Urban Climate News

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From the IAUC President

Colleagues, you will forgive me if I dedicate this column to the approaching **ICUC8**, which will be held in my home city of Dublin from August 6th-10th.

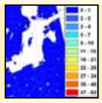
Over 430 are registered for the event and over the five days there will be nearly 500 oral and poster presentations. This is, I think, evidence of the growth in interest in urban climate studies. Moreover, the international make-up of the participants is extraordinary. The largest single delegate group comes from Japan (50); however there are more than twenty travelling from Germany, US, Canada, and France. Sizeable numbers will also travel from China, Hong Kong, Korea, Spain and Brazil.

ICUC8 will continue a tradition established by previous ICUC events by creating a convivial environment for an exchange of ideas on the climates of cities, the impact of cities on climates at all scales (and vice versa) and the employment of this knowledge to the better design of urban areas.

Moreover, we hope that ICUC8 will provide milestones for the development of the field. The plenary lectures will focus on the history and future of the field, urban morphology, the urban boundary layer, multi-scale modelling and the urban carbon flux.

I hope that I will be able to communicate the success of ICUC8 in the next issue of *Urban Climate News*.

Inside the Summer issue...



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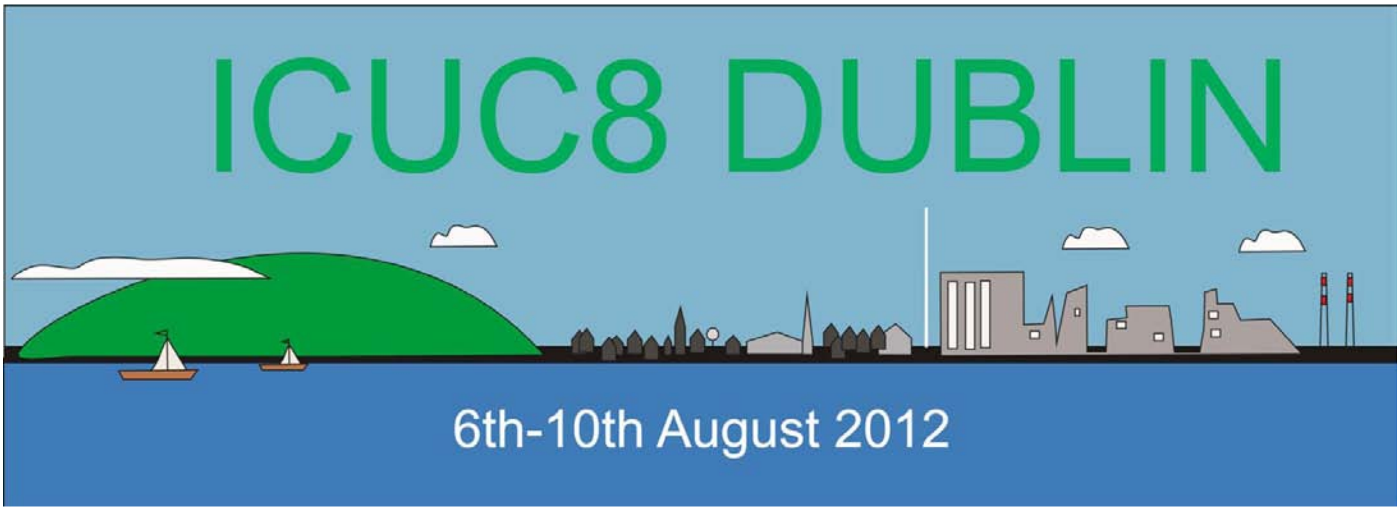


Green Roofs in Big Cities Bring Relief From Above

A co-op in Manhattan with a roof garden. (NYTimes)

May 2012 — It's spring – time to plant your roof. Roofs, like coffee, used to be black tar. Now both have gone gourmet: for roofs, the choices are white, green, blue and solar-panel black.

All are green in one sense. In different ways, each helps to solve serious environmental problems. One issue is air pollution, which needs no introduction.The second is the urban heat island. Because cities have lots of dark surfaces that absorb heat and relatively little green cover, they tend to be hotter than surrounding areas – the average summer temperature in New York City is more than 7 degrees hotter than in the Westchester suburbs. This leads to heavy air-conditioning use – not good – and makes city dwellers miserable. For a few people every year, the heat is more than a discomfort – it's fatal.

The other problem is storm water runoff. In New York, as in about a fifth of American cities, there is only one sewer system to conduct both rainwater and wastewater. About every other rainfall in New York, sewers flood and back up, discharging their mix of rainwater and wastewater into the city's waterways. It doesn't take much to overload New York's sewers – it can take only 20 minutes of rainfall to start water from toilets flowing into Brooklyn's waterways. The water does more than flood streets. It makes us sick – cases of diarrhea spike when sewers overflow. When sewers back up, polluted water runs into our lakes and oceans, closing beaches.

How can a new roof help?

At 1:45 in the afternoon on August 9, 2001, the temperature in Chicago was in the 90s. Eleven stories up, on the roof of City Hall, the surface temperature of the black tar measured 169 degrees. But Mayor Daley, environmental innovator – yes, that Mayor Daley – had done something interesting. The year before, a section of the City Hall roof had been painted white. The surface temperature there was between 126 and 130 degrees. And much of the roof of the building had become a garden – 20,000 plants in 150 varieties, chosen for their abilities to thrive without irrigation and stand up to Chicago's notorious wind. The surface temperature of the green roof varied between 91 and 119 degrees.

So the difference between a black tar roof and a green roof was at minimum 50 degrees. And the green roof was able to retain 75 percent of a one-inch rainfall. The two tasks go hand in hand – green roofs cool by capturing moisture and evaporating it.

Putting living vegetation on the roof is not a new idea. For thousands of years people have made sod roofs to protect and insulate their houses, keeping them cooler in summer and warmer in winter. The modern movement for green roofs began in the last 50 years in Europe. Germany, where about 10 percent of roofs are green, is the leader; some parts of Germany require green roofs on all new buildings.

Greening a roof is not simple or cheap. Over a black roof – flat is easiest but sloped can work – goes insulation, then a waterproof membrane, then a barrier to keep roots from poking holes in the membrane. On top of that there is a drainage layer, such as gravel or clay, then a mat to prevent erosion. Next is a lightweight soil (Chicago City Hall uses a blend of mulch, compost and spongy stuff) and finally, plants.

An extensive roof – less than 6 inches of soil planted with hardy cover such as sedum – can cost $15 per square foot. An intensive roof – essentially a garden, with deeper soil and plants that require watering and weeding – can double that. But because the vegetation is thicker, it will do a better job of cooling a building and collecting rainwater. Plants reduce sewer discharge in two ways. They retain rainfall, and what does run off is delayed until after the waters have peaked.

A study conducted by Columbia University and City University of New York of three test roofs built by Con Edison in Queens found that the green roof – an extensive roof, planted with sedum – cut the rate of heat gained through the roof in summer by 84 percent, and the rate of heat lost through the roof in winter by 34 percent.

Another study (same researchers, same Con Ed test sites) found that green roofs are a very cost-effective way to reduce storm water runoff. If New York has one billion square feet of possibly greenable roof, planting it all could retain 10 to 15 billion gallons of annual rainfall — which would cut a substantial amount of sewage overflow. "If you add in all the other green infrastructure, such as street trees, permeable pavement and ground collection pits, it might be possible to eliminate the combined sewage overflow without building specialized water detention tanks, which are hugely expensive," said Stuart Gaffin, a research scientist at Columbia's Center for Climate Systems Research, who co-authored both studies with colleagues from City College.

Green roofs have other advantages.They scrub the air: one square meter can absorb all the emissions from a car being driven 12,000 miles a year, said Amy Norquist, chief executive of Greensulate, which installs green roofs. And green roofs can provide the plants that animals, birds and bees need where parks are far apart.

White roofs are cheap and don't require any engineering – just a layer of special paint. New York City is trying to coat a million square feet of roof a year. Building owners can do the work themselves, or they can engage CoolRoofs, a city initiative that promotes white roofs and organizes hundreds of volunteer painters. Since 2010, about 3,000 volunteers have coated 288 buildings.

