

City Weathers workshop

On 23 – 24 June, academics and practitioners in urban design and climatology gathered at the University of Manchester for a workshop entitled “City Weathers.” The workshop was organised by Michael Hebbert, Professor of Town Planning at the Manchester Architectural Research Centre, and Vladimir Jankovic, Wellcome Research Lecturer at the Centre for History of Science Technology and Medicine in the University of Manchester. Together, they had conducted a research project on climate science in urban design with an historical and comparative study of applied urban climatology since the 1950s. The study found that not only does the urban design of the size and arrangement of buildings and spaces have an impact on the climate of cities and towns at different scales, but it has been measured and in some cases, policies created to minimise adverse affects on temperature, wind, and air quality.

The workshop brought together academics studying the effects of man on the local climate of cities in the present day, practitioners designing places, and policy makers guiding development through the planning system with a sprinkling of historical perspectives. It was set up in the manner of an academic conference with a number of paper sessions concentrated around different disciplines with a keynote speech on the history of London’s urban climate by Sue Grimmond, Professor and Chair in Physical Geography at King’s College London.

The first session brought together work that is currently being done at the city-region and even the global scale. The Met Office introduced their methods for estimating the temperature component of urban climatology, known as the urban heat island, at a range of scales from the global to the mesoscale, or the district level. Gerald Mills, the current President of the International Association for Urban Climate, produced a summary of the issues facing the planning system. The first is to recognise that all too often, only the indoor climate is considered with a well-defined set of guidance from solar gain and natural ventilation on a proposed building. There is also the outdoor climate to consider, where the design of a building both responds from and feedbacks to the microclimate, or the spaces between buildings. The measurement of urban heat island is also important – the microscale between buildings is different from the overall effect of the city’s presence, and this is different again from satellite readings made from space. He was followed by the introduction of BUCCANEER from Birmingham City Council and the University of Birmingham, a planning tool intended to show the effect on the urban heat island of new proposals, and the intensification of areas at a higher risk to public health due to high temperatures. This in turn was followed by a review of the situation in the Netherlands, where overall urban heat islands adding 3 to 8 degrees, mainly at night, with mobile weather stations on bicycles used to traverse cities.

The second paper session introduced climatic mapping. The opening two presentations from the Chinese University of Hong Kong presented the reasons for creating these maps and how they have been used in the creation of planning guidance for Hong Kong. The climate map is a way to assemble climatic information for planning actions in a format that is user-friendly to planners – meaning visualisation and categorisation of complex data. The climate map takes in climatic and meteorological elements, geographic terrain data, greenery information, and planning parameters to produce an analysis map of local climates including topography, density, land use, the urban heat island, landscape, water, and wind, then finally maps that contain guidelines for development proposals. For Hong Kong, five different climatic zones were created to reflect the sensitivity of the

urban climate to additional development, which informed the new Building Separation and Design Guidelines for Hong Kong. An example of the application of the guidelines was presented with the changes to the redevelopment of the former airport. A final presentation was made from the Institute for Environmental Meteorology at University of Kassel, Germany on the creation of climate maps that reflect human sensitivity to heat or cold. This was built out of temperature reads indoor and outdoor along with interviews of a range of people throughout the different climatic conditions of the year.

The first day ended with a keynote speech and the showing of a short film. Sue Grimmond traced the history of interest in the urban climate in London. There were some instances of concern over air quality in cities throughout London's development, but the first mentions of an "urban effect" did not come until the 19th Century. In this instance, it was described as "urban contamination" of the true measurements of the weather of London, and instruments were moved to the outskirts of cities. The actual term of the urban heat island was not used until the 1950s, and more and more detailed measurements of the increased temperature of urban weather stations. Her final message was that with the coming of more and more data in the future, the ability of planners and climatologists to measure small scale impacts of planning decisions – for example, planting of street trees - should become easier to justify in the near future. The short film "Urban Development and Urban Climate in Stuttgart" from 1976 was shown to the participants to end the evening. The film detailed the efforts of the city to prevent further rises in the urban heat island since a meteorologist was hired by the city council in 1938. The film detailed the situation of a city in a basin and the role of wind, changing surfaces on the ground and on top of buildings, and the placement of industry and heating plants in limiting the effects of the urban heat island. Most notable was the powerful advice given to limit development in sensitive areas that would have prevented cool wind from coming down from the countryside into the city using effective and convincing arguments.

