Urban Climate News

Quarterly Newsletter of the IAUC

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From the IAUC President

Dear colleagues in the IAUC community.

When I wrote my March column it seemed inconceivable that in the third quarter of 2020 we would still be dealing with the havoc caused by COVID-19, but we are. In Melbourne, Australia, we are currently slowly emerging from our second hard lockdown, as other parts of the world are again entering various shades of new lockdowns. I fervently hope that you and your families are remaining safe and well and that you are all managing in your altered working conditions. One positive (maybe it's a negative) for me is that, with little else to occupy my time, I seem to have been able to get through a fair bit of work!

One negative to get out of the way before focusing on positives is that, as you will read elsewhere in this Newsletter, the decision has been made to **postpone our Sydney ICUC-11 for a year**, from August 2021 until August 2022. In consultation with our members, and for a number of very significant reasons, this seemed the most sensible thing to do. Australia's borders are closed and are likely to remain so until well into next year. On a related but positive note, the disruption to ICUC-11, and to many other scientific meetings, has resulted in an initiative to develop a regular online IAUC seminar series. Many thanks to Natalie Theeuwes for taking the initiative on this – more information to follow soon.

Continuing with the positives; as you may know, we had two excellent new members voted onto the IAUC Board at the last election, Simone Kotthaus and Melissa Hart. I look forward to working with them in the future. Last, but not least in the way of "good news" stories is the announcement of the IAUC awards, including the new Timothy Oke Award. Alberto Martelli is a very worthy winner of the 2020 Luke Howard Award, for outstanding contributions to the field of urban climatology, and Chao Ren and Scott Krayenhoff are deserving winners of the 2020 Timothy Oke Award, for early-to-mid career working in our field. More details of these awards and the work of the awardees can be found later in this Newsletter and on the IAUC website.

I hope that you will enjoy reading this issue No.77 of the Quarterly Newsletter of the IAUC as much as I have. There is the usual variety of excellent articles and reports of interest for our membership, including the *In the News* section compiled by **Paul Alexander**. This will be the last *In the News* section compiled by Paul, and we thank him sincerely for his contributions. As a consequence, we are looking for someone to replace Paul in finding items in the media that are timely and relevant to urban climatology. If that person is you, please get in touch with David Pearlmutter (davidp@bgu.ac.il).

With best wishes.

– Nigel Tapper,
IAUC President
nigel.tapper@monash.edu

Inside the September issue...

HELP WANTED! Expressions of interest are sought for the role of **News items Editor**. The role involves trawling periodically (four times a year) through ~1,209,600 news items that are created across the globe daily, for stories that fit the urban climate community's eclectic interests.

For more information or to put yourself forward, please contact either

David Pearlmutter (davidp@bgu.ac.il) or

Paul Alexander (paul.j.alexander@outlook.com)

Racist housing policies have created some oppressively hot neighborhoods

Decades of redlining and other discriminatory practices reshaped urban landscapes in Minneapolis and elsewhere, leaving some areas 10 degrees hotter than others.

September 2020 — The blacktop burned Melodee Strong's feet through her sneakers as she stood at the corner of Plymouth and Penn Avenues in North Minneapolis, gazing at the 250-foot-long "Black Lives Matter" street painting she and other artists were working on.

It was mid-July and brutally hot. By late morning, temperatures had soared to over 100 degrees Fahrenheit. The paint dried so fast that Strong could watch as it crinkled into place, wishing she had worn thicker-soled shoes. "Unless we had astronaut shoes, or fireman's boots, I don't think anything would have worked," she said.

Two months earlier, just a few miles south, George Floyd had been killed by a Minneapolis police officer. In response, Strong and the artists decided to paint the mural, and they intentionally put it here in North Minneapolis, a historical center of Black life in the city—and ground zero for some of its starkest racial disparities.

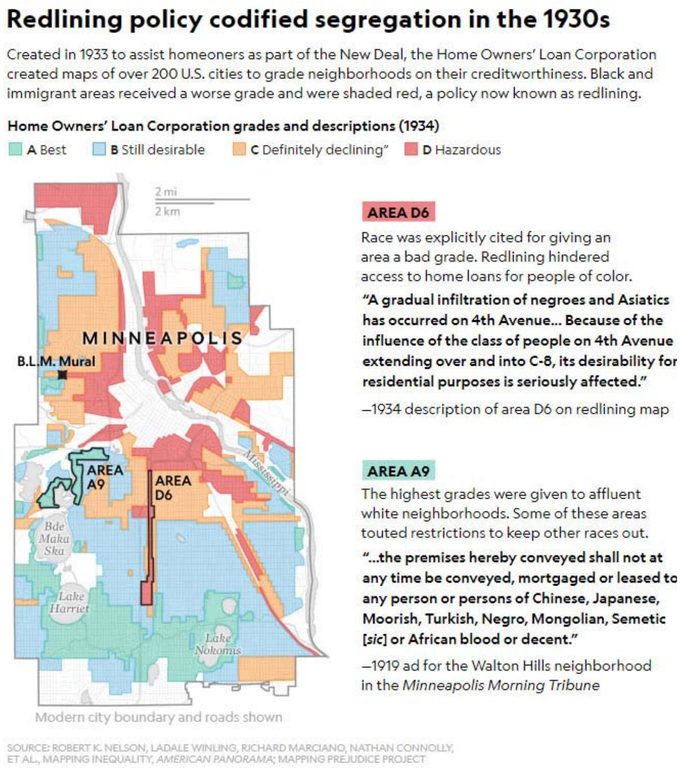
This particular spot holds another distinction: It's one of the hottest neighborhoods in the city. Temperatures around here can be more than 10 degrees Fahrenheit hotter than the city's cool areas, according to an analysis published earlier this year, putting at risk the health and safety of the neighborhood's residents, about half of whom are Black.

This disparity is not an accident. The heat shimmering around Strong is at least in part the result of over a century of explicitly and implicitly racist and exclusionary city planning decisions at both the local and national level.

Such decisions have resulted in measurable differences in heat. A recent study found that in more than 100 American cities, neighborhoods that were "redlined" in the 1930s—deliberately discriminated against on racial grounds, in home loans and other economic support—are today, on average, about 4.7 degrees Fahrenheit hotter than un-redlined neighborhoods in the same city.

That means in formerly redlined neighborhoods, which are still primarily filled with Black and brown communities, families face heat stresses now that foreshadow the ones climate scientists say will strike the more affluent parts of Minneapolis and other cities decades in the future.

"Heat today is an indicator for what's gone on in the past," says Vivek Shandas, an urban planning expert at Portland State University and an author of the study, published in the journal *Climate*. Redlining and other discriminatory policies have shaped the distribution not just of cooling trees and hot pavement but also the location of freeways, factories, and other factors that affect health in today's urban landscape, he says: "You pull that string and so many things unravel, decade after decade."



Source: nationalgeographic.com

Hot cities

Scientists have long known that features common to cities can make heat measurably worse. Two hundred years ago, an amateur climatologist in London found that thermometers he'd set up in the center of the city almost always measured warmer temperatures than ones from pastoral outer hamlets—the first evidence of what we now know as the "urban heat island effect."

Today, researchers think of the heat island as more of an archipelago: In any city, hot spots appear where concrete and asphalt prevail, while cool zones emerge around trees, parks, or other open space.

Dark surfaces like paved roads or tar-covered rooftops readily absorb heat from the sun. They also tend to hold onto that heat more tightly than natural materials like loose dirt or plants. Big, densely clustered buildings do the same. Once heated up, they release the heat only slowly into the surrounding air like a hot, stale breath.

Trees and plants, on the other hand, cool cities down. Their leaves reflect away some incoming solar heat and shade the ground below. Their roots also suck water from the ground and eventually release it to the air in a process called evapotranspiration. The energy to vaporize the water comes from heat in the air, which leaves the left-behind air cooler.

But trees grow where they grow, and neighborhoods look how they look, because of choices made in the past.

This summer, young scholars in the predominantly Black Near North neighborhoods in Minneapolis saw the difference with their own eyes. Six days in a row, masks on, a group of students from the Liberty Community Church's 21st Century Academy summer program piled into a van and drove away from their home base to different nearby neighborhoods.

They each held a worksheet prepared by Cyreta Odunuyi, one of the leaders of the summer academy. It posed a series of questions: What do you see in this neighborhood? How does that change as we drive into these other areas?

Near the church, they saw abundant pavement and few green spaces. But as they drove into the leafy, affluent Bryn Mawr neighborhood, just a few minutes away, they saw houses set far apart from each other, with wide swaths of lawn between them. Parents strolled beneath the verdant tree canopy with their babies.

Underlying the differences they saw, Odunyi explained to the scholars, is redlining.

Covenants, redlining, and their legacy

"Redlining" is a colloquial term for a practice introduced in the 1930s, as the federal government struggled to revive the U.S. economy during the Great Depression. Government leaders wanted to help homeowners who were facing default on their mortgages or otherwise wouldn't be able to afford houses, so they developed a state-sponsored lending program—the Home Owners' Loan Corporation, or HOLC—that could issue mortgages.

The HOLC hired real estate agents to map areas within cities where loans would be "safe—" places where property values would stay high, protecting the government's investment. At the time, the ethics code of the burgeoning real estate profession required them to maintain and promote neighborhood segregation in the interest of "racial harmony." The HOLC maps were created with the explicit intention of keeping some neighborhoods white.

"Safe" areas, like Bryn Mawr in Minneapolis, were outlined in green and graded with an A. Neighborhoods that were considered risky were outlined in yellow (C, "Definitely Declining"), or red (D, labeled "Hazardous"). If just one African-American family lived in a neighborhood, it would usually be redlined.

Before there was a national policy encouraging and enabling housing segregation, local-scale strategies had taken root. Racially explicit "covenants' prohibiting a property's sale to non-white buyers had proliferated across the country since the late 1800s. Minneapolis's first covenant, from 1910, read unambiguously: "[These] premises shall not at any time be conveyed, mortgaged or leased to any person or persons of Chinese, Japanese, Moorish, Turkish, Negro, Mongolian or African blood or descent."

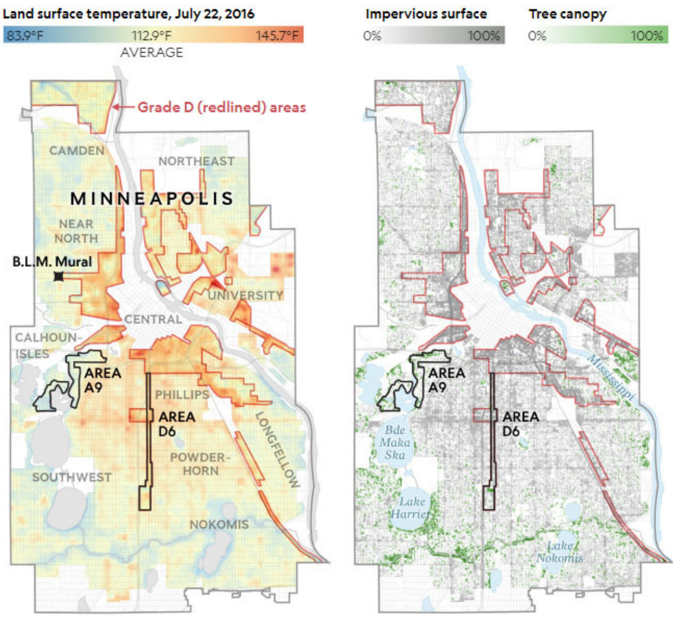
Covenants were in use until 1968, when the Fair Housing Act made the practice illegal.