But less investment buys less return. White roofs don't catch rainwater, help biodiversity or clean the air. Gaffin's group found that the white portion of the Con Ed roof averaged 43 degrees cooler than black at noon on summer days. That's something, but it's a smaller cooling effect than green roofs offer. Green roofs improve each year as vegetation becomes denser and taller. But after a few months, a white roof tends to look like city snow – covered with soot. As a white roof dirties, it loses a lot of its cooling ability.

The newest roof variation is a blue roof. It's a roof covered by a waterproof membrane and gravel, with controlled-flow drains, and costs about $5 a square foot. Blue roofs don't cool anything – they help only with storm water control by releasing water more gradually. Despite the price, a blue roof is a hard sell – not everyone is comfortable with the idea of a pond on the roof.

The fourth roof option doesn't save energy – it creates it. New Jersey has installed 500 megawatts of solar power – enough to run half a million homes. California has installed double that. New York City? So far, just 6.5 megawatts.

How have New Jersey and California done it? Private vendors install and maintain the solar panels, and are paid in future energy savings. Scott Stringer, the Manhattan borough president, argues that New York should use this system to put solar panels on the roof of every public school. Stringer's report says putting solar roofs on all available public schools would eliminate as much carbon emissions as planting 400,000 trees — eight times the number in Manhattan now.

Public schools have become a testing ground for the new roofs. At the Robert Simon complex in the East Village, which houses three schools (my children attend two of those schools), work is beginning this summer on a farm. A committee at the Earth School was looking for green ideas that would go beyond recycling and create a curriculum. Abbe Futterman, the science teacher, was already growing vegetables and fruit in sawed-off pickle barrels right outside her classroom window, using the garden to teach plant science and nutrition. The kids tend it, and use the produce to cook food from around the world.

The Fifth Street Farm will be a much larger vegetable and fruit garden in planters raised above the roof on steel girders – not a classic green roof. The money has come from various government offices – those of Stringer, State Senator Daniel Squadron and City Council member Rosie Mendez. Douglas Fountain, an architect who is assisting the schools in implementing the construction (and a parent of a Tompkins Square Middle School student) said that it was designed to be easily

Painting a roof white in Philadelphia. (NYTimes)

replicable by other schools.

Is a green roof a good investment for a building owner? Perhaps, but the biggest reason might not be reduced energy costs – lots of factors affect a building's energy use. More savings come from the fact that temperature swings make a black tar roof expand and contract. The smaller the spread, the longer the roof life. Roanoke, Va., for example, just installed a green roof on its municipal building, at a cost of $123,000, adding anywhere from 20 to 60 years to the life of the current roof membrane. "I personally believe a green roof is the last roof you'll have to put on," said Gaffin.

But any changes to a black tar roof are undoubtedly good investments for cities — indeed, interest in green roofs is soaring largely because of the sewage problem and the costs of trying to solve it the old way. New York City decided it was more cost effective to build green infrastructure, including green roofs, than to construct more sewer pipes or storage tanks, and it is spending $1.5 billion over the next 20 years on green projects that will reduce rainfall runoff. The goal is to cut sewer outflows by 40 percent by 2030.

New York City was not one of the first American cities to promote green roofs. "But the city is doing quite well," said Gaffin. "The green infrastructure plan is very ambitious." The problem is that the little-by-little approach won't produce real environmental benefits until they reach a critical mass, and that could take a long time. "We get biodiversity benefits from small scale greening, and individual building owners will get an energy benefit," said Gaffin. " But to make a difference to the city's climate or hydrology we'd have to get up to 30, 40 or 50 percent coverage. What we have now is a drop in the bucket." – *TINA ROSENBERG, NYTimes. Source*: http://opinionator.blogs.nytimes.com/2012/05/23/in-urban-jungles-green-roofs-bring-relief-from-above/?src=recg

Multimedia: Explore New York's green rooftops

NYC's billion-square-foot roofscape is getting a climate makeover with solar, living roofs and white paint. See how in this interactive feature:

http://www.guardian.co.uk/environment/interactive/2012/jun/07/climate-change-new-york

Improvements In Urban Planning Key To Protecting Global Health

May 2012 — With the World Health Organization projecting the global urban population to almost double to 6.3 million by 2050, better urban planning is essential to improve the health of Earth's city dwellers.

In an attempt to address the potential health crisis that this booming population could cause, the University College of London and the Lancet Commission have issued a report recommending future policy initiatives that could lead to healthy urban development, and highlighting the case studies that are already taking strides toward that goal.

The coming population boom "will not only result in more megacities (cities of more than 10 million people), increasingly concentrated in Asia, but also in more medium-sized cities, especially in Africa," the report said.

"UN estimates are that about 1 billion people, nearly a sixth of the global population, live in slum-like conditions. With the worldwide population predicted to expand to 9 billion by 2030, the number of people living in slum-like conditions could reach 2 billion."

With these projections in mind, the report issued five recommendations for alleviating or avoiding health-related challenges for major cities.

First, city governments should forge an alliance among health officials, urban planners and "those able to deliver urban change for health in active dialogue."

Stakeholders also need to address health inequalities among communities in urban areas, making community representatives involved and accountable. This could require local governments to support under-resourced and less organized sections of their urban population, the commission advised.

Lead author Professor Yvonne Rydin of the UCL Bartlett School of Planning singled out one important step policymakers could take to improve health outcomes for lower income city residents.

"There is a major need to retrofit older housing, particularly for those with lower incomes, to a) save them fuel bills and b) cut down on energy use and greenhouse gases," Rydin stated. "But we mustn't do this in a way that compromises indoor air quality. Means of ventilation are essential. Well insulated houses also need to be effective in reducing heat gain in heat waves. And care needs to be taken on details to ensure that more insulation does not create the conditions for mould growth. The details are really important here."

There is a perception that living in a city, especially in wealthy nations, gives a person an 'urban advantage' over their rural neighbors, the report said. Urban planners need to be mindful of the health advantages city living can convey and should maximize these benefits as best they can. The report recommended that city frameworks should explicitly incorporate urban health goals and policies aimed at the improvement of urban health.

The commission also recommended that city planners perform a complexity analysis to better understand the web of relationships that affect urban health. At the very least, policy makers "should be alert to the unintended consequences of their policies."

Kosovo settlement in Cape Town, South Africa. ***Source:*** **redorbit.com**

Finally, the commission recommends using locally-scaled pilot projects that include active dialogue and continuous assessment.

The report also includes some case studies of public works and policy decisions that have had a positive impact on public health. In Mumbai, India, the Slum Sanitation Program (SSP) aims to provide access to one public toilet per 50 people living in slums or low income areas by 2025 through the construction of sanitation facilities. The report notes that some sanitation facilities have even become community centers, providing space for teaching and meeting.

While the program is backed by funding from the World Band and state government, nominal usage fees cover local maintenance, water, and electricity costs. These fees have allowed high standards of care to be maintained, but evidence exists that in some of the poorer settlements, only the relatively wealthier families are able to pay the fees. This forces the remaining population to resort to defecation in open areas.

In another case study in Bogota, Colombia, the decade-old Bus Rapid Transit system has decreased car usage, encouraging people to walk to transit stations and reducing carbon dioxide emissions. The system has also had other civic benefits including reduced traffic congestion and greater average travel speeds.

Rydin noted another healthy aspect of Bogota's public policy launched in 1974 that sees a huge return on investment and also increases physical activity and reduces emissions.

"In (Bogota) they close 97 km of roads on Sundays and holiday for public access. About 1 million people use this pedestrian space. It has been estimated that for each $1 spent on this, about $3-4 are saved in health costs. And that does not include the financial benefits of reduced air pollution and knock-on economic activity." *Source*: http://www.redorbit.com/news/science/1112544425/improvements-in-urban-planning-key-to-protecting-global-health/

UCLA study forecasts extent of warming in greater Los Angeles

June 2012 — A groundbreaking new study led by UCLA climate expert Alex Hall shows that climate change will cause temperatures in the Los Angeles region to rise by an average of 4 to 5 degrees Fahrenheit by the middle of this century, tripling the number of extremely hot days in the downtown area and quadrupling the number in the valleys and at high elevations.

"Mid-Century Warming in the Los Angeles Region" is the first study to provide specific climate-change predictions for the greater Los Angeles area, with unique predictions down to the neighborhood level. The sophisticated regional climate study was produced by UCLA with funding and support from the city of Los Angeles, in partnership with the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC). It is available at http://c-change.la/.