The subsequent paper session focused on warmer climates. The presentation from Glasgow Caledonian University explained that not all urban heat islands being investigated are in temperature zones – planning in tropical or arid climates also needs to take into account the heat island. One can argue that this is more urgent for attention as humans are already at the edge of their physical ability to deal with heat. An application of microclimate modelling and the choice of urban form in a tropical subclimate of South Korea was explored by the Technical University of Kaiserslautern. The final presentation by Tel Aviv University investigated the desert climate of Beersheba, Israel. The researchers measured the contribution of different surfaces to the heat of an individual street, finding that greenery was the coolest and cars with dark paintwork the hottest.

The next paper session examined the different effects of urban form on urban microclimates in both historic and future cities. A presentation from the Illinois Institute of Technology traced the different microclimates and indoor climates of Budapest based on their historical building typology. These included 19th century single-aspect flats arranged around courtyards, double-aspect flats in perimeter blocks, and 20th century slab blocks and podium blocks, and traced how natural ventilation in each of these types has decreased over time. A study at Aachen University, Germany examined the city's regulations over time to increase air quality and public health since the 19th Century. Finally, RAVEN Architecture + Urban Design explained a practitioner's view on how to create a climate-resilient urban design. The main message was that built environment practitioners need to develop both the physical and institutional capacity for constant change over time. Some

new interpretations of the principles of good urban design to a resilient and adaptive urban design were also presented alongside some practical tips on solar design, ventilation, green fingers, and the shifting of grids to the local contexts.

The final paper session focused on the measurement and management of the urban heat island up to the scale of the city-region. Ben Gurion University, Israel presented a process for managing microclimates between buildings through the complex process of managing a city and professionals from diverse fields. One message was that urban climatologists should, in the planning process, set a clear definition of goals at the outset, then allow designers to respond at length, then come back late in the planning process to evaluate and advise. The next presentation from the City University of New York explained the regional planning dimension of overheating through the management of long-term “concreting” of green spaces. One estimate was that maintaining the current heat island of New York in the future required the lifting of green space to around 20 percent in the future. Similarly, a presentation by the University of Manchester with the Oxford Road Partnership explored how greening beyond what is currently present through a range of interventions of different sizes will limit the rise of temperatures in the future. The conference was capped by a presentation by the City of Stuttgart which has been a recognised forerunner in the application of climate science to urban design and planning. The presenter recapped many of the procedures covered in the film and the advisory role played by climatologists to decisions on planning applications in the city. This included more detail on ventilation at the city-region scale using planned green corridors and working with developers to build in a way that limits the blocking of wind from the surrounding hills when the council was minded to grant permission. There were further measures in planning and building control guidance, including painting flat roofs white, tree planting, and greening of tram tracks and permeable car parking surfaces. This also included the encouragement of infill development to avoid sensitive areas from coming under development pressure in the first instance.

There were several messages given about the application of knowledge about the urban climate to the planning system. The presence of an urban conurbation does add heat to the local atmosphere, creating an urban heat island of higher temperatures, lower wind, and poorer air quality. The response of the UK planning system at present is mainly in the ability of development control to improve the indoor climate, or mitigate overheating inside buildings. Planners should be able to write policies in development plans with more detailed guidance that take into account potential improvements to the outdoor climate between buildings addressing solar gain and ventilation in the increasing heat and declining air quality in summer predicted for this part of the world. Planners trained in climatology should be able to participate in pre-application discussions at the right time and the right level in the design process whilst letting designers use their creativity in finding solutions. Finally, there are planning tools, notably climate maps, available to aid planners to visualise the issues and valid responses amongst their peers, politicians, and the general public.

To download papers and presentation slides from the workshop, go to the website of the University of Manchester at

<http://www.sed.manchester.ac.uk/architecture/research/csud/workshop/programme/>

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