By then the damage had been entrenched for decades. In the early 20th century, Minneapolis, like many other northern U.S. cities, had only a small Black community—about 1 percent of the city's population. But the families were scattered across the city, not centered in any one area. Only after the advent of racial covenants, redlining, and other discriminatory practices were they forced into a few narrow zones near the city center and denied the opportunity to buy property.

By the 1940s, those newly segregated Black neighborhoods had some of the lowest rates of homeownership in the country, at least in part because Black families were ineligible for federally insured loans and denied access to private credit. Over the following decades, as the Great Migration brought more Black families north, the disparities and the segregation grew. In Minneapolis, as in many other cities, the city's funding for parks, neighborhood maintenance and infrastructure, schools, and more, went elsewhere.

Today redlined areas face worse urban heat

Satellites can detect the minute changes in temperature on the earth's surface, revealing how urban heat varies block by block. Areas with more trees and vegetation are cooler than those with low-lying buildings and expanses of bare pavement, also known as impervious surfaces.



In Minneapolis, redlined areas are, on average, 10.8°F hotter than neighborhoods that were given an A grade.

Fewer trees and more impervious surfaces like parking lots help make redlined areas 5.3°F warmer than the city's average.

DATA SHOWN ONLY FOR RESIDENTIAL AREAS ON 1934 REDLINING MAP
SOURCES: NASA; JEREMY HOFFMAN; VIVEK SHANDAS

Source: nationalgeographic.com

A 'Rorschach test' of inquality

The indelible effects of racism influenced everything from the location of waste sites to school funding, says Kirsten Delegard, a historian at the University of Minnesota who led a massive project to map Minneapolis's historical covenants and relate them to today's racial disparities.

"We kept showing this map to different groups, and it was like a Rorschach test of their background and interests," she says. Health experts, for example, noticed that the covenant-free, redlined areas of the map corresponded disturbingly well with the areas they knew had high asthma rates and low birth weights—conditions associated with exposure to air pollution and other environmental hazards. A local food expert saw that stands of fruit trees were abundant in neighborhoods where whites-only covenants had been common. In one of the most striking examples, Delegard recalls, a city council member exclaimed that her map of racial segregation looked just like a map of street tree cover.

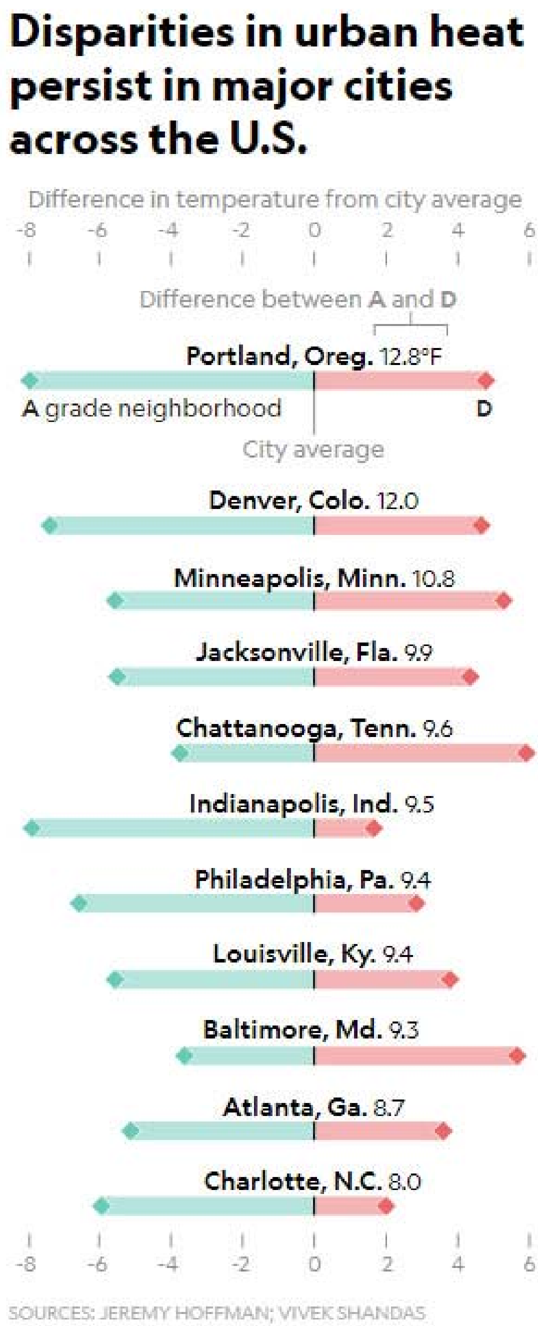
"This is the base map that everything else is built on," Delegard says. "Any other measure of well-being can be traced back to these restrictions."

"Once you see it, you can't unsee it, and it changes how you think and feel," says Kevin Gilliam, a doctor who works in a clinic around the corner from the BLM street painting. It's an easy pivot, he says, to couple this summer's social unrest, the devastating effects of the pandemic on Black communities, and environmental justice issues.

"It is not a stretch of the mind or imagination to connect social ills with environmental disparities, housing disparities, and health disparities," Gilliam says. "All these things can be traced back to the same roots."

That includes heat. In formerly redlined neighborhoods, as the Minneapolis city council member had noticed, there are fewer trees and more pavement. Other factors, like the major freeways that snake through the center of the city, contribute as well—and their locations were also predicated on racist planning decisions. Built in the 1950s and 60s, as the Black population of the city grew, the freeways served to further isolate nonwhite communities. The pavement absorbs heat from the summer sun and radiates it to the surrounding neighborhoods.

Liberty Church and the site of the BLM street painting are both in areas graded "C"—not quite redlined, but historically they too had received little investment. In the short drive to Bryn Mawr, the young scholars crossed the physical reality of policies put in place over 100 years ago and reinforced over and over in the intervening years.



Source: nationalgeographic.com

Heat will spread

Minneapolis has one of the largest temperature disparities between formerly redlined neighborhoods and those graded "A" in the 1930's, according to the study by Shandas and his colleagues. But the researchers found a similar pattern in nearly every single one of the 108 cities they analyzed. Minneapolis, Portland, and Denver had the biggest differences, with temperature differentials over 10 degrees Fahrenheit.

"All these cities, when you look at them, it's almost surgical," says Jeremy Hoffman, lead author of the paper and chief scientist at the Science Museum of Virginia. "You look along one little road and you can know exactly where the redlining happened."

According to the Centers for Disease Control, heat kills more than 700 people each year in the U.S. One recent study suggests the actual number may be nearly 10 times larger.

Heat is dangerous far below the threshold at which it is directly lethal. It exacerbates many health complications, like hypertension and heart disease. Many common medications also disrupt the body's ability to control its internal temperature. Air quality often plummets when temperatures rise, leading to more pollution-related illness.

Just a few degrees of extra heat during an extreme event, or over the longer term, can push people past health thresholds into dangerous territory, says Catherine Harrison, a public health specialist on Minneapolis's Emergency Preparedness team. Experts estimate that some 3,000 deaths occur annually in the U.S. because of moderate heat.

Climate change will increase the risks. And residents of northern cities, which were not built with extreme heat in mind, may be particularly vulnerable. For example, the 1995 Chicago heat wave killed over 700 people, primarily elderly people of color who lived without air conditioning in the hottest parts of the city, where temperatures were likely higher than the officially recorded values.

An analysis from the Union of Concerned Scientists says the number of days in Minneapolis with a heat index of above 100 degrees Fahrenheit—the kind of day Melodee Strong painted in—could increase to 20 by the middle of the century, and over 40 by the end of the century. (Between 1960 to 1990, on average, only two days a year were that hot.) The city is expecting average summer temperatures to rise by nearly eight degrees Fahrenheit by the middle of the century.

"By 2025, we're going to be seeing a lot more heat waves and days above 90," says Eric Wojchik, a planner with the Twin Cities' Metropolitan Council, which recently assessed the area's climate vulnerability. He pauses. "2025 is not that far away."

In Minneapolis, residents of the city's hotspots are already experiencing the heat that is coming for everyone. Residents of the cool areas, who are primarily white, are living in a very different heat-landscape—one that can be double-digits cooler on a hot day, according to a University of Minnesota analysis.

This disparity in experience has clear consequences in terms of social action and policy, says Harrison. Even the really hot days aren't yet that bad for many white residents, she says.

"I think, when white comfort is impacted, when the 'out there' issues become more proximal to them—that's when we'll see serious action occur" to address both local heat issues and climate change, Harrison says.

Currently, there is no funding for climate change-related heat adaptation in the city, says Kelly Muellman, the sustainability program coordinator for the city. Nor, adds Harrison, is there funding to assess the risk systematically, meaning that heat-related illnesses and deaths are likely underestimated.

A respite isn't always available

For those living in the hottest neighborhoods, the issues are here, now, and especially acute because of the COVID-19 crisis. The pandemic was certainly on Liberty pastor Alika Galloway's mind at the beginning of summer. In late June, she and her husband, Pastor Ralph Galloway, knew that the summer scholars would soon be arriving.

To follow guidance on COVID-19, the Galloways wanted the kids outdoors as much as possible, But they also wanted to shield them: from both gun violence and overzealous policing in the neighborhood, especially as police backlash against protests ramped up, and from the pandemic itself, which was ravaging Minneapolis's communities of color at rates more than three times higher than in white communities.

The Galloways also worried about the heat.To minimize their own carbon footprint, they had for years resisted installing air conditioning. But the conditions in June and July were too concerning, so they gave in.

"We really didn't want to," says Galloway. "But this is our children, our babies. You have to make this tragic moral choice, because you're in this destructive heat, in order to get them some relief so they can learn and rest, because their homes aren't cool either."

The Galloways, their young scholars, and everyone else in the hot zones of the city are living at the edge of the future, in a world shaped by the country's racist past and present and partially shut down by COVID-19. For Sam Grant, director of the Minnesota chapter of 350.org and a longtime advocate for environmental justice, the intersection of all these crises has rendered some things crystal clear.

"It's two kinds of heat we're facing," Grant says. "The heat of racism and of temperature. To have both those at the same time, in a global pandemic: It is an ugly, ugly moment. But I think—I hope—it is causing a reopening, as well."

Source: https://www.nationalgeographic.com/science/2020/09/racist-housing-policies-created-some-oppressively-hot-neighborhoods/

Why the 6 topics for the first Biden-Trump debate are actually all about climate change

[Note: This opinion piece was published by grist.org on September 23 2020, ***before*** *the first US presidential debate on September 29th.]*

September 2020 — Next Tuesday night President Trump and Democratic presidential nominee Joe Biden will travel to Cleveland, Ohio, to square off in the first of three presidential debates. Fox News anchor Chris Wallace will moderate, and he's already chosen his six topics for discussion.

They are: the records of the two candidates, the battle to replace Ruth Bader Ginsburg's seat on the Supreme Court, election integrity, issues surrounding race and violence in U.S. cities, the once-booming-now-busted economy, and of course the six-month-old COVID-19 pandemic that has cost 200,000 Americans their lives.