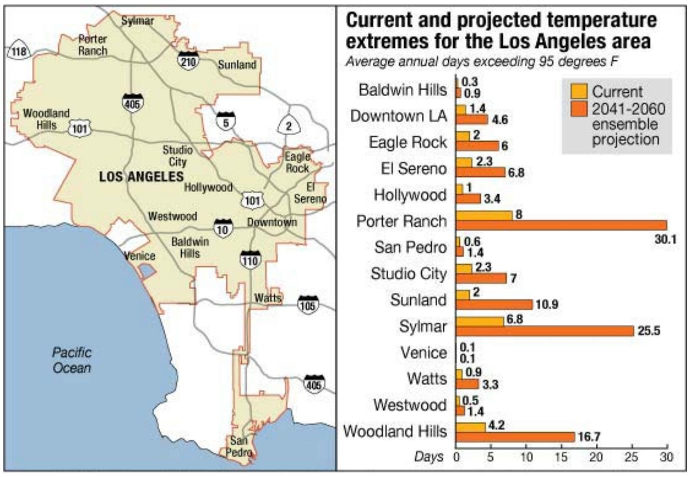
"The changes our region will face are significant, and we will have to adapt," said Hall, an associate professor in UCLA's Department of Atmospheric and Oceanic Sciences who is also a lead author on the Intergovernmental Panel on Climate Change reports, which, among other things, assess global climate-change simulations for the United Nations.

"Every season of the year in every part of the county will be warmer," Hall said. "This study lays a foundation for the region to confront climate change. Now that we have real numbers, we can talk about adaptation."

The study looked at the years 2041–60 to predict the average temperature change by mid-century. The data covers all of Los Angeles County and 30 to 60 miles beyond. The study overlaid this entire area with a grid of squares 1.2 miles across and provided unique temperature predictions for each square. This is in contrast to global climate models, which normally use grids 60 to 120 miles across — big enough to include areas as different as Long Beach and Lancaster.

According to the study, coastal areas like Santa Monica and Long Beach are likely to warm an average of 3 to 4 degrees. Dense urban areas like downtown Los Angeles and the San Fernando and San Gabriel valleys will warm an average of 4 degrees, and mountain and desert regions like Palm Springs and Lancaster will warm 4 to 5 degrees.

These figures are only annual averages, and the day-to-day increase in temperatures will vary, said Hall, who is a member of UCLA's Institute of the Environment and Sustainability (IoES) and director of the institute's Center for Climate Change Solutions. Southern Californians should expect slightly warmer winters and springs but much warmer summers and falls, with more frequent heat waves. Temperatures now seen only on the seven hottest days of the year in each region will occur two to six times as often. The number of days when the temperature will climb above 95 degrees will increase two to four times, depending on the location. Those days will roughly double on the coast, triple in downtown Los Angeles and Pasadena, and quadruple in Woodland Hills. In Palm Springs, the number of extremely hot days will increase from an annual average of 75 to roughly 120.



Current and projected annual averages of days exceeding 95°F in LA area. *Source:* UCLA

"Places like Lancaster and Palm Springs are already pretty hot areas, and when you tack on warming of 5 to 6 degrees, that's a pretty noticeable difference," Hall said. "If humans are noticing it, so are plants, animals and ecosystems. These places will be qualitatively different than they are now."

The type of climate modeling used in the study is done almost exclusively at the national or international level, said Paul Bunje, the managing director of the LARC, which is based at UCLA's Institute of the Environment and Sustainability. Other cities and states have localized global climate models — but usually by localizing only one model. Hall's team needed months of computer time to downscale 22 global climate models, each with slightly different assumptions about how to predict climate change or factors like future greenhouse gas emissions. Once they recalculated the almost two dozen global models at the local level, the team analyzed the results and integrated them into an ensemble projection to create the forecast for the entire region.

"This is the best, most sophisticated climate science ever done for a city," said Bunje, who is also the executive director of UCLA's IoES Center for Climate Change Solutions.

"L.A. is one of the first cities to get its act together, from the scientists all the way up to the mayor," Bunje said. "Nobody knew precisely how to adapt to climate change because no one had the data — until now. These are shocking numbers, and we will have to adapt."

Cutting greenhouse gas emissions could reduce the impact on Los Angeles, Hall said. However, even if the world has unanticipated — and perhaps unrealistic — success in drastically reducing greenhouse gas emissions, the greater Los Angeles area will still warm to about 70 percent of the currently predicted levels, the study found.

"We looked not only at a business-as-usual scenario where greenhouse gas emissions continue but also at a scenario where emissions are curtailed," Hall said. "Even if we drastically cut pollution worldwide, there will still be quite a bit of warming in Los Angeles." *Source:* http://newsroom.ucla.edu/portal/ucla/climate-change-in-la-235493.aspx

The City and the Coming Climate: Climate Change in the Places We Live

By Brian Stone
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The world's largest cities are warming much more rapidly than the planet as a whole. While this observation will come as no surprise to the international urban climate community, it nonetheless raises a set of questions that are central to contemporary research focused on climate change at the urban scale: What climatic factors are accelerating the pace of warming in cities? And, how should the management of climate change at the urban scale differ from the management of climate change at the global scale? These questions are at the heart of my recently published book, *The City and the Coming Climate: Climate Change in the Places We Live* (Cambridge University Press).

The answers to these questions hold important implications for urban populations in the present period. As demonstrated by the incidence of increasingly intense heat waves over the past decade, most notably across Western Europe in 2003 and Russia in 2010, extreme heat events are responsible for exceptionally large fatality rates in recent years, particularly in urban environments. Perhaps more than any other symptom of climate change, extreme heat events demonstrate the very real threat posed by changing climate today – not decades in the future – and in the planet's most heavily populated environments. Yet, at present, climate management policy is surprisingly ill-suited to address the physical drivers of warming at the urban scale.

As explored in the book, at least four changes in international climate policy are needed to better position cities to confront climate change phenomena driven not only by the global greenhouse effect but by an urban heat island effect that is typically the dominant driver of warming at the urban scale. The first of these changes entails a fundamental revision of the definition of climate change developed for the U.N. Framework Convention on Climate Change, the international agreement adopted 20 years ago this summer, at the 1992 Earth Summit in Rio de Janeiro, and which lays the policy groundwork for international climate change management. Through this agreement, climate change is defined as, "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."[1]

What is remarkable about this definition, and ultimately problematic for cities, is that it fails to recognize the land surface drivers of warming that are often fundamental to climate change processes at sub-global scales, such as changes in albedo and the surface energy balance resulting from land use change. Fully cognizant of the importance of land surface forcing agents for climate change, the Intergovernmental Panel on Climate Change (IPCC) departs from the Framework Convention definition in asserting that "climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere *or in land use*" (emphasis added).[2] An important outcome of having adopted the Framework Convention definition for international climate policy is that a reduction in radiation-trapping greenhouse gases is presently characterized as climate change "mitigation," but a reduction in the radiation itself is not. Recent work suggests this incomplete characterization of climate change phenomena may be hindering the efforts of large cities to most effectively manage rapidly rising temperatures.

