity and the majority of energy-related emissions. The role of cities in reducing emissions and protecting their inhabitants is therefore central to effective climate policies.

Key Findings from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) | For more information please visit **cisl.cam.ac.uk/ipcc**

Cities account for 37–49% of global GHG emissions

Urban infrastructure accounts for over 70% of global energy use

Over 64% of the world population to live in cities by 2050, significantly increasing energy use for infrastructure

New infrastructure and land-use policies could reduce GHG emissions by 20–50% by 2050

IMPACTS

Climate change is expected to affect numerous aspects of urban life.

Adaptation is possible if complex, but cheaper in the long run than doing nothing. How cities adapt to the effects of climate change will vary enormously.

Sea-Level Rise

Two-thirds of cities with populations above 5 million are located in the Low Elevation Coastal Zone. Rising sea levels and storm surge flooding could have widespread effects on populations, property, and ecosystems, presenting threats to commerce, business and livelihoods.

ADAPTATIONS
Responses include: **(A)** improving early warning systems, **(B)** strengthening coastal infrastructure, a significant degree of rezoning (including relocation of critical services), **(C)** and evacuation and crisis response management.

Food Insecurity

All aspects of food security are potentially affected by climate change, including access to food, food utilisation and price stability. Climate change is likely to cause food production in some regions (including the ocean due to warming and acidification) to decline.

ADAPTATIONS
Local responses include support for urban and peri-urban agriculture, **(D)** green roofs, local markets and enhanced social (food) safety nets. **(E)** Develop alternative food sources, including inland aquaculture, to replace ocean-based resources under threat.

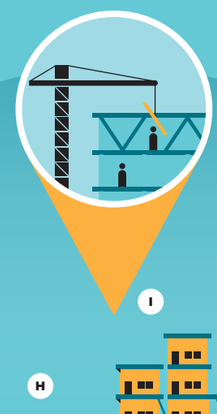
Extreme Weather Events

Changes in extreme rainfall could cause the amount of sewage released to the environment from combined sewage overflow spills and flooding to increase by 40% in some cities. Inland flooding is often made worse by uncontrolled city development.

ADAPTATIONS
Responses include strengthening infrastructure, **(F)** localised migration, wastewater, stormwater and runoff infrastructure and management, and better emergency measures including **(G)** stockpiling fuel, water and food.

Increased Temperatures

The mean temperature rise in some cities could be over 4°C by 2100, with peak seasonal temperatures even higher. More hot days will exacerbate urban heat island effects, resulting in more heat-related health problems and, possibly, air pollution.



ADAPTATIONS
Development of urban planning heat management strategies, **(H)** including green zones, wind corridors, green roofs and water features. **(I)** Building codes will need to be improved, and the infrastructure used by vulnerable parts of the population will need to be made more resilient.

Freshwater Availability

Risks to freshwater resources, such as drought, can cause shortages of drinking water, electricity outages, water-related diseases (through use of contaminated water), higher food prices and increased food insecurity from reduced agricultural supplies.

ADAPTATIONS
Options include **(J)** encouraging water recycling and grey water use, improving runoff management and developing new/alternative water sources, **(K)** storage facilities and autonomously powered water management and treatment infrastructure.

Mitigation efforts can have positive impacts for generations to come

Energy Supply

Reductions in greenhouse gas (GHG) emissions can be achieved by the use of low-carbon technologies including renewables, nuclear, and carbon capture and storage. Switching from coal to gas can be a bridging solution.

Transport

Emissions can be reduced by avoiding journeys, shifting to low-carbon transport systems, enhancing vehicle and engine efficiency, and reducing the carbon intensity of fuels by substituting oil-based products with natural gas, bio-methane or biofuels, or with electricity or hydrogen produced from low GHG sources.

Buildings

Retrofitting existing buildings can reduce heating energy requirements by 50–75% in single-family housing and 50–90% in multi-family housing at costs of about US Dollar 100 to 400 per square metre. In contrast, substantial new construction in fast-growing regions presents a great mitigation opportunity as emissions can be virtually eliminated for new builds.

Energy Demand

Increasing the efficiency of buildings, appliances and distribution networks will reduce energy demand. Changes in the awareness and behaviour of residents can also reduce demand. Projections suggest demand may be reduced by up to 20% in the short term and 50% by 2050.

Low Carbon Cities

Options for rapidly developing cities focus on shaping their urban and infrastructure development trajectories. For mature cities, options lie in urban regeneration (compact, mixed-use development that shortens journeys, promotes transit/walking/cycling, and adaptive reuse of buildings) and rehabilitation and/or conversion to energy-efficient building designs.

Policy Instruments

Approaches include co-locating high residential with high employment densities, achieving high land-use mixes, investing in public transit. The best plans for advancing sustainable urbanisation and low carbon development, especially in fast-growing parts of the world requires political will and institutional capacity.