Notice a glaring omission? We do. Climate change is nowhere to be found, despite weeks of news about wildfires in the American West and a hyperactive Atlantic storm season that's already whizzed through the English alphabet.

Lawmakers noted the climate's absence, too: In an effort spearheaded by Massachusetts' Democratic Senator Ed Markey, on Wednesday 37 U.S. Senators — 35 Democrats and Independent Bernie Sanders — wrote to the Commission on Presidential Debates, imploring that the climate crisis receive greater attention during this debate cycle. "The climate crisis isn't coming, it's here," they wrote, and voters want the candidates to talk about it. A poll released this week found that 74 percent of voters want climate questions to be asked during the three presidential debates.

Even with no changes to Wallace's debate agenda, our warming planet could still come up in the first debate. As we at *Grist* attempt to prove daily, climate has links to nearly all other issues in the election, including COVID, Trump's and Biden's records, and of course the economy. Don't believe us? Keep reading.

The Trump and Biden records

For years, American presidents have used their executive powers to shape environmental policy, and President Trump is no exception. Since 2016, he has used his office to pursue a business-friendly, deregulatory agenda, rolling back at least 68 of the country's environmental and climate-related policies.

Biden of course can't cite the same presidential experience, but as vice president he supported the Obama administration's use of executive orders to implement a climate agenda, which included the Clean Power Plan. Biden also can point to his decades-long career in the Senate — during which, all the way back in 1986, he introduced the Global Climate Protection Act, the chamber's first climate change bill.

Both Trump and Biden have pitched themselves as climate candidates — the former is claiming to be the "No. 1 environmental president," while the latter is promising that he can lead the fight against climate change.

The Supreme Court

Ruth Bader Ginsburg's death on Friday vaulted the topic of Supreme Court nominations into the spotlight as a major campaign issue. Among the many legacies the late and "notorious" justice leaves was her support for environmental policies. According to Politico, she was a consistent vote in favor of clean air and water regulations and emissions controls.

Her successor, who will ultimately be chosen by either Trump or Biden, may be poised to help shape decades of environmental policy — especially as the Court considers weighing in on an increasing number of lawsuits that states, cities, and counties have filed against fossil fuel companies for their contributions to warming.

COVID-19

The pandemic and the climate crisis share many of the same roots. Deforestation and habitat destruction are obviously bad news for the environment — but they can also make a "disease-emergence event" more likely by pushing wild animals into closer contact with humans. When that happens, animal diseases can make the jump to us. Scientists say this is what likely happened with the coronavirus.

There's nothing we can do about SARS-CoV-2 now, but much as world leaders can take action to prevent aspects of climate change, they can also implement policies to prevent future pandemics from cropping up. That might mean curbing urban encroachment on wild spaces, but it can also mean addressing factory farms in the U.S., which scientists have long said are "a hotspot for emerging pandemics."

The economy

After six months of COVID lockdowns (and still no end to the pandemic in sight), much of the candidates' plans for the economy will involve some sort of recovery from the coronavirus-induced recession. Climate advocates like the group C40 Cities have called for a plan that prioritizes sustainability and environmental justice. That might mean investing in green jobs, public services, mass transit, and retraining programs for workers in the fossil fuel industry.

In July, Biden made clear he saw the creation of a new clean energy economy as a part of the recovery from COVID. He unveiled a $2 trillion plan that over four years would invest heavily in transitioning the U.S. to 100 percent carbon neutral electricity by 2035, shifting the government fleet of vehicles to electric, and funneling 40 percent of energy infrastructure improvements to vulnerable communities. As vice president under President Obama, Biden oversaw the implementation of the 2009 Recovery Act, which included more than $90 billion in clean energy investments.

Race and violence in our cities

It's impossible to talk about racial justice in the U.S. without also looking at the conditions in which many communities of color live. From air pollution to tainted water to toxic chemical exposure, environmental impacts fall heavily along racial and economic lines, with low-income Black, Hispanic, and Indigenous communities facing greater harms than their more affluent, white counterparts. And the effects of climate change — including sweltering urban heat and rising sea levels — are set to cause disproportionate economic damage to these communities as well.

Addressing racial inequities in America's cities also addresses the climate crisis, sparing vulnerable communities from the pollutants that exacerbate warming and pulling them off the frontlines of climate change.

Election integrity

The compounding crises of COVID-19 and calls for racial justice have brought to light serious concerns about the integrity of the presidential election — specifically, people are worried about systemic voter suppression. Many past policies have worked to limit Black, Brown, and Indigenous people's access to the ballot box, yet these are the same demographics who stand to lose the most from climate change.

Relatedly, these groups consistently rank global warming as a greater concern than their white counterparts. They may be more likely to vote based on a candidates' position on climate change — and disenfranchising them could thwart the public's interest in taking climate action.

So, it's fine, Mr. Wallace, that climate didn't make into your top six issues. But it should be clear from what's written above that there's no real excuse for warming to go unmentioned during your 90 minutes with President Trump and Vice President Biden. *Source:* https://grist.org/politics/why-the-6-topics-for-the-first-biden-trump-debate-are-actually-all-about-climate-change/

Prestigious science journal gives first endorsement in 175-year history

September 2020 — In a break with its 175-year tradition, the prestigious US magazine *Scientific American* has for the first time endorsed a candidate in a US presidential election – the Democratic party nominee, Joe Biden. The magazine has taken the line because, it says, "Donald Trump has badly damaged the US and its people – because he rejects evidence and science."

In a piece published in October's edition, the editorial board writes: "The most devastating example is his dishonest and inept response to the Covid-19 pandemic, which cost more than 190,000 Americans their lives by the middle of September. He has also attacked environmental protections, medical care, and the researchers and public science agencies that help this country prepare for its greatest challenges."

They criticise Trump, saying: "At every stage, Trump has rejected the unmistakable lesson that controlling the disease, not downplaying it, is the path to economic reopening and recovery," and refer to the recent revelation from interview tapes published by the veteran journalist Bob Woodward that Trump was stating in public "this is like a flu" while saying in private that it was "lethal and highly transmissible".

They go on to say the president "repeatedly lied to the public about the deadly threat of the disease", and that supporting the wearing of masks – a strategy they say would hurt no one – could have saved thousands of lives in the US. Instead "Trump and his vice-president flouted local mask rules, making it a point not to wear masks themselves in public appearances".

They condemn the president for reacting to America's worst public health crisis in a century by saying: "I don't take responsibility at all."

Away from the coronavirus pandemic, the article also attacks the president's record on environmental, health and scientific issues more broadly, saying:

"Trump's refusal to look at the evidence and act accordingly extends beyond the virus. He has repeatedly tried to get rid of the Affordable Care Act while offering no alternative; comprehensive medical insurance is essential to reduce illness. Trump has proposed billion-dollar cuts to the National Institutes of Health, the National Science Foundation, and the Centers for Disease Control and Prevention, agencies that increase our scientific knowledge and strengthen us for future challenges. Congress has countermanded his reductions. Yet he keeps trying."

Only this week, Trump appeared to contradict experts on the fires ravaging the US west coast, saying that the climate would soon cool, and that "I don't think science knows" about the climate disaster unfolding across California, Oregon and Washington state.

Laura Helmuth, the ninth editor-in-chief of the *Scientific*, took over in April this year. Formerly a weekly, *Scientific American* switched to monthly publishing in the 1920s, and is considered to be the longest-running regularly published magazine in the US. In the past it has carried articles by Albert Einstein, Orville Wright of the Wright Brothers, Francis Crick, Al Gore and Mark Twain.

The editorial endorsing Biden concludes: "Although Trump and his allies have tried to create obstacles that prevent people from casting ballots safely in November, either by mail or in person, it is crucial that we surmount them and vote. It's time to move Trump out and elect Biden, who has a record of following the data and being guided by science."

Source: https://www.theguardian.com/us-news/2020/sep/16/prestigious-us-science-journal-breaks-with-tradition-to-back-biden

As Earth overheats, asphalt is releasing harmful air pollutants in cities

September 2020 — As the world heats up, cities with heat-trapping asphalt and little tree cover have left residents sweltering and breathing in more air pollution.

Asphalt is releasing hazardous air pollutants into communities, especially when hit with extreme heat and sunlight, according to research published in the journal Science Advances on Wednesday. Researchers found that asphalt in California's South Coast Air Basin emitted more secondary organic aerosols in the summer than gas and diesel motor vehicles combined.

While vehicle emissions are likely to decline in the future, asphalt emissions will likely become worse as cities expand and climate change accelerates.

The new findings are critical as more frequent and intense heat waves roast neighborhoods that have lots of asphalt and little to no cooling vegetation.

Over the past 60 years, every decade has been hotter than the last and 2020 is set to be the hottest year on record. The heat and air pollution disproportionately affect poor and marginalized people who are more likely to live in neighborhoods without tree cover but abundant with asphalt pavement.

A man walks along the salt flats at Death Valley National Park, in August 2020. *Source:* cnbc.com

In the U.S., where heat kills more people than any other weather event, Black and Latino people are more likely to reside in hot areas.

For example, cities like Baltimore, Dallas and New York have poor neighborhoods that become significantly hotter in the summer than wealthier areas of the same city due to a history of racist housing policies that left formerly redlined minority neighborhoods in hotter parts of town with more industrial activity and highways.

Researchers heated asphalt to temperatures from 104 degrees Fahrenheit to 392 degrees Fahrenheit and noticed that asphalt emissions persisted at a steady rate after heated with summertime temperatures, which suggests that asphalt continues to release air pollutants even after the summer sun and heat pass.

A Las Vegas resident attempts to fry an egg in the parking area at Badwater Basin, the lowest point in North America at 279 feet below sea level, in Death Valley National Park, California in August 2020. *Source:* cnbc.com

"While emissions from some other sources might decrease in the future, the current consumption of asphalt materials and their emissions may remain similar or increase with elevated summertime urban temperatures driven by climate change and urban heat island effects, thus affecting their relative impact on urban air quality over time," said Drew Gentner, a Yale University professor and author of the study.When hit with solar radiation, researchers found that road asphalt releases up to 300% more emissions. "That's important from the perspective of air quality, especially in hot, sunny summertime conditions," said Peeyush Khare, a researcher at Yale University and another author of the research.

Researchers said the type of air pollution from asphalt is comparable to vehicle emissions in the city of Los Angeles, which has some of the highest smog levels in the country. Battling extreme heat, sunlight and wildfires that are made worse by climate change, city officials are scrambling to plant trees for shade and cover hundreds of bus stops. *Source:* https://www.cnbc.com/2020/09/02/climate-change-hot-asphalt-releases-harmful-air-pollutants-in-cities.html

A man keeps cool with a bottle of ice on his head as the thermometer reads 130°F (59°C) at the Furnace Creek Visitors Center in Death Valley. *Source:* cnbc.com

Cutting air pollution in Europe's cities would improve health of poor, says watchdog

European Environment Agency calls for strong action to protect most vulnerable in society

September 2020 — Cutting air pollution and improving green spaces in cities would immediately improve the health of the poorest people in society, a report from Europe's environmental watchdog has found.

Environmental factors inflict greater damage on the health of those in poverty, who already suffer a disproportionately greater burden of disease, than on the better-off, according to the European Environment Agency. Measures that reduce air pollution and give people greater access to parks and similar amenities are well within the reach of governments.