To assess the extent to which cities have incorporated strategies into climate action plans to address urban heat island formation – the principal driver of warming trends in large cities – in addition

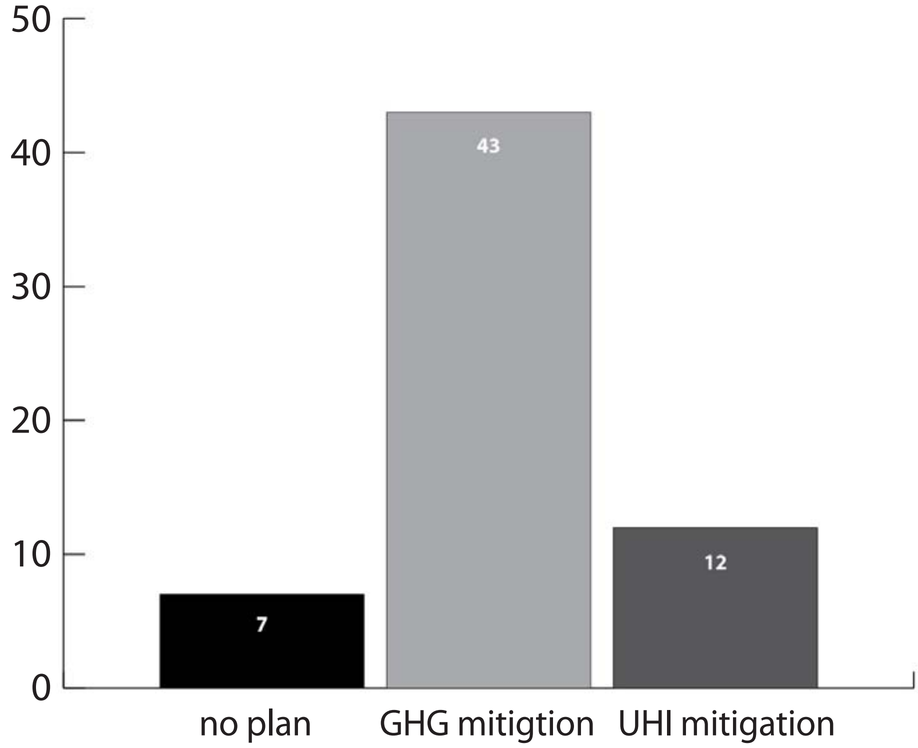

Figure 1. Frequency of greenhouse gas and/or local heat management strategies in climate action plans of the 50 most populous U.S. cities. Adapted from Stone, B., Vargo, J., Habeeb, D. Managing climate change in cities: Will climate action plans work? *Landscape and Urban Planning*, in press.

to greenhouse gases, my research group at Georgia Tech surveyed the climate action plans of the 50 most populous U.S. cities. The results, presented in Figure 1, find that all cities for which such a plan is in place (43 of 50 cities) have adopted strategies designed to reduce the emission of greenhouse gases. A much smaller number – 12 of the 50 surveyed – have included in climate action plans strategies specifically designed to address the urban heat island effect. In short, the most populous regions of the United States are most often preparing for a climate future that is driven by the global greenhouse effect alone. This tendency to emphasize global scale, atmospheric drivers of warming trends in climate action plans, while overlooking the local scale, land use drivers, enhances population vulnerability to extreme heat.

A second change in climate management policy needed to more effectively address the accelerated pace of warming underway in cities is the regular performance of scientific assessments at sub-global scales. In concert with periodic assessments of global scale climate processes, as carried out by the IPCC every 5 to 7 years, is the need for a systematic assessment of climate change processes at the scale of regions undergoing rapid land use change – particularly urbanized regions. While shifts in albedo and the surface energy balance carry profound implications for climate at local to regional scales, the impacts of such shifts are often obscured by the globalized metrics of climate change incorporated into global scale assessments, such as the oft-cited mean annual change in global temperature. If management programs are to be developed to address regional-scale climate phenomena, region-specific scientific assessments will be needed to gauge the principal drivers of warming at this scale, as well as the effectiveness of land-based mitigation strategies in slowing these trends.

How might the policy response to a regionally based system of regular scientific assessment differ from that of a globally based assessment? A wealth of climate research suggests that land use conversions, particularly deforestation, play a far more significant role in local to regional scale climate change than at the global scale. In light of this evidence, efforts to manage climate change from local to global scales could be better integrated through an emphasis on avoided deforestation and reforestation, particularly in proximity to urbanized regions. Recent policy innovations such as the Reducing Emissions from Deforestation and Forest Degradation (REDD) program represent a positive step in this direction. But here again, the privileging of emissions over non-emissions based agents of climate forcing limits the potential effectiveness of REDD for local climate management. Rather than assessing the benefits of forestation programs in carbon-based terms alone, avoided deforestation and reforestation efforts should be valued as well in terms of local heat management.

To be most protective of human health, some percentage of global forest management activities should be targeted toward urbanized regions. Enabling nations signing onto international climate change agreements to direct forest management efforts toward their own cities where appropriate, in addition to rural areas subject to extensive deforestation, would provide a much stronger linkage than presently exists between the global policy framework and local scale planning. As urbanized regions account for only a small percentage of the global land surface, the proportion of re-vegetation efforts directed to cities necessarily would be small but could yield substantial local benefits, including both carbon sequestration and heat island management.

The potential for forestation and other land use strategies to address both the emissions and non-emissions agents of climate forcing in urban environments suggests the need for better integration of strategies focused on mitigation with those oriented toward adaptation. Characterized in the book as "adaptive mitigation," a wide range of strategies shown to be effective in reducing heat island formation are also effective in reducing emissions or enhancing sequestration of carbon dioxide. Thus, a final needed change in the international community's approach to climate management is the prioritizing of adaptive approaches to carbon management over non-adaptive approaches.

At present, non-adaptive mitigation rules the day, with the vast majority of mitigation funds being directed to energy projects that produce no secondary benefits for local populations in the form of heat management, enhanced flood protection, or agricultural resilience. For example, mitigation strategies involving the substitution of a lower carbon-intensive fuel, such as natural gas, for a higher carbon-intensive fuel, such as coal, are an effective means of lowering CO_2 emissions, yet provide few other benefits related to local climate management. A restructuring of the global policy framework to prioritize adaptive mitigation over non-adaptive mitigation, particularly in urban environments, would better integrate local and global policy objectives.

In combination, these recommended revisions to the established international framework for climate change management would substantially elevate the significance of urban environments in global climate policy. It should be emphasized, however, that cities cannot rely on the global policy framework to govern regional scale climate management. Fundamentally oriented toward the planetary-scale phenomenon of the global greenhouse effect, the Framework Convention and its associated protocols lack both the legislative mandate and regulatory scope to sufficiently alter the land use practices of cities and regions. Indeed, even national governments may lack the direct regulatory authority needed to institute changes in the land development and greenspace planning practices of municipal governments. In many countries, it is municipal governments themselves that will need to institute policy changes and secure the needed resources to enhance regional climate resilience – a task in which the urban climate research community is uniquely well positioned to assist.

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[1] United Nations Framework Convention on Climate Change, May 9, 1992, S. Treaty Doc No. 102-38, 1771 U.N.T.S. 107.

[2] IPCC, Climate Change 2001: *The Scientific Basis: Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (Houghton, J., Y. Ding, D. Griggs, M. Noguer, P. van der Linden, X. Dai, K. Maskell, & C. Johnson, eds.) (Cambridge University Press, 2001).

Global Model of Anthropogenic Heat Flux

Introduction

How people live and work in cities, how they move from place to place, what they consume and the technologies they use, all affect heat emissions in a city influencing the urban climate. Predictions of human induced climate change suggest increases in surface air temperatures anywhere between 0.5 and 6.5 °C over the next 100 years. The Urban Heat Island (UHI) effect tends to exacerbate further such warming and temperatures in cities are predicted to rise even more, resulting in increased energy demand for cooling systems in the warmest months in cities located in the low and mid-latitudes, although cities in high altitudes may need less heating energy during the cold periods. Increasingly studies of urban climate are multi-disciplinary with data from multiple sources collated to model, understand and predict urban climate conditions.

