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Heat on cities to change

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The world's cities can do the most to worsen or mitigate environmental damage and climate change. Julian Hunt and Lorna Walker focus on London

It is becoming increasingly apparent that the often disastrous effects of global climate change can be mitigated only by addressing the role the world's big cities play in environmental change. They are where most of the world's population lives, and they are responsible for most global consumption of energy and materials and the discharge of most pollutants and waste. If they do not make big changes in their infrastructure - especially transport and power - and buildings and in how their residents live, there will be little overall improvement in the global environment.

Such changes in urban planning will, like climate change, take tens of years and are probably reliant on significant developments in how cities are governed. If no action is taken, research suggests that there will be annual rises in temperature of about 4C in Britain's rural areas and peak values in London of up to 5C or more greater than those in surrounding areas.

Urban areas should be of particular concern to the forthcoming World Summit on Sustainable Development, and the meeting will hopefully seek to build on the many practical programmes and environmental studies of Agenda 21, initiated at the UN Conference on Development in Rio de Janeiro in 1992. In London, for example, the Natural History Museum has taken a lead role, working with local communities to study and preserve some of the unique features of the region's plant and animal ecology.

In terms of monitoring the environment, there has also been much improvement since 1992: local and national government regularly publish data for judging what progress is being made towards a more sustainable UK environment. But although there have been reductions in carbon dioxide emissions, improvements in air quality (especially in urban areas) and a net increase in biodiversity, this progress is in doubt beyond 2010 unless substantial long-term policy and investment decisions are made in the next few years to change our industry, transport and lifestyles.

In the environmental field, much of the research is concerned with urgent questions of policy and practical measures. But studies with broader and historical perspectives are also essential. To this end, many of the more constructive solutions to the problems raised by urban development are emerging from research in a variety of fields, from biology and geography to physics, medicine, archaeology and political science. And interdisciplinary research in technology and social science is leading to new ways of explaining and presenting environmental issues. Academics and practitioners from a wide range of backgrounds will meet next month to discuss how such research can be applied to London's environment.

London has some historical advantages. It never experienced the overwhelming events suffered by some other cities, such as the disappearance of its river or large earthquakes. But

ensuring the city's safety and commercial growth has meant that its buildings and river structures have had to adapt to climate change and variations in sea level, as well as to the risk of major flooding.

The threat to society of a dangerous environment was pointed out in the 1660s by the Royal Society after the plague and the Great Fire; by Engels; and by many parliamentary reports in the 19th century. Recent research on health and society shows that large variations in community health in London are likely to be associated with environmental inequality. This is due mainly to air pollution, but in future it will probably be linked to high peak temperatures in inner-city areas (as occurs today in the US and China). Environmental health is likely to be a key cause of future political tensions, as it is already in some developing countries.

Air pollution has been the worst aspect of London's environment for centuries. It led to a royal decree against coal smoke in the 13th century; in the 1850s parliamentarians complained in the summer months that they could not stand the putrefying odours from the untreated sewage in the Thames; and in 1952 London suffered its greatest smog, which killed more than 3,500 people in days, mainly as a result of lung damage caused by sulphur dioxide and smoke particles. By contrast, the greatest air pollution threat nowadays derives from car exhaust fumes and their interaction with solar radiation - as Los Angeles scientists first explained in the 1940s. Through computer modelling and streetside monitoring of up to 20 different types of gases and particles, the London-wide Air Pollution Research Group has shown how, quite unlike the old smog, the concentration of these pollutants varies greatly from one street to another, according to variations in the intensity of traffic. This is because car exhaust pipes are at such a low level. Computer predictions can now be made that could in future be used on a regular basis to control traffic so as to reduce the build-up of pollution in critical areas, or to advise pedestrians, cyclists and motorists where air quality was least harmful.

Other related areas of research on urban environmental hotspots include understanding and mitigating noise pollution, where the UK lags far behind continental countries.

Technological changes have also had a big impact on London's environment. From being a local city, with people walking to work and growing food nearby, London has become a high-density community, ingesting energy and raw materials, and exporting lots of waste. According to current mathematical models of city growth, this pattern will continue even though some predictions by town planners had suggested that mobile communication and the internet would render the city obsolete. Perhaps the increased speed and ease of communication and computing simply helps make face-to-face business more competitive. However, in a wider social context, technology is also helping to empower communities by allowing them a say in how their environment develops. Using computer images of new housing plans, architects can make alterations interactively in consultation with members of the community, leading to a decision-making process that is more "transparent" and less likely to end in discord.

Pollution control, planning and technology are equally essential for finding new solutions to the growing problems of transporting and disposing of London's solid waste, a major responsibility of the Greater London Assembly directorate of environment. Alternatives to the current landfill and incineration-disposal methods (that the European Union says are mandatory) are being sought by motivating industries to develop profitable waste recycling technologies, hopefully by applying the biochemical science and engineering research under way at many universities.

Liquid waste is managed better. The large reservoirs and pumping stations that provide London's drinking water and deal with its liquid waste are also well known ecological amenities and fine examples of industrial architecture. As London expands and lifestyles change, more water is needed. As a result, some of the capital's drinking water is being

recycled through humans and treatment plants several times. Research into the effect of such processes is being undertaken at Thames Water, University College London and other universities; for example, climate change affects the rate of microbiological processes, and there are fears that the increasing volume of substances such as oestrogen, which may not be destroyed in the treatment plants, could endanger human health.

The capital's reservoirs along with its other major open spaces play a critical role in its ecology. Particularly important questions being asked by researchers are why certain species are disappearing, notably sparrows, and how the ecological chain along the rivers and in the Thames Estuary will evolve as sea levels rise and massive new structures are introduced, such as a new Thames Barrier.

The Middlesex University Flood Research Centre is focusing some of its social and economic studies on how future flooding events might affect the London area, especially if the current flood control and warning systems fail or are not strengthened in time. The centre's research into popular understanding of the issues is being used to recommend how warning systems might operate in other natural and artificial disastrous events.

The academic community could play an exciting and vital role in the debate about London's future environment. This has been recognised by the Natural Environment Research Council's Urgent programme and the Economic and Social Research Council's Urban programme.

Consultancies are involved in establishing realistic and specific targets and measures of progress towards sustainability so that organisations and communities can contribute meaningfully to improving the environment they live in. The government and the Greater London Authority have made a useful start with their broad-based list of measures and targets and London has some important advantages, as its vigorous history and current economic growth suggest. But it is only a start and much more needs to be done.

Julian Hunt is professor of climate modelling at University College London and Lorna Walker is a director of Arup. Lord Hunt is chairing "London's Environment and Future", a conference on new developments in academic research on September 17-18 at the Senate House, London. For more details: www.cpom.org/leaf .

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