"Strong action is needed to protect the most vulnerable in our society, as poverty often goes together with living in poor environmental conditions and poor health," said Hans Bruyninckx, the executive director of the EEA. "Addressing these connections has to be part of an integrated approach towards a more sustainable and inclusive Europe."

Poor people are more likely to live in areas with high air pollution, which causes 400,000 premature deaths in Europe each year, and noise pollution, which contributes to 12,000 premature deaths a year and raises stress levels. They are also likely to have less access to green and "blue" spaces – such as riversides, lakes and coastal areas – which an increasing body of work shows are important for good physical and mental health.

The EEA found that countries with less social inequality and cleaner environments also showed improved health, with Norway and Iceland showing the lowest level – 9% – of deaths attributable to environmental factors, while in Albania the proportion was more than one in five, and in Bosnia and Herzegovina more than one in four.

Heatwaves, made more frequent by the climate crisis, are another environmental factor leading to deaths, but other emerging problems are also having an impact. Antibiotics found in sewage can spread antimicrobial resistance, as can the overuse of antibiotics in intensive farming, and infections from multi-drug-resistant bacteria cause 25,000 deaths in the EU each year.

The coronavirus crisis has underscored how people's health is affected by their access to clean air and green spaces, with research suggesting possible links between air pollution and worse outcomes for those who catch the virus. The EEA said it was examining the potential links.

Stella Kyriakides, the EU commissioner for health and food safety, said: "Covid-19 has been yet another wake-up call, making us acutely aware of the relationship between our ecosystems and our health, and the need to face the facts – the way we live, consume and produce is detrimental to the climate and impacts negatively on our health."

Smoke billows over residential buildings in Rome. Poor people are more likely to live in areas with high air pollution, which causes 400,000 premature deaths in Europe each year. *Source:* theguardian.com

The toll on people's health of poor environmental quality has often been ignored, even while governments have recognised the impact of related issues such as obesity, said Catherine Ganzleben, author of the EEA report published on Tuesday. Air pollution leads to the premature death of 400,000 people a year in Europe, but governments have failed to take the measures needed – from regulations on vehicle emissions to better public transport, cycle lanes and pedestrian planning – to improve it.

"We need to move away from the single-issue approach, and from the purely environmental perspective," Ganzleben told the Guardian. "Much of the burden of disease falls on the most vulnerable, and we need to acknowledge and tackle that by looking at people's overall wellbeing and the links between environment, health and wealth in an integrated fashion."

Improving people's health can also in turn have a beneficial impact on the environment, according to Ganzleben. Obesity is a leading cause of ill-health, and eating less meat and more fruit and vegetables can help people with weight loss. Such a change of diet would also improve the environment, as intensive agriculture for meat production gives rise to ammonia, which contributes to the particulate matter that is the most harmful form of air pollution, as well as producing large quantities of greenhouse gases that intensify the climate crisis.

Source: https://www.theguardian.com/environment/2020/sep/07/cutting-air-pollution-in-europe-cities-would-improve-health-of-poor-says-watchdog

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Characteristic Scales for Turbulent Exchange Processes in a Real Urban Canopy

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This article summarizes a recently published paper and related work: Barbano F, Brattich E, Di Sabatino S (2020) Characteristic Scales for Turbulent Exchange Processes in a Real Urban Canopy. *Boundary-Layer Meteorology* (https://doi.org/10.1007/s10546-020-00554-5)

Introduction

In urban canopies characterized by the skimming-flow regime (Oke, 1987), local atmospheric circulation and exchange processes are driven by turbulence. For an inertially driven circulation (Britter and Hanna, 2003), exchange processes are known to be driven by, and scale with, the vertical flux of momentum at the shear layer (Barlow et al., 2004; Solazzo and Britter., 2007; Klein and Galvez, 2015), the intensity of the background flow in the inertial layer (Barlow and Belcher, 2002; Harman et al., 2004), the turbulent momentum transport (Kim and Baik, 2003), and the turbulence kinetic energy transport (Salizzoni et al., 2011) from the shear layer to the street canyon. The efficacy also varies according to local morphological characteristics, such as the street-canyon aspect ratio (Barlow and Belcher, 2002) and the roof geometry (Kastner-Klein et al., 2004). For an in-canopy thermally-driven circulation, i.e. when the differential heating between opposite building facades is larger than the unperturbed inertial flow (Dallman et al., 2014), exchange processes are modified by the turbulent heat transport (Nazarian et al., 2018), and their efficacy scales with the level of mixing within the canyon and the thermal stratification above (Nazarian et al., 2017), and the heat release from the ground (Li et al., 2012).

Exchange processes have been typically identified as key mechanisms of ventilation and pollutant removal from the canyon cavity, and thus responsible for the city breathability. Following Lo and Ngan (2017), city breathability is assessed by two categories of diagnostic quantities. The first is based on the evaluation of turbulent mass exchange between the canopy and the overlying atmosphere, typically quantified by exchange velocities (Bentham and Britter, 2003) or exchange rates (Liu et al., 2005). The second category is based on the evaluation of diagnostic time scales associated with pollutant removal or in-canyon circulation. Within this last category, different time scales have been derived from computational fluid dynamics simulations and wind-tunnel experiments, directly using pollutant concentration and emission and mass transport through the canyon interface. Our main focus is to define new time scales and rates characterising the city breathability that are independent from the pollutant removal and concentration, and strictly related to the fundamental nature of the exchange processes. These quantities enable the quan-

Figure 1. Measurement sites (Bologna city centre) and focus on the instrumentation set-up in both (Marconi Street) and (Laura Bassi Street) canyons. (*Source:* https://www.openstreetmap.org)

tification of the speed and efficiency of the process of transferring momentum and heat between the canopy and the atmosphere above, according to the dominant in-canyon circulation and the background wind direction. Moreover, this research intends to clarify whether mass exchange is driven by either mechanical or thermal processes and which of these two is dominant.

Methodology and Field Campaign Data

To quantify the efficacy of mixing in a street canyon caused by mechanical and thermal processes, new diagnostic time scales and exchange rates are derived through the Buckingham theorem (Durst, 2008). Time scales define the time required to generate mixing within different canyon layers caused by momentum and heat exchange through the rooftop-level interface and within the canopy, and thus increasing as the exchange process intensity decreases. Four different time scales τ are defined to describe mechanical process at the rooftop $\tau_d^H=\frac{H^3}{\overline{w'u'}|_H W}\frac{\Delta z}{\Delta U_b}$ and within the canyon $\tau_d^S=\frac{H^2 u_*^H}{\overline{w'u'}|_S W}$ thermal process at the rooftop $\tau_h^H=\frac{H^3}{\overline{w'\theta'}|_H W}\frac{\Delta z}{\Delta \theta_b}$ and within the canyon $\tau_h^S=\frac{H^2\theta_*^H}{\overline{w'\theta'}|_H W}$ where $\overline{w'u'}|_H$ and $\overline{w'u'}|_S$ are the kinematic momentum fluxes at the rooftop and within the canyon, $\overline{w'\theta'}|_H$ and $\overline{w'\theta'}|_S$ are the kinematic heat fluxes at the rooftop and within the canyon, $\Delta U_b/\Delta_z$ and $\Delta\theta_b/\Delta_z$ are the wind speed and potential temperature gradients, u_*^H and θ_*^H are the friction velocity and temperature scales at the rooftop, H is the mean building height and W is the mean canyon width. From the ratios between the time scales within and above the canyon, the exchange rates are defined for the mechanical $\eta_d=\frac{\tau_d^S}{\tau_d^H}=\frac{\overline{w'u'}|_H}{\overline{w'u'}|_S}\frac{u_*^H}{H}\frac{\Delta z}{\Delta U_b}$ and thermal $\eta_h=\frac{\tau_h^S}{\tau_h^H}=\frac{\overline{w'\theta'}|_H}{\overline{w'\theta'}|_S}\frac{\theta_*^H}{H}\frac{\Delta z}{\Delta U_b}$ processes to describe the relative mixing time caused by momentum and heat exchange between different atmospheric layers. Thus, exchange rates provide information about the transport efficacy from the canopy to the atmosphere above and their combination in a total exchange rate η_t can be used to interpret pollutant-concentration variation within the canyon, depending on the in-canyon circulation. This final hypothesis has been tested using the normalised concentrations C^+ of the carbon monoxide as a passive tracer, in order to minimise the traffic emission-rate contribution and the flow dependency while accounting for the canyon geometry. Although time scales and rates do not account for the wind direction explicitly, it is likely that application of the method to a real environment requires a discretisation per wind direction. Therefore, a wind-direction discretisation is performed to evaluate the proposed method for different wind sectors, accounting for wind perpendicular, parallel from north, parallel from south and oblique (45° from southwest) to the street canyon orientation (please refer to Barbano et al., 2020 for a complete and exhaustive description of the methodology).

The proposed methodology is evaluated using field measurements collected during an extensive experimental field campaign from 7 August to 26 September 2017 within the urban canyon of Marconi Street in the city centre of Bologna (44° 29′ N, 11° 20′ E, 56 m above

Figure 2. Setup and preparation for the experimental field campaigns in the two street canyons in Bologna.

mean sea level), a medium-size city located within the Po Valley, in northern Italy. The experimental campaign was originally designed to study turbulence and local-scale dynamics and thermodynamics within a real urban environment in the presence of vegetation, and to characterise local-air quality. A twin campaign was performed during the winter season (from 15 January to 15 February 2018) to address the same research areas during completely different atmospheric conditions. The urban environment intended for the campaign's investigation was the street canyon. Therefore, two street canyons in the city centre of Bologna became the designated field campaign environment: the aforementioned Marconi Street and Laura Bassi Street. Marconi Street is a long main bus artery located in the core of the business centre (Fig. 1, Marconi Street). The street is composed of four lanes (mean canyon width W=20 m) bounded by tall and densely-packed buildings (mean canyon height H=33 m a.g.l.), interrupted by a few small junctions and one major intersection. The street is 17° displaced to the east from north-south direction and it is almost free of vegetation. Despite traffic being restricted to only residents and certain citizens, the traffic in Marconi Street is intense as more than the 50% of Bologna bus lines enter this street. Laura Bassi Street (Fig. 1, Laura Bassi Street) is a similarly long two-lane road located in a residential neighbourhood of Bologna, characterized by small buildings (H=17 m) with surrounding gardens and wide frontal distances (W=25 m). The street is 24° displaced to the east from north-south direction and it is characterised by the presence of a line of deciduous trees on both sides of the street. It also shares a similar traffic rate with Marconi Street, mostly due to private vehicles.