LUCY

The Large scale Urban Consumption of energY model (LUCY) simulates all components of anthropogenic heat flux (Q_F) from the global to individual city scale at 2.5′ x 2.5′ resolution. LUCY includes a database of different working patterns and public holidays, vehicle use and energy consumption for each country. These databases can be edited to include specific diurnal and seasonal vehicle and energy consumption patterns and local holidays. If better information about individual cities is available within this (open-source) database, then the accuracy of this model can only improve, to provide the community data from global-scale climate modelling or the individual city scale in the future. Allen *et al*. (2011) provides the detail of the procedures used to model the three components of anthropogenic heat flux: heat emissions from vehicles, heat released from buildings and heat released from metabolism. Anthropogenic heat flux values are very dependent on the spatial and temporal scale they are determined for with greater spatial variability expected as the spatial resolution becomes higher. When the anthropogenic heat flux for a large part of Europe is plotted it is very evident where the major urban areas are located (Figure 1). Tokyo is renowned for its very large

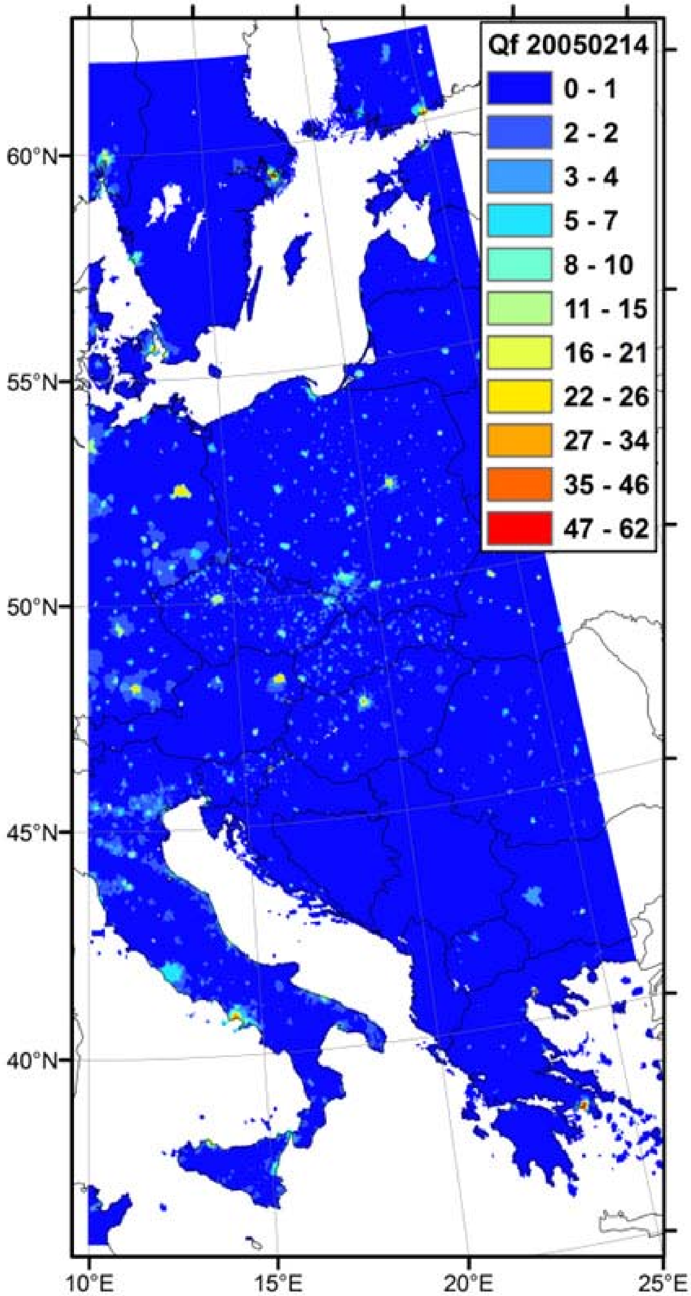

Figure 1: A snapshot of anthropogenic heat flux (Q_F W m^{-2}) for a latitudinal transect across Europe on 14 February 2005. The pixel resolution is 2.5′ x 2.5′ (Allen *et al*. 2011).

anthropogenic heat flux values, which are typically cited as being the largest for any urban area (Ichinose *et al*. 1999). Here we show a comparison of the fluxes for London and Tokyo at the 2.5′ x 2.5′ scale. First considering the temporal pattern through the year: the mean flux for the whole urban area of To-

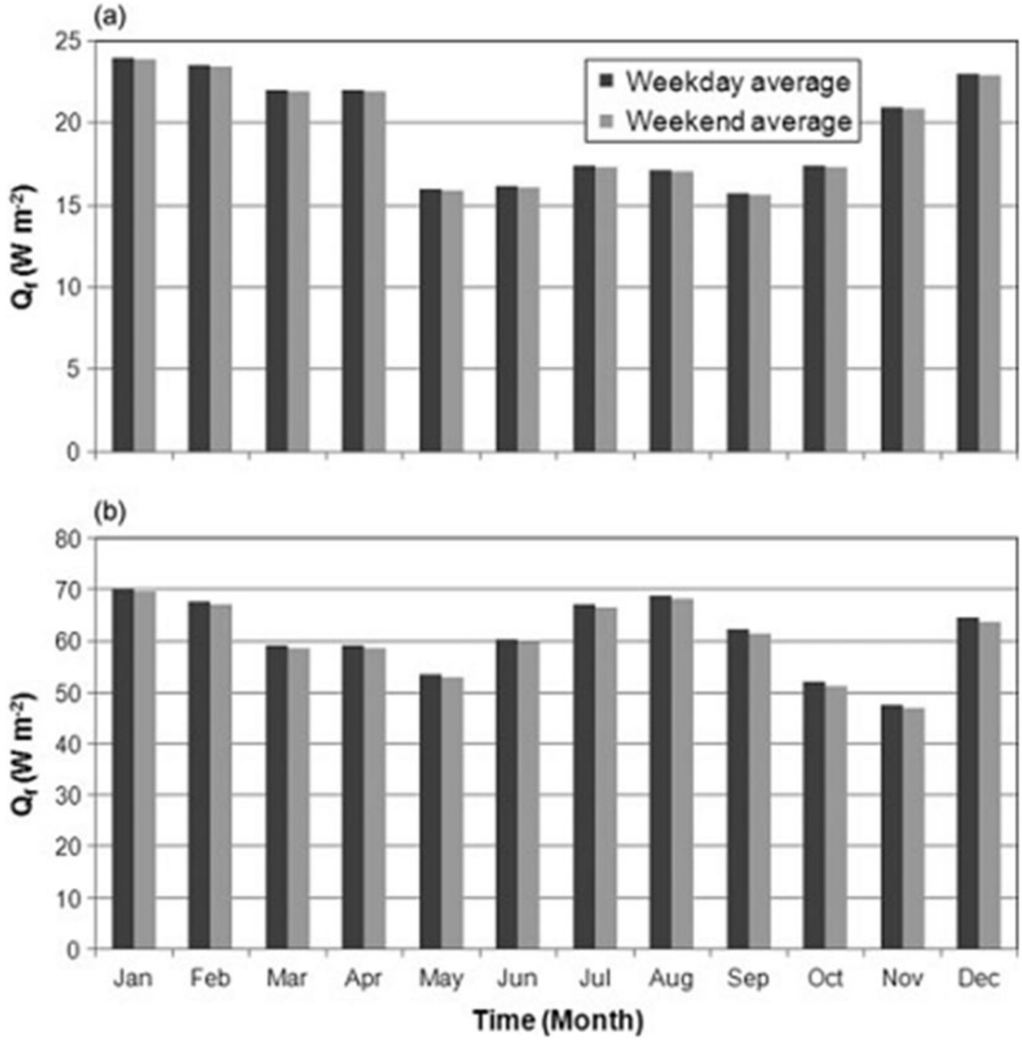

Figure 2: Monthly average anthropogenic heat emissions in (a) London and (b) Tokyo during 2005 (Allen *et al*. 2011).

kyo is 2-3 times greater than for London at all times of the year (Figure 2).

LUCY - Graphical User Interface

In an attempt to make LUCY user friendly, a Graphical User Interface (GUI) has been created with common windows and buttons in addition to command line execution. LUCY was originally executed on a Windows platform using Matlab (version R2009b) from Mathworks Inc. as MATLAB is well suited to extensive matrix processing which means that fast and efficient results are obtained. The GUI makes use of the MATLAB Compiler Runtime (MCR) which allows the full functionality of MATLAB without the need for a user to have a full version of MATLAB installed. Through the GUI the user can change most model input parameters, such as time to run the model, the region/city of interest, as well as input data such as global grids of energy consumption etc. (Figure 3).

Developments since Allen *et al*. (2011)

Subsequent to the publication of the Allen *et al*. (2011) paper, further developments regarding the introduction to theoretically examine any day or number of sequential days between 1900 and 2100 as well as heat released from buildings are being made. The success of estimating a specific point in time is highly dependent on the datasets available for that specific time of interest. Data sources needed for the model to make accurate assumptions on anthropogenic heat flux are: population density, air temperature, energy consumption and traffic data in the form of number of cars, freight and motorbikes per 1000 people by country (Allen *et al.* 2011). Popu-

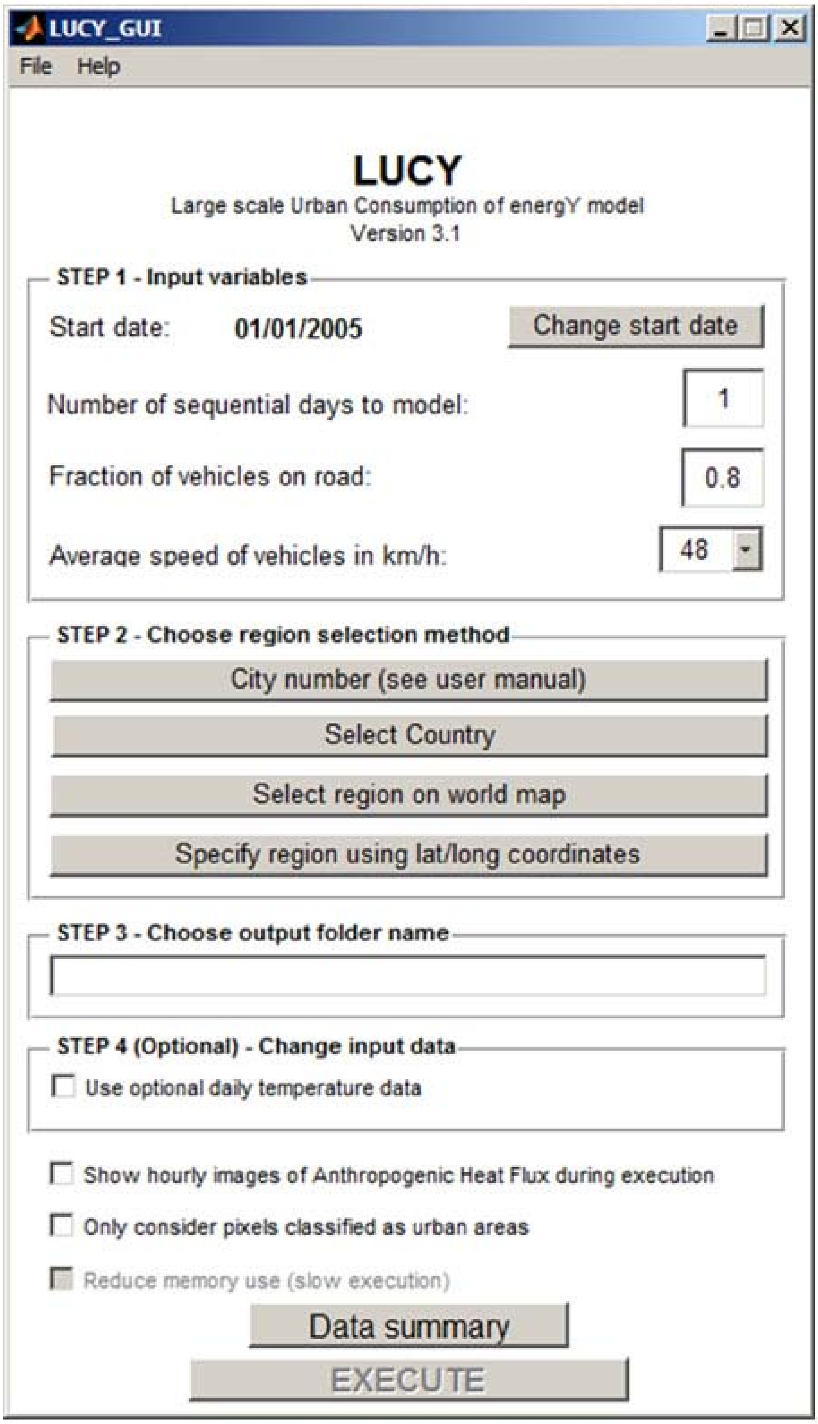

Figure 3: The Graphical User Interface (GUI) for LUCY.

lation and temperature are spatially explicit whereas country totals by year are used for energy and traffic data. Newer versions of LUCY (from version 3) are designed to use gridded datasets on global terrestrial monthly temperatures (0.5° x 0.5° resolution) created by Willmott *et al*. (2011). Using the GUI, a summary table of the available data used in a specific calculation is presented. Figure 4 shows an example of predicted Q_F in Europe on 17 February 2015.

Future developments

To improve the heat released from buildings we are currently working on a scheme which will be more responsive to temperature and monthly energy consumption for different countries. Monthly energy consumption data are not as easily accessed as annual data, so where the data are not available we will need to categorize countries in terms of how they consume energy based on economic wealth and regional climate. For example, the seasonal pattern in the UK is driven by energy consumption for heating during winter whereas the US also uses a proportion of their energy to cool their buildings during the hot summer months (Figure 5). In order to introduce this new scheme we are currently trying to acquire monthly energy consumption data for any country in the world and any information on such data would be very much appreciated. Figure 6 presents the specification on the datasets needed. Please contact the authors if such a dataset or information exists to your knowledge.

Software available from: http://geography.kcl.ac.uk/micromet/

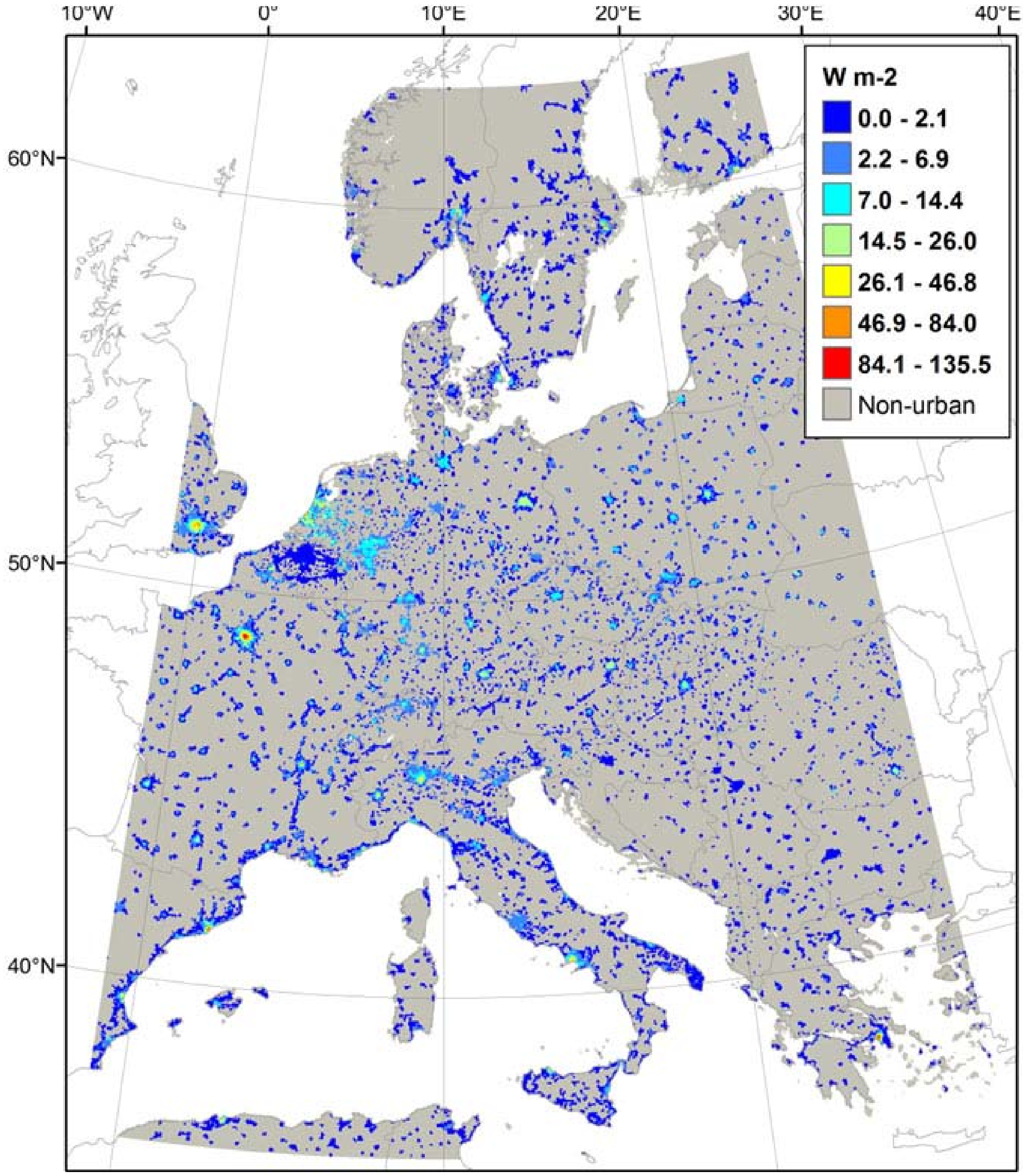

Figure 4: Daily average anthropogenic heat flux within urban areas (W m^{-2}) on 17 February 2015.