Three levels within (2) and above (1) each street canyon (namely rooftop, mid-canyon and ground levels, Fig. 1) were fully instrumented to collect high-resolution meteorological and air quality data. The ground level was located at 4 m a.g.l. in Marconi Street and at 3 m just below the tree crown in Laura Bassi Street, the mid-canyon level on the banisters of a balcony at the second floor, at 7 m a.g.l. in Marconi Street and 9 m a.g.l. approximately in the middle of the tree crowns in Laura Bassi Street while the rooftop level was on top of the highest building of each canyon, i.e. at 33 m a.g.l. in Marconi Street and at 20 m a.g.l. in Laura Bassi Street. Supporting measurements were also collected using the permanent monitoring of the Emilia-Romagna Environmental Protection Agency (ARPAE) within the city (Fig. 1, Bologna city centre). All three sites in the street canyons were equipped with sonic anemometers, with a sampling rate of 20 Hz, and thermohygrometers, sampling at 1 Hz, suitable for the evaluation of turbulence. Air-pollution concentrations were measured at the ground-level site, i.e. in the proximity of the traffic-related emission source, with an ad-hoc instrumented van able to collect the major traffic-related pollutants (NO, NO_2, NO_x, CO and SO_2), ozone and particulate matter (PM_{10} and $PM_{2.5}$) once per minute. The rooftop levels were completed by net radiometers and, in Marconi Street, a gas analyser suitable for eddy covariance measurements. Background-flow characteristics (variables with subscript *b*) and background air quality data were retrieved from two ARPAE meteorological sta-

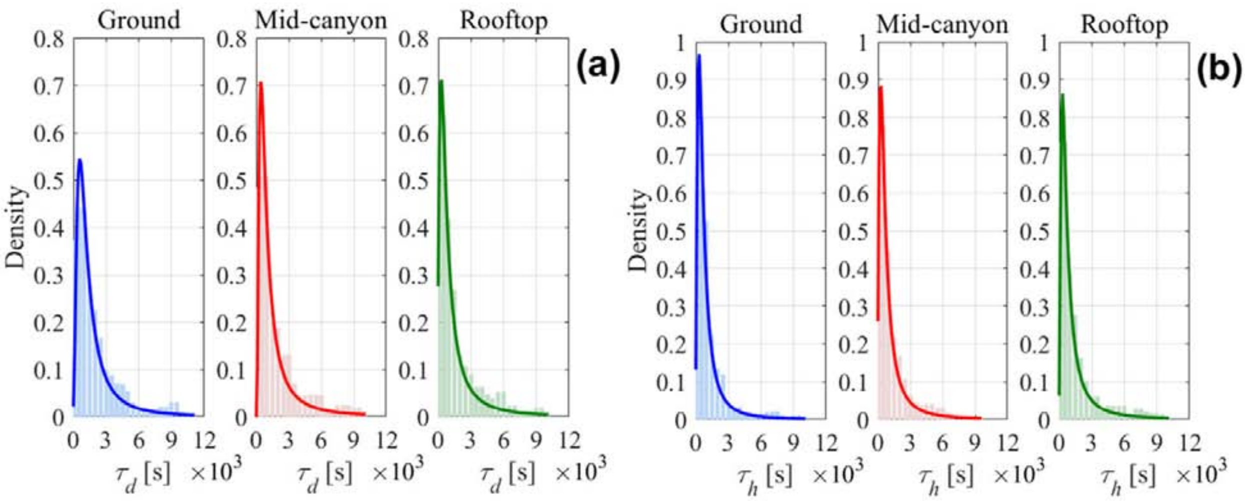

Figure 3. Density distributions of mechanical τ_d (a) and thermal τ_h (b) time scales and respective GEV functions retrieved at the ground (blue), mid-canyon (red), and rooftop (green) levels. The bin size is 500 s.

tions located at the top of the tallest building in Silvani Street and at the top of the Asinelli tower and two air quality monitoring stations of Port San Felice and Giardini Margherita respectively.

The collected measurements were meant to provide a consistent data analysis to characterise the aforementioned research areas in a real environment, but also to serve as a support for computational fluid dynamics and dispersion models. As examples, we used a CFD model solving the steady-state Reynolds-averaged Navier–Stokes equations to verify a newly-proposed relationship between in-canyon thermal circulation and pollutant concentrations (Di Sabatino et al, submitted to *Atmosphere*); we also adopted a simplified CFD model (QUIC) to investigate the morphological aspects of the vegetation impacts on ventilation (Barbano et al, submitted to *Building and Environment*); finally, we proposed a methodology to introduce the effect of trees on pollutant dispersion in an operational dispersion model (Di Nicola et al., in preparation).

Results

The previously defined mechanical and thermal time scales are computed from the 5-min-averaged data collected at the three canyon levels during the period of weak synoptic forcing 20-23 September 2017. Figure 3 shows the density distributions of these time scales before the application of the wind-direction discretisation. Time-scale distributions reveal similar shapes, with maximum occurrences within the first three bins and exponential-like decreases at larger values. Both time scales are skewed toward zero because mixing dominates inside and above the canyon. As displayed in Fig. 3, the time scale distributions can be approximated using the generalised extreme value (GEV) functions, whose modes give an estimation of the momentum and heat exchange time, i.e., the mixing time of an atmospheric layer, while the function shapes and tails provide a good evaluation of the mixing-time variability. An equivalent analysis is performed after the application of the wind-direction discretisation (not shown).

The mechanical time scales depend on the canyon layer and the background wind direction, as expected for the momentum flux the time scales vary with. For perpendicular and oblique wind directions, the momentum flux at the ground can be strongly inhibited by the mechanical friction of the surface and obstacle roughness (Kastner-Klein and Rotach, 2004), enhancing the momentum time-scale mode to typical values of 540 s, more than twice the rooftop ones (τ_d^S ranges between 120 s and 210 s according to the wind direction), where the flux is sustained by the background flow, lowering the time-scale values. For parallel wind directions, time scales become smaller within the canyon than the rooftop by approximately 120 s, as the channelling effect of the mean flow sustains the turbulent production. Nevertheless, mixing for parallel wind directions requires much more time than for perpendicular ones, both at the rooftop (τ_d^H ranges between 420 s and 1100 s according to the wind direction) and within the canyon (τ_d^S ranges between 320 s and 980 s according to the wind direction). The thermal time scales are more self-consistent and, apart from the oblique wind-direction case, describe faster mixing than the mechanical ones. Typical values for perpendicular and both parallel wind directions range between 180 s and 220 s, though the differential heating of building facades during the day (Cheng et al., 2009) and the heat release from the street surface (Li et al., 2012) can contribute as additional heat sources, increasing vertical mixing, and reducing the magnitude of the time scale.

As a consequence of the variation of the mixing properties within and above the street canyon, pollutant concentrations are also affected. Under the assumption of mass

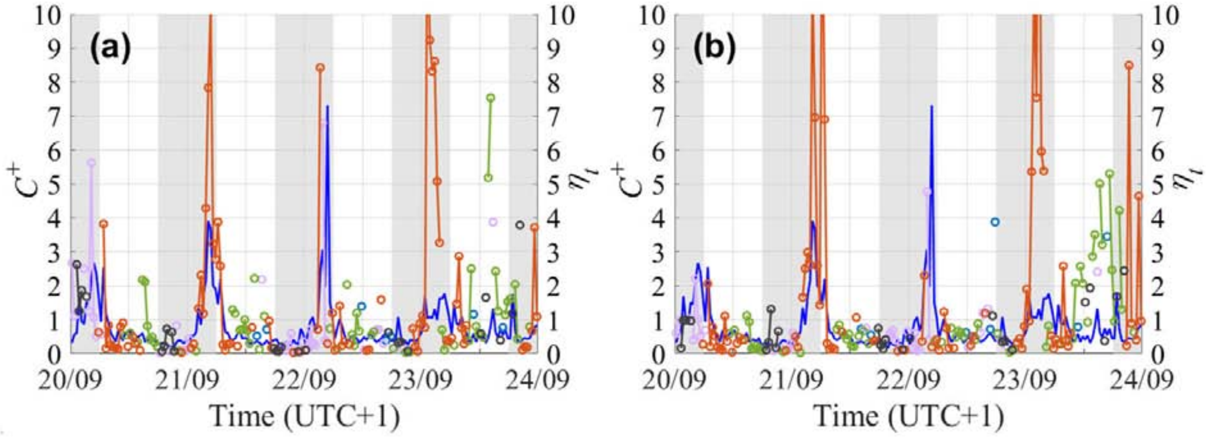

Figure 4. Comparison between the normalized concentration C^+ (continuous blue line) and the total exchange rate η_t (coloured lines with markers) for (a) the rooftop to ground level and (b) the rooftop to mid-canyon level exchange rates. The total exchange rate η_t follows the wind-direction classification (north parallel displayed in light blue, south parallel in purple, perpendicular in green, south-west in orange, and the remaining sectors in black). The shadowed areas highlight night-time periods.

transport behaving as momentum and heat transport, exchange rates are expected to regulate the levels of the normalized concentration C^+ within the canyon, depending on the most effective in-canyon circulation. Therefore, the total exchange rate η_t can be used to address the normalized concentration C^+ variations within the analysed period (see Fig. 4). The evolution of the compared quantities in Fig. 4 shows a good agreement and respects the mixing characteristics under specific wind directions. The large values of η_t observed for the south-west direction match the diurnal peaks of C^+ concentrations, which is a signature of inefficient exchange causing pollutant accumulation. Pollutant removal increases for north parallel and perpendicular directions in accordance with the decrease in η_t values. For south parallel wind directions, disadvantageous and advantageous exchange rates are observed, with both providing a good agreement with the C^+ signal. It can be concluded that exchange processes analysed in terms of inertial and thermal circulations provide a direct approach to assess the variation of passive pollutant concentrations within an urban canopy.

As a practical test, we investigate the in-canyon mixing requirements necessary for an efficient and an inefficient pollutant removal. To perform the test, we consider the typical values obtained from the perpendicular and oblique wind directions. During perpendicular wind-direction conditions, the normalised concentrations are frequently around the value of 0.5, while typical values of mechanical and thermal time scales are similarly around 220 s. Therefore, to obtain such low pollutant concentration, the in-canyon mixing time must be close to 110 s (less than 2 minutes) that can be achieved only by a sustained turbulent activity. On the other hand, peaks of normalised concentrations reach values of 4 during oblique wind directions. As typical values of mixing time scale at the rooftop can rise to 520 s, the in-canyon atmosphere could have taken up to 2080 s (more than 30 minutes) to be mixed. In this scenario, the pollutant source rate is indeed faster than mixing, and in-canyon concentrations inevitably increase. Definitively, turbulence intensity inducing mixing can be considered as a key factor in the mixing processes.

As an additional practical tool, the procedure to discern inertial and thermal circulations has allowed us to define two simple parametrisations to compare the in-canyon U_C^m to background U_b^m wind-speed ratio and in-canyon air temperature difference ΔT^m of different canyons with aspect ratios satisfying the skimming flow regime (Oke, 1987). The parametrisations read as $\frac{U_C^m}{U_b^m}=\frac{H}{W}\frac{W_m}{H_m}\frac{U_C}{U_b}$ and $\Delta T^m=(\frac{H_m}{W_m}-2)(T_1-T_2)$ respectively, where U_C/U_b and H/W are Marconi Street wind-speed ratio and aspect ratio respectively, T_1 is a canyon-facing building-façade temperature, T_a is the ambient temperature outside the canopy, and H_m/W_m is the canyon aspect ratio to be compared with. These simple parametrisations have been proven positive by comparing Marconi Street with the street canyon studied in Dallman et al. (2014).

Conclusions

Exchange processes between the urban canopy layer and the atmosphere above have been investigated to characterize the combined effects of mechanical and thermal processes in a real urban street canyon. Mechanical processes are found to vary within and above the canopy, describing fast mixing at the canyon rooftop level and efficient exchange under different wind directions. Thermal processes are found to be even faster than the mechanical ones, leading to more homogeneous mixing in the canopy, and are specifically efficient for perpendicular wind directions. Both mechanical and thermal processes are found to be inefficient under oblique wind directions. The exchange rates have been shown to regulate the pollutant-concentration variability within the canopy when the effect of local emissions has been removed. The analysis also shows that exchange processes are not effective in pollutant removal in the presence of oblique wind directions. To illustrate the importance of mechanical and thermal processes in causing mixing, an evaluation of the local-circulation regime has been introduced. Using this approach, simple parametrizations have been introduced to generalize the quantification of the flow characteristics, thus extending the current findings to different street-canyon aspect ratios. The methodology discussed here, as well as the diagnostic quantities introduced, allow for the analysis of field data in view of a fast assessment of the ventilation conditions within urban canyons and the likely occurrence of pollution hot-spots.

Acknowledgement

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Tropical bird species diversity, native abundance and behavior on and around large-scale green buildings in urban Singapore

This article summarizes results from a recently published paper: Belcher, R.N. et al. (2019) Vegetation on and around large-scale buildings positively influences native tropical bird abundance and bird species richness. *Urban Ecosystems* 22, 213–225 (https://doi.org/10.1007/s11252-018-0808-0)

Introduction

Urban areas are expanding (Seto et al., 2012). When an area becomes urban, high specialisation animal species are more likely to be lost while generalist ones are more likely to survive, a process known as biotic homogenization (McKinney, 2006; Kowarik, 2011). This is due to lack of resources from natural areas which are important for their survival (Gurevitch and Padilla, 2004). Often this is compounded by generalist introduced species outcompeting any of the remaining native species. Singapore is typical of this trend, with several introduced invasive species such as the Javan Myna *Acridotheres javanicus* becoming better established and heavily associated with human-modified environments, following a loss of much of its original vegetation cover since 1819 whilst urbanising (Brook et al., 2003).

When designing large-scale projects, architects are often given freedom in the placement and configuration of green space, including those that are elevated (such as roof gardens and green walls). If the number of large-scale buildings increases, it is important to consider whether they can support biodiversity including native species due to their intrinsic value and the ecosystem services and subsequent benefits they provide. This is increasingly recognized in urban planning, which aims to increase bird abundance and richness, primarily at ground level (Austin, 2014). The effectiveness of ground level green spaces in supporting urban birds has also been assessed in a number of previous research studies (Sodhi et al., 1999; González-García and Sal, 2008; Arifin and Nakagoshi, 2011; Nagendra and Gopal, 2011; Nielsen et al., 2014). However, little research has been completed on whether or not vegetated elements (e.g. ground gardens, green walls or roof gardens) on and around these buildings can impact bird species richness or abundance; or whether they support more native or introduced bird species.

Our study aims to fill current research gaps by exploring broadly how vegetation influences bird use of dense building developments in the urban environment. Recommendations from this study can be used as evidence for future building developers in tropical cities that wish to have more biodiversity on multiple green space types on and around large-scale buildings.

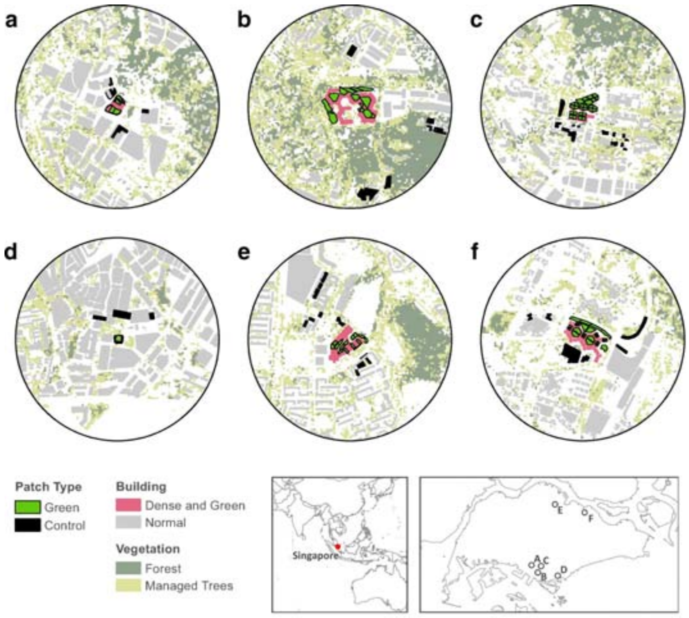

Figure 1. Location and urban context of survey spaces within each of the six ~1km^2 circular zones. Vegetation classification taken from Richards et al. (2017). Building footprints taken from OpenStreetMap contributors (2015).

Materials and Methods

We identified three green space types (roof gardens, green walls and ground gardens) on six large-scale green buildings in tropical Singapore incorporating greenery on which to conduct our research. We matched each roof garden and green wall space to a nearby control rooftop or wall that shared similar characteristics that could affect bird abundance or diversity, specifically: location, space area, noise and space height (Washburn et al., 2016). Control walls were also required to have a perchable surface for birds to use. Similarly, ground gardens were matched with either vacant plots or carparks (with trees). The six ~1 km^2 area circular zones where the surveys were conducted across each of the seven space types can be seen in Figure 1.

Two researchers surveyed roof garden and ground level spaces a minimum of two times using the active search point method with binoculars (Berry et al., 2015; Bibby, 2000); while all walls and control roofs were surveyed using the Vantage Point (VP) method with spotting scopes and binoculars (Bibby, 2000; Chiquet et al., 2013; Lee and Marsden, 2012). A total of 361 point surveys were conducted. Each point survey lasted 10 minutes, between 7:00 and 10:00 am from May to July 2017. We did not count overflying birds and only counted individuals landing in the survey space multiple times as one count. The following information was recorded for each bird counted: species, main behaviour, and main surface the bird was found to perform those behaviours on. We also compiled information on whether species were introduced or native to Singapore from the Digital Nature Archives of Singapore, compiled by the National University of Singapore (Lee Kong Chian Natural History Museum, 2017).

Generalised linear mixed-effects models (GLMM) for each green space type and its respective control were generated separately for introduced and native avian species. Bird abundance on roof and ground spaces was modelled with a Poisson error structure (Bolker et al. 2009). Presence or absence of either a native or introduced bird species was modelled with a binomial error structure. GLMMs for bird species richness comparing each respective green and control space were made. All models included above matching factors and cloud cover and time of survey as control variables. Random effects were space (due to repeated counts in the same space) and a spaces circular zone (Figure 1). We aggregated the main behaviour expressed and most used surface of each bird individual sighted, by each space type and divided it by the total point counts per space type. We also calculated the proportion of different bird species found across each type.

Figure 2. The native Olive-backed sunbird *Cinnyris jugularis* at a Roof Garden surrounded by Firecracker Plant *Russelia equisetiformis* which provides nectar it feeds on. *Photo credit:* Emmanuel Goh

Figure 3. The introduced Javan Myna *Acridotheres javanicus* foraging on turf grass at a vacant plot. *Photo credit:* Emmanuel Goh

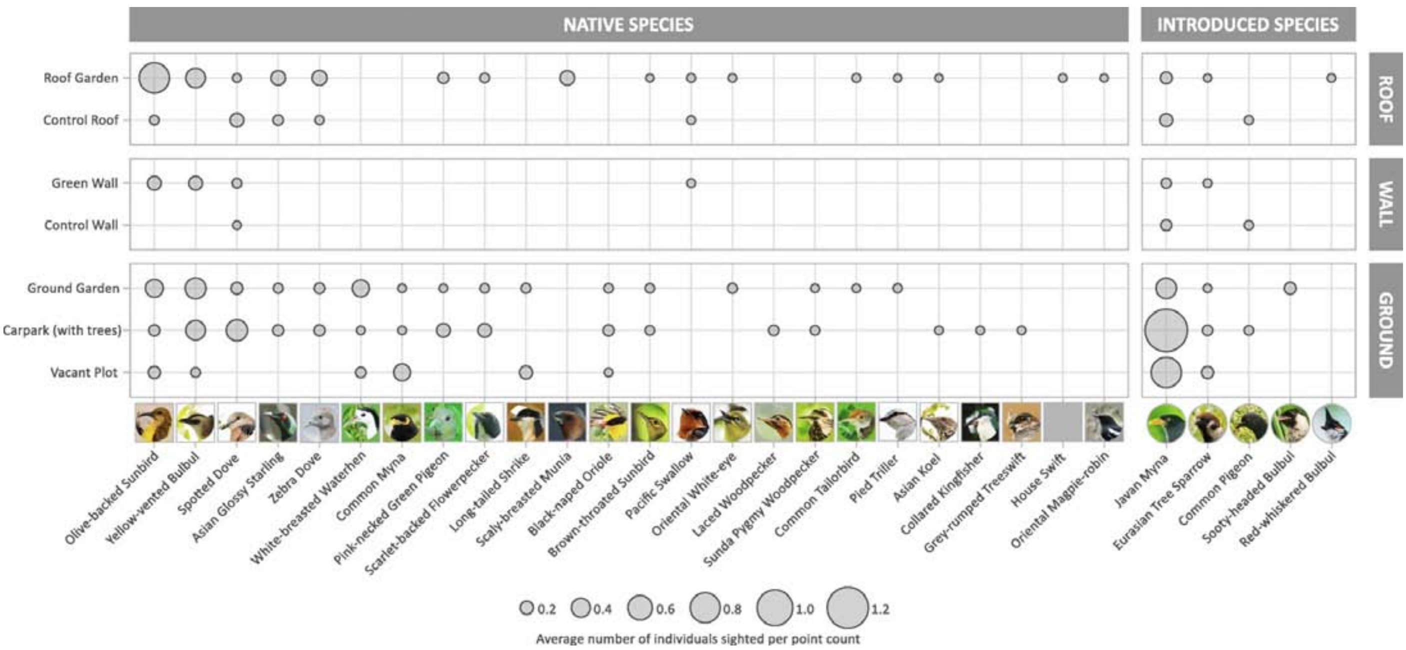

Figure 4. Proportion of times we sighted each native and introduced species per point count across the different space types. *Photo credits*: Emmanuel Goh

Results and Discussion

The most commonly sighted species during point counts on roof gardens and green walls was the Olive-backed sunbird *Cinnyris jugularis* (Figure 2; Figure 4). On ground gardens, and in carparks (with trees) and vacant plots, the most commonly sighted was the Javan Myna *Acridotheres javanicus* (Figure 3; Figure 4).