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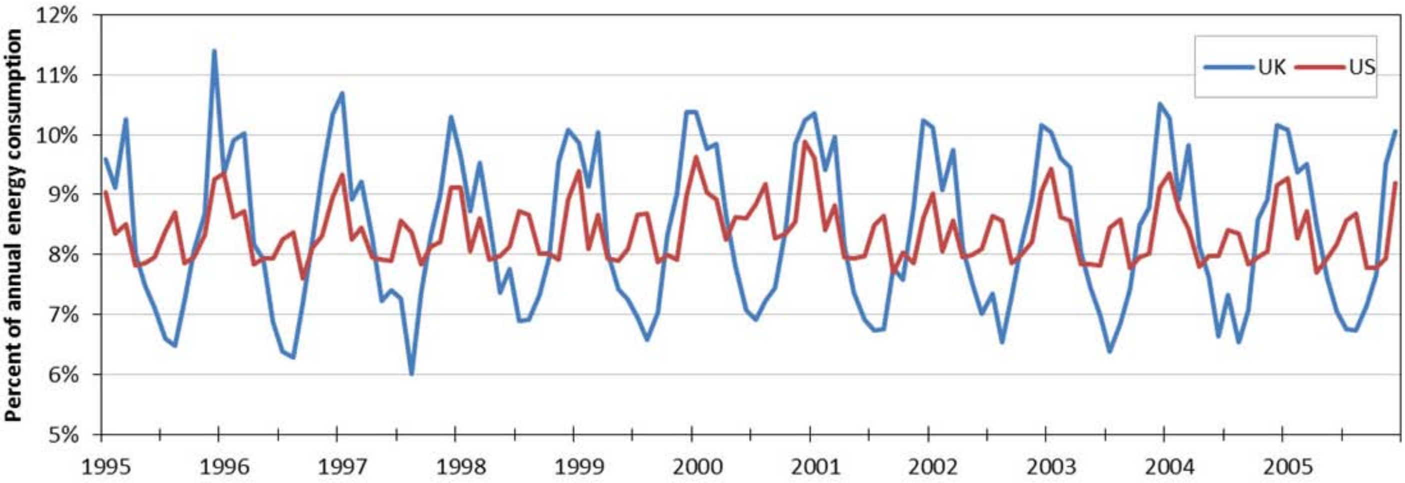

Figure 5: Example of relative monthly energy consumption for UK and US.

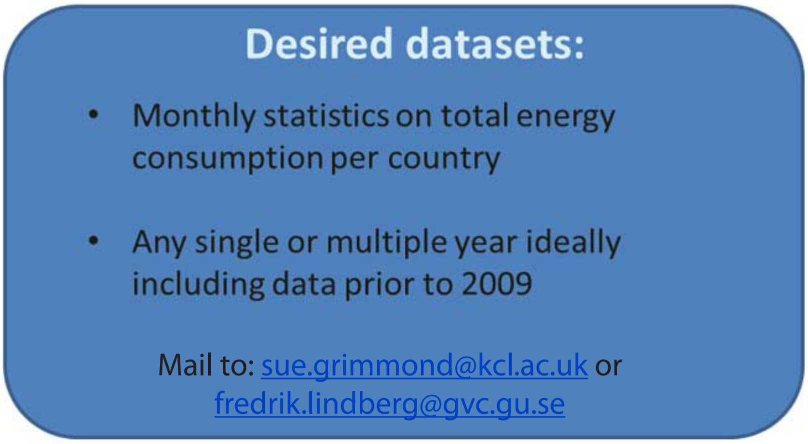

Figure 6: Specifications of energy data needed for upcoming version of LUCY.

Fredrik Lindberg[1], Lucy Allen[2], Simone Kotthaus[2] and C.S.B. Grimmond[2]

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Another 18-month review of *Urban Climate News*

Each year and a half I have been summarizing the contributions to *Urban Climate News* over the previous six issues, and on the eve of ICUC8, it is time for another recap.

The accompanying tables show the range of feature articles and urban project reports which were published over this period. In addition to the article title and authors, each listing includes a link to the issue in which the article appeared. I would like to thank all the contributors of these articles, which reflect on the diversity and vitality of the field of urban climatology.

Also, my special thanks go to Winston Chow who has provided juicy news items from the international media, and Julia Hidalgo, who together with the bibliography committee has provided the extensive lists of publications. Finally, I'd like to recognize Gerald Mills for his leadership over this period, and wish Gerald the best of luck with ICUC8 in Dublin. – *David Pearlmutter, Editor*

Feature Articles	Author(s)	Issue
Meso-urban modeling in support of heat-island mitigation	**Haider Taha**	March 2011
UHI effects on temperature records near Brussels, Belgium: An observational and modeling study	**Rafiq Hamdi**	June 2011
Urban-scale CFD modeling in Tokyo	**Yasunobu Ashie**	September 2011
Surface temperature variability and mortality impact in the Paris region during the August 2003 heat wave	**Bénédicte Dousset et al.**	December 2011
How much do urban heat islands influence estimates of observed large-scale climate change?	**David Parker**	March 2012
The City and the Coming Climate: Climate Change in the Places We Live	**Brian Stone**	June 2012

Urban Project Reports	Author(s)	Issue
Heat wave in Moscow city in summer of 2010: Results of meteorological measurements and possible explanations	**Mikhail A. Lokoshchenko**	March 2011
Spatial geotechnology applied to urban climate studies: Thermal analysis of urban surface and land use in Caracas	**Karenia Córdova**	March 2011
Thermal adaptation and attendance in outdoor public spaces	**Tzu-Ping Lin**	June 2011
CO_2 flux measurements in Łódź, Poland	**W. Pawlak, K. Fortuniak and M. Siedlecki**	June 2011
Global expansion of urban areas: Results from a meta-analysis	**Karen C. Seto**	September 2011
An Indoor-Outdoor Building Energy Simulator - Application to Study Cool Pavement Impacts on Building Energy Use	**Neda Yaghoobian and Jan Kleissl**	December 2011
Urban Heat Islands and Urban Thermography – The UHI Project	**Paolo Manunta et al.**	December 2011
European UHI Project Targets Strategies for Heat Island Mitigation and Adaptation	**Joachim Fallmann, Peter Suppan and Stefan Emeis**	March 2012
Global Model of Anthropogenic Heat Flux	**F. Lindberg, L. Allen, S. Kotthaus and C.S.B. Grimmond**	June 2012

Recent publications in Urban Climatology

In this edition a list of publications that have come out until May 2012 are presented. As usual, papers published since this date are welcome for inclusion in the next newsletter and IAUC online database. Please send your references to julia.hidalgo@ymail.com with a header "IAUC publications" and the following format: Author, Title, Journal, Volume, Pages, Dates, Keywords, Language, URL, and Abstract.

Happy reading,

Julia Hidalgo

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New Journal: *Urban Climate*

Launching in 2012, *Urban Climate* provides a platform to share results and insights on all aspects of urban climate.

Urban Climate serves the scientific and decision making communities with the publication of research on theory, science and applications relevant to understanding urban climatic conditions and change in relation to their geography and to demographic, socioeconomic, institutional, technological and environmental dynamics and global change.

Editors-in-Chief: Professor Alexander Baklanov and Professor Matthias Ruth.

http://www.journals.elsevier.com/urban-climate

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Upcoming Conferences...