Roof gardens had a significantly higher abundance of native species than control roofs (Figure 5). The probability of seeing one or more native birds was higher on green walls than control walls (Figure 5). Similarly, roof gardens and green walls had a significantly higher diversity of species than control roofs and control walls respectively

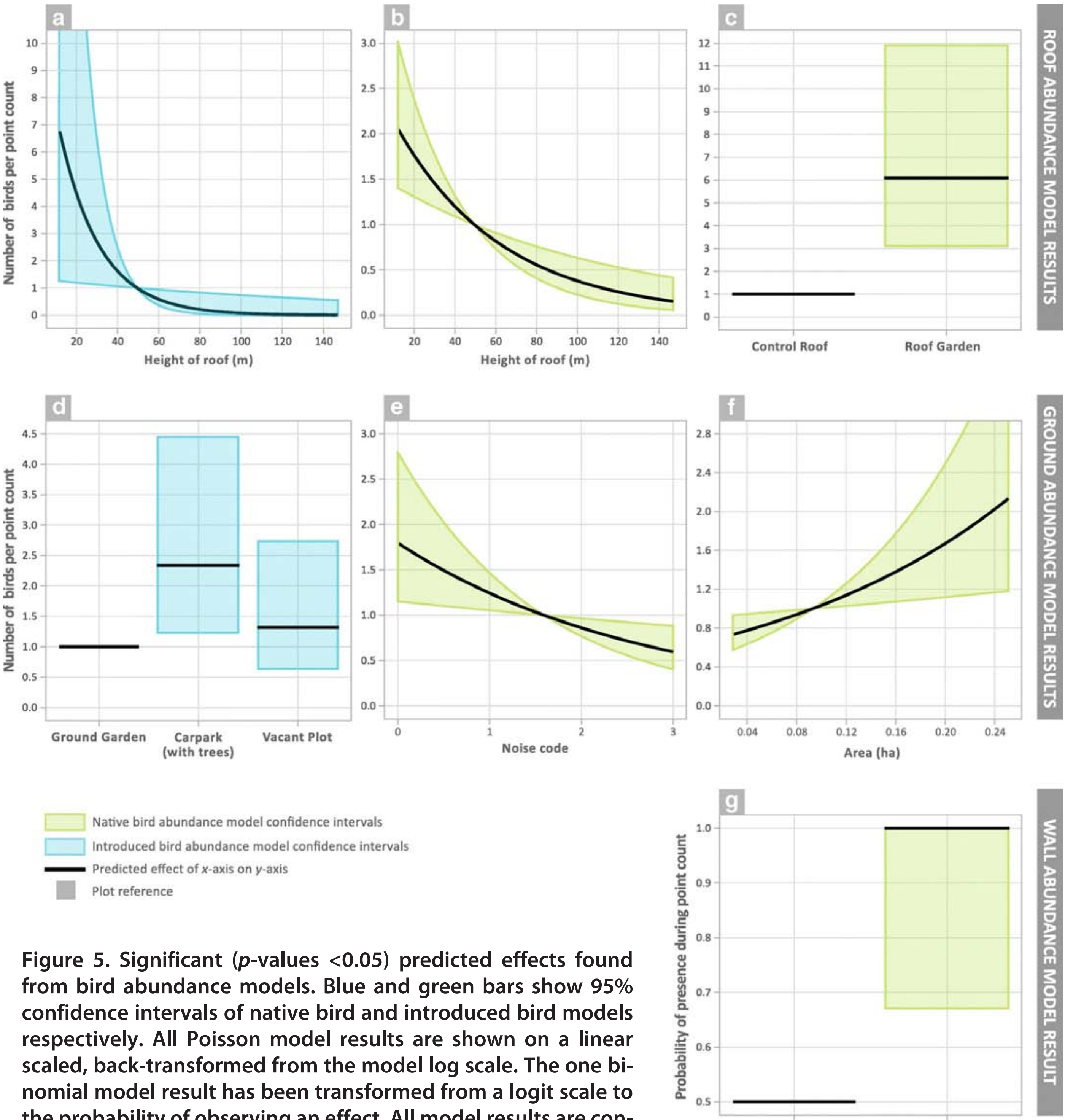

Figure 5. Significant (*p*-values <0.05) predicted effects found from bird abundance models. Blue and green bars show 95% confidence intervals of native bird and introduced bird models respectively. All Poisson model results are shown on a linear scaled, back-transformed from the model log scale. The one binomial model result has been transformed from a logit scale to the probability of observing an effect. All model results are contrasts, predicting the effect of a one unit change (or effect of a category compared to the reference category) of the explanatory variable, holding all other variables (and in the case of factors, also the left-most y-axis label reference level) constant at their mean values.

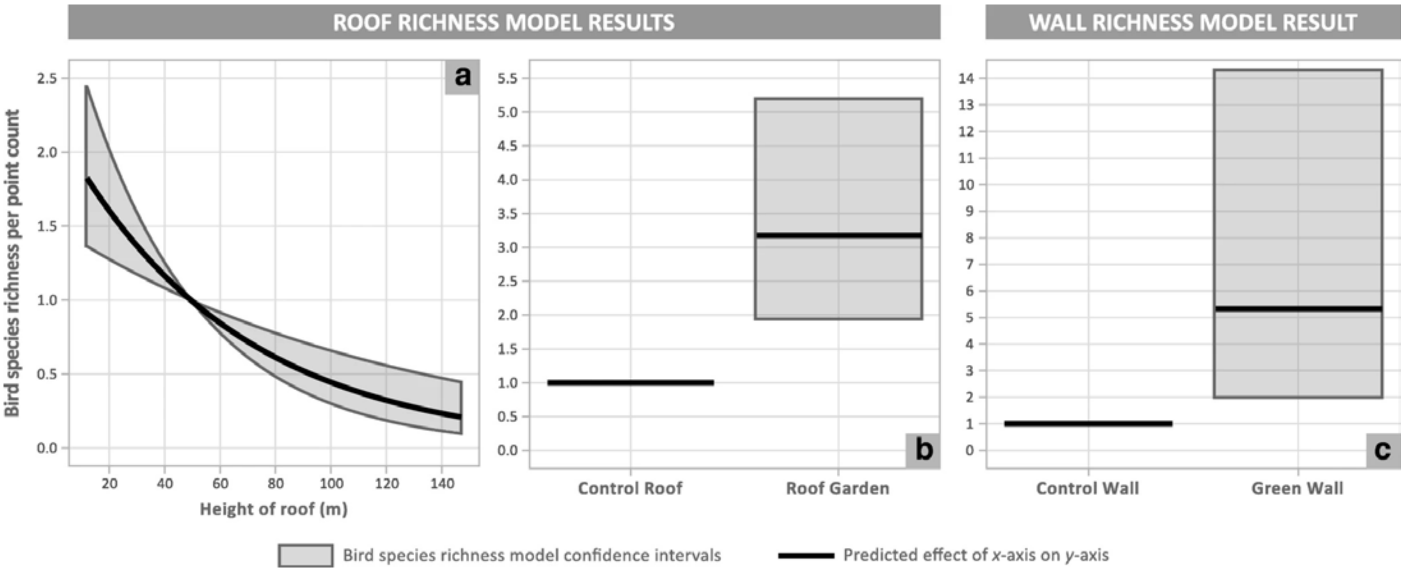

Figure 6. Significant (*p*-values <0.05) predicted effects found from bird species richness models on a linear scale. Grey bars show 95% confidence intervals. All model results are contrasts, predicting the effect of a one unit change (or effect of a category compared to the reference category) of the explanatory variable, holding all other variables (and in the case of factors, also the left-most y-axis label reference level) constant at their mean values.

(Figure 6). These patterns are likely due to provision of suitable habitat, food, and nesting materials supplied by roof gardens and green walls which were not present on control roofs and control walls. This also resulted in a larger diversity of behaviour on elevated green than elevated control spaces (Figure 7). We also hypothesize that roof gardens may provide an environment in which natives face less competition from introduced species which may be more likely to utilize ground-level resources such as food courts and waste-bins.

There was no significant difference between the diversity of species and abundance of native species in ground gardens, car parks (with trees) and vacant plots (Figure 5; Figure 6). We propose that this is partly due to the different species found across these two space types (see details in publication). However, a higher species richness was observed at ground gardens compared to vacant plots suggesting that ground gardens are better at supporting bird diversity than vacant plots.

There was no significant difference between the abundance of introduced species on control roofs and green roofs. Our results also suggest that both roof types are less attractive to introduced species than they are to native species. More introduced species were observed in carparks (with trees) than ground gardens, although there was no significant difference between bird abundance in vacant plots and ground gardens (Figure 5). Elevated spaces may be less preferable to introduced species as they lack resources readily available on the ground. Previous research has found that urban Javan Mynas (the most common introduced bird sighted) forage around food courts and waste-bins (Yap et al. 2002; Lim and Sodhi 2004) and short managed grass (Kang 1989). However only one elevated space (zone A in Figure 1) had lawn spaces and non-contained human food outlets. These resources were found on the ground where Javan Mynas were found either: resting on tree branches (at carparks and ground gardens) nearby waste-bins, foraging on the asphalt ground, nearby waste-bins (at carparks) or foraging on grass (at ground gardens and vacant plots) (Figure 7).

Total bird species richness and the abundance of native and introduced species significantly decreased with roof height (Figure 5; Figure 6). This can be explained by optimal foraging theory, as higher roof gardens would be less optimal for birds to forage in due to wind currents and distance requiring birds to expend more effort to reach them. This could also inhibit a bird's ability to discover new elevated roof gardens. Higher noise levels at ground spaces were found to decrease native bird species abundance. Larger ground spaces were associated with a higher abundance of native birds.

Conclusion

Elevated urban vegetation can partially mitigate the impact of habitat loss on native bird species. Furthermore, vegetated spaces on buildings can support a higher diversity of species than non-vegetated spaces on buildings. Designers and urban planners should consider that the instrumental and existence value that biodiversity

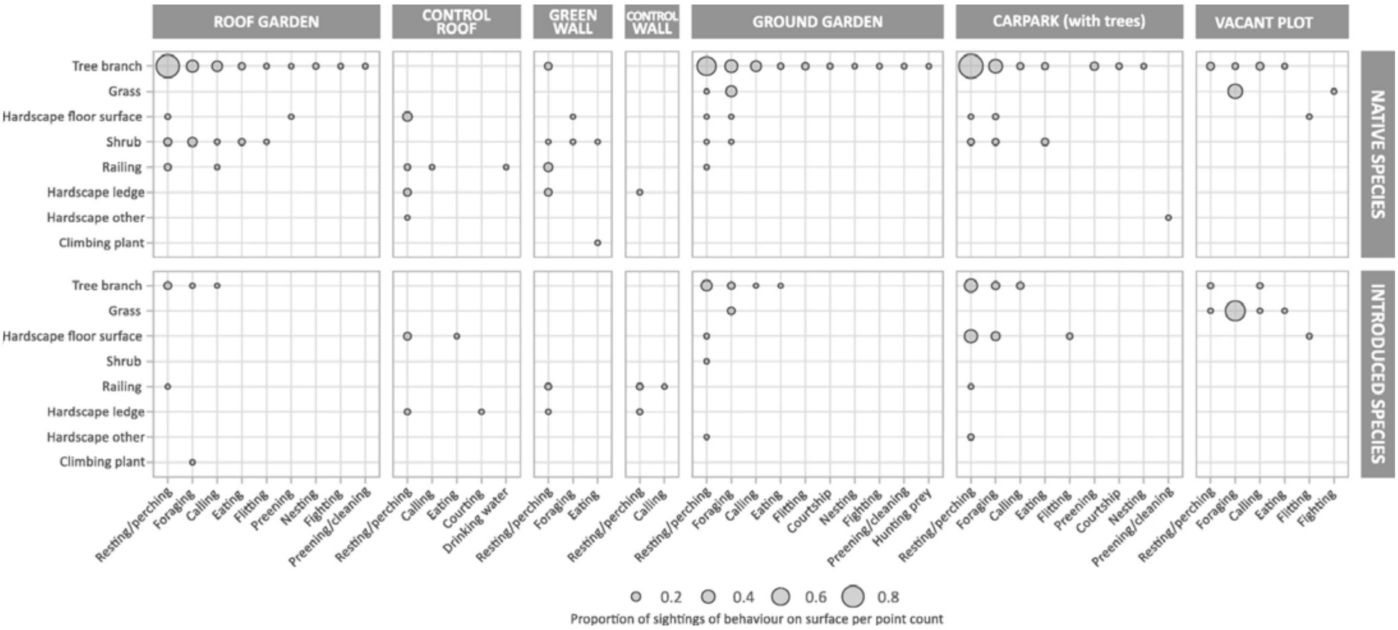

Figure 7. Dominant behaviour and surface used for birds observed across different survey spaces.

can bring to the urban environment can be encouraged by these green space types. Our findings also indicate that if designers intend to support high bird diversity and native abundance, new roof gardens and green walls should be developed at levels lower than ~60 m, corroborating previous research (Wang et al. 2017). Furthermore, our preliminary analysis suggests that specific design features created by landscape architects across both elevated and ground level spaces could discourage or support specific bird species. Nuisance Javan Mynas can be discouraged by replacing heavily managed short turf grass (Figure 3; Figure 7) with more natural native ecosystems. An increase in all birds (both native and introduced) could be supported by providing more trees, as birds spent most of their time on tree branches (Figure 7; Figure 8). Similarly, olive-backed sunbirds can be encouraged on roof gardens by planting nectar-providing plants (Figure 2; Figure 7).