THE 8TH INTERNATIONAL CONFERENCE ON URBAN CLIMATE (ICUC8)
Dublin, Ireland • August 6-10, 2012
http://www.icuc8.org

SESSION AT IGC: URBAN CLIMATE AND AIR POLLUTION IN A CHANGING CLIMATE
Cologne, Germany • August 26-30, 2012
https://igc2012.org

11TH URBAN ENVIRONMENT SYMPOSIUM – URBAN FUTURES FOR A SUSTAINABLE WORLD
Karlsruhe, Germany • September 16-19, 2012
http://www.hues.se

6TH INTERNATIONAL CONFERENCE ON FOG, FOG COLLECTION AND DEW
Yokohama, Japan • May 19-24, 2013
http://www.fogconference.org/

Report on ICUC8 in Dublin, Ireland on August 6th-10th, 2012

As of July 1, there are over 430 delegates registered to attend ICUC8. Of these more than 30 have received support to attend owing to the generosity of the World Meteorological Organization, the European Space Agency, the Japan Prize and the Science Foundation of Ireland. As a result the make-up of the delegates is even more diverse than it would otherwise be. In the table below I have listed the countries that have the largest number attending. As has been the case for previous ICUC events, the support of the Japanese community is outstanding. There are large numbers from European and North America but it is especially gratifying to see increasing attendance from China and India, two countries that are experiencing rapid urban growth. In addition, about 40% of the delegates that will attend ICUC8 are PhD students that will present, which is indicative of the growing strength of the field.

The programme of presentations includes about 360 oral and 120 poster presentations. This programme will be available on the conference website (www.icuc8.org) this week. This schedule will be the basis for the book of abstracts, that is currently being prepared. A preliminary set of proceedings will be available for ICUC8 based on papers submitted by the end of June. A final set will be produced by the end of October which will be available on the IAUC website. We also hope to record the plenary lectures for www.urban-climate.org. Finally, it is our intention to publish a selection of papers in a special issue of a scientific journal.

— Gerald Mills

Country	N	Country	N	Country	N
ARGENTINA	2	HUNGARY	9	NIGERIA	6
AUSTRALIA	8	INDIA	5	POLAND	11
AUSTRIA	3	IRELAND	9	PORTUGAL	8
BELGIUM	4	ISRAEL	8	RUSSIA	5
BRAZIL	12	ITALY	9	SINGAPORE	5
CANADA	21	JAPAN	52	SOUTH KOREA	6
CHINA	18	KENYA	1	SPAIN	11
CZECH REP	3	KOREA, SOUTH	11	SRI LANKA	3
EGYPT	1	LUXEMBOURG	1	SWEDEN	9
FINLAND	6	MALAYSIA	4	SWITZERLAND	8
FRANCE	25	MEXICO	2	TAIWAN	5
GERMANY	39	NETHERLANDS	7	UK	32
HONG KONG	12	NEW ZEALAND	1	USA	37

CALL FOR PROPOSALS FOR NEXT ICUC MEETING (ICUC-9)

The International Association for Urban Climate (IAUC) (http://www.urban-climate.org) organises an international conference on urban climatology at regular intervals. The next International Conference on Urban Climate, ICUC-8 will be held in Dublin, Ireland from August 06-10, 2012 (http://www.icuc8.org).

ICUC-8 is the continuation of a series of similar conferences starting in Kyoto, Japan in 1989, followed by those in Dhaka, Bangladesh in 1993, Essen, Germany in 1996, Sydney, Australia in 1999, Lodz, Poland in 2003, Göteborg, Sweden in 2006 and Yokohama, Japan in 2009. The success of this series helped to create a cohesive international community of urban climatologists. At the end of the abstract acceptance period for ICUC-8 over 560 abstracts have been accepted for oral or poster presentation.

The aims of these conferences are to provide an international forum where the world's urban climatologists can meet to showcase and discuss modern developments in research, and the application of climatic knowledge to the design of better cities. They cater to the interests of a diverse community of meteorologists, climatologists, hydrologists, ecologists, engineers, architects and planners and others interested in these topics.

We would like to start the process to identify the location and host of the next ICUC meeting which will probably be held in 2015. Those interested in hosting the next conference are invited to submit a proposal which should address the following points:

1. Organizer's name and institutional affiliation

2. Location for conference, facilities available (indicate why proposed location is a good choice for an ICUC conference. Please also indicate hotels, distance between hotels and conference venue. Availability of "cheap" housing options for e.g. students)

3. Proposed timing of conference.

4. Proposed registration or other fees for conference, and an indication of how surpluses or deficits are to be handled (assuming 300 participants with about 1/3 of the attendees being students); indicate what the registration fee would cover.

5. Whether there will be a preprint volume or conference proceedings (printed or on CD-ROM).

6. Institutional/private/government support for holding the conference at this location. This might include suggestions for a joint conference with another society or organization.

Previous organizers of ICUC conferences are:

Professor Y. Nakamura, Japan (ynaka@pu-kumamoto.ac.jp)

Professor W. Kuttler, University of Essen, Germany (wilhelm.kuttler@uni-due.de)

Professor Richard DeDear, University of Sydney, Australia (richard.dedear@sydney.edu.au)

Professor K. Klysik, University of Lodz, Poland (klysik@krysia.uni.lodz.pl) (ICUC-5)

Professor S. Lindqvist, Göteborg University, Sweden (sven@gvc.gu.se) (ICUC-6)

Professor Manabu Kanda, Tokyo Institute of Technology (kanda.m.aa@m.titech.ac.jp) (ICUC-7)

Dr Gerald Mills, University College Dublin, Ireland (gerald.mills@ucd.ie) (ICUC-8)

These people can provide insight into the necessary financial and institutional support that is needed to run a successful conference. It must be appreciated that ICUC of itself has no funds, its main resource is the goodwill and enthusiasm of its members and the knowledge that designated ICUC meetings attract the best of the international urban climate community, and that our past success has created mutually beneficial inter-organizational linkages.

Proposals should be submitted in electronic format to Rohinton.Emmanuel@gcu.ac.uk by **16 July 2012**. We will have initial evaluations with the Board of the IAUC and then ask finalists to prepare a presentation for the Board Meeting at ICUC-8. If you have any queries or would like to see what a full previous proposal looked like please contact Rohinton Emmanuel.

Board Members & Terms

- Tim Oke (University of British Columbia, Canada): President, 2000-2003; Past President, 2003-2006; Emeritus President 2007-2009*
- Sue Grimmond (King's College London, UK): 2000-2003; President, 2003-2007; Past President, 2007-2009*
- Matthias Roth (National University of Singapore, Singapore): 2000-2003; Secretary, 2003-2007; Acting-Treasurer 2006; President, 2007-2009; Past-President 2009-2011*
- Gerald Mills (UCD, Dublin, Ireland): 2007-2011; President, 2009-2011
- Jennifer Salmond (University of Auckland, NZ): 2005-2009; Secretary, 2007-2009
- James Voogt (University of Western Ontario, Canada), 2000-2006; Webmaster 2007-*; 2009-2013
- Manabu Kanda (Tokyo Institute of Technology, Japan): 2005-2009, ICUC-7 Local Organizer, 2007-2009.*
- Sofia Thorsson (University of Gothenburg, Sweden): 2008-2012
- Rohinton Emmanuel (Glasgow Caledonian University, UK): 2006-2010; Secretary, 2009-2011
- Jason Ching (EPA Atmospheric Modelling & Analysis Division, USA): 2009-2013
- David Pearlmutter (Ben-Gurion University of the Negev, Israel): Newsletter Editor, 2009-*
- Alberto Martilli (CIEMAT, Spain), 2010-2014
- Aude Lemonsu (CNRS/Meteo France), 2010-2014
- Silvana di Sabatino (Univ. of Salento, Italy), 2010-2014
- Hiroyuki Kusaka (University of Tsukuba, Japan): 2011-2015
- David Sailor (Portland State University, USA): 2011-2015

* appointed members

IAUC Committee Chairs

Editor, IAUC Newsletter: David Pearlmutter
Bibliography Committee: Julia Hidalgo
Nominating Committee: Tim Oke
Chair Teaching Resources: Gerald Mills
Interim-Chair Awards Committee: Jennifer Salmond
WebMaster: James Voogt

Newsletter Contributions

The next edition of ***Urban Climate News*** will appear in late September. Items to be considered for the upcoming issue should be received by **August 31, 2012** and may be sent to editor David Pearlmutter (davidp@bgu.ac.il) or to the relevant section editor:

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Submissions should be concise, written in a manner that is accessible to a wide audience, and incorporate figures and photographs. The articles in this Newsletter are unrefereed, and their appearance does not constitute formal publication; they should not be used or cited otherwise.