Figure 8. The native Laced woodpecker *Picus vittatus* resting on a Roof Garden tree branch. *Photo credit:* Emmanuel Goh

Acknowledgements

This research was conducted at the Future Cities Laboratory at the Singapore-ETH Centre, which was established collaboratively between ETH Zurich and Singapore's National Research Foundation (FI 370074016) under its Campus for Research Excellence and Technological Enterprise Programme.

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Science and Solutions for a Changing Planet DTP, and MRC Centre for Environment and Health,
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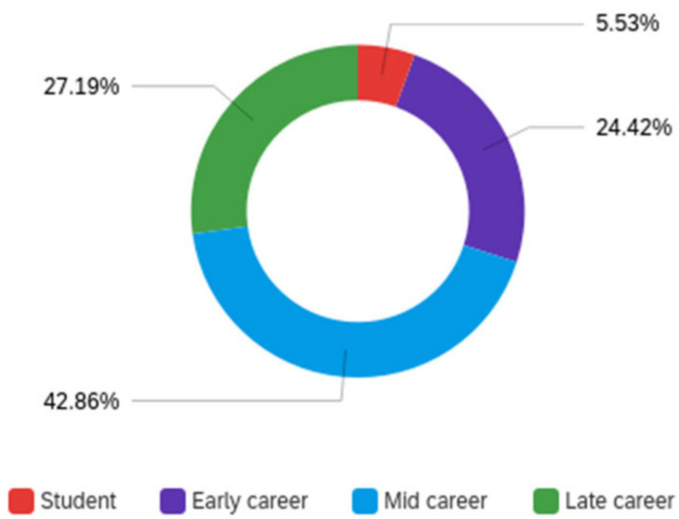
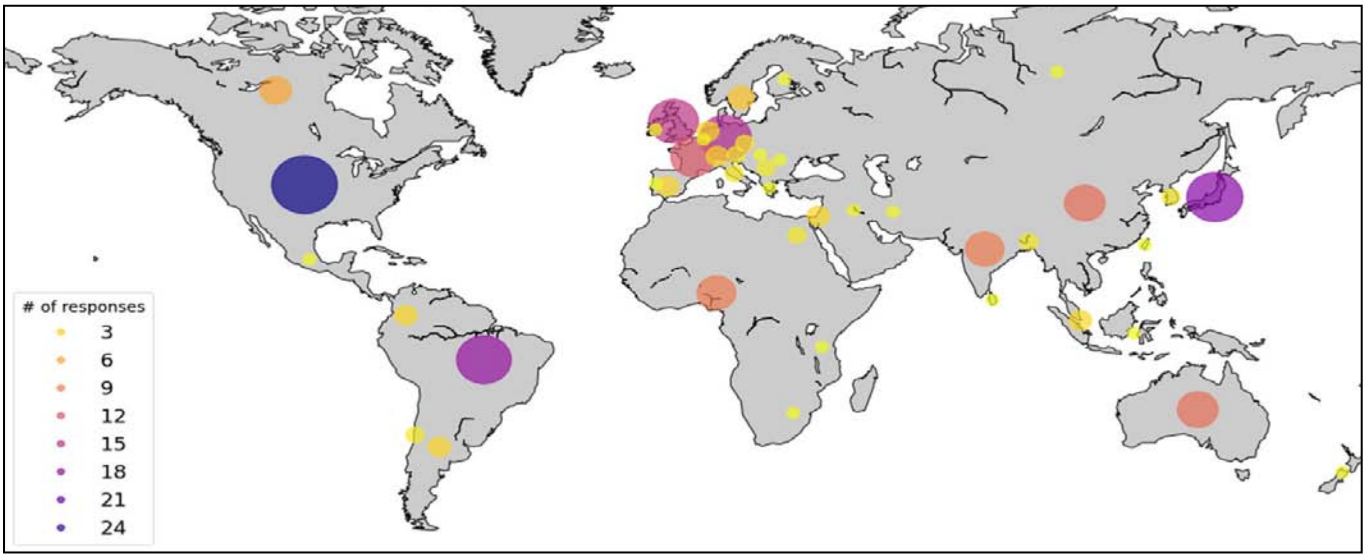
As you are aware, we recently surveyed the urban climate community to ask how COVID may impact their ability to submit an abstract, attend the conference at proposed dates, possible future postponement dates, and what their preferences are for face-to-face versus virtual components. Here we'd like to share the summary of ICUC11 survey outcomes as well as key messages concluded by the organizing committee and the Board.

The ICUC11 survey on COVID-19 impacts was distributed to the IAUC community as well as previous AMS attendees of the Symposium on Urban Environment and was open from July 28th to August 18th. The complete list of questions in this survey can be found here: https://bit.ly/3hdZpaz.



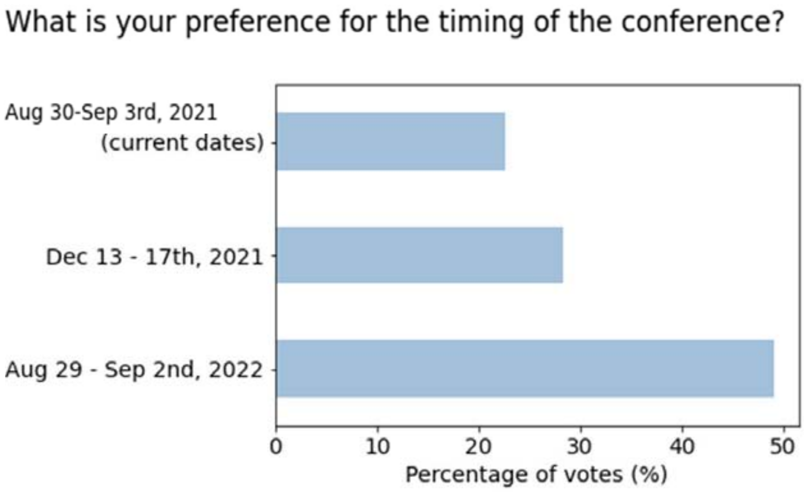
A. Demographics of respondents

- *Total number of responses*: 217
- *Gender representation*: 32.3% of respondents are women, 64.5% men, 3.2% prefer not to specify
- *Career stage*: 5.6% student, 23.9% early, 43.7% mid, 26.8% late career
- *Geographic representation*: We received participation from 45 countries, with the United States, Japan, Brazil, Germany, and the United Kingdom being the most represented countries. The following map represents the distribution and number of survey respondents in different regions. We note that all six geographic regions identified by WMO are represented in our survey response.



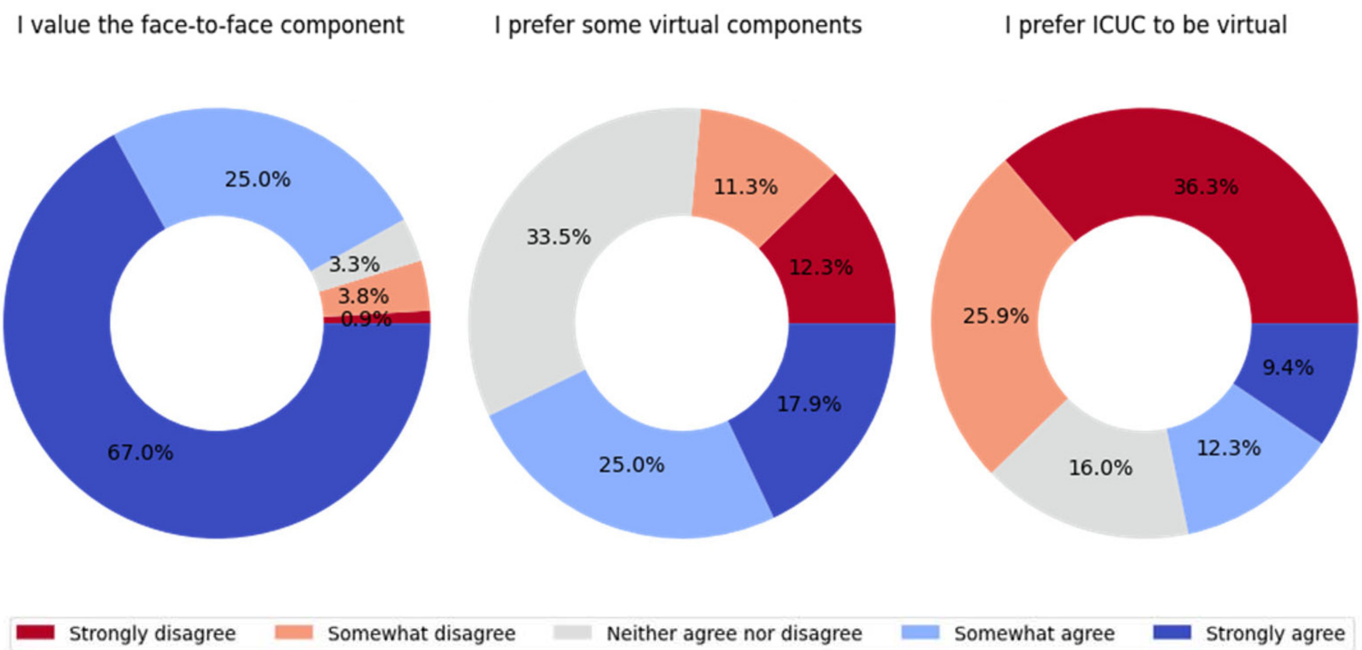
B. Survey Outcome: Abstract submission and postponement

- *Abstract submission*: 46.5% indicated it's unlikely or they are unsure that they'd submit an abstract by Oct 2020.
- *Conference date:*
  - Only 30.5% indicated that it's likely that they'd attend ICUC in 2021, compared to 74.2% voting "likely" or "very likely" for postponement option 2 (Aug-Sep 2022).
  - 77.3% are in favor of postponement, with 49.2% favoring option 2 (Aug-Sep 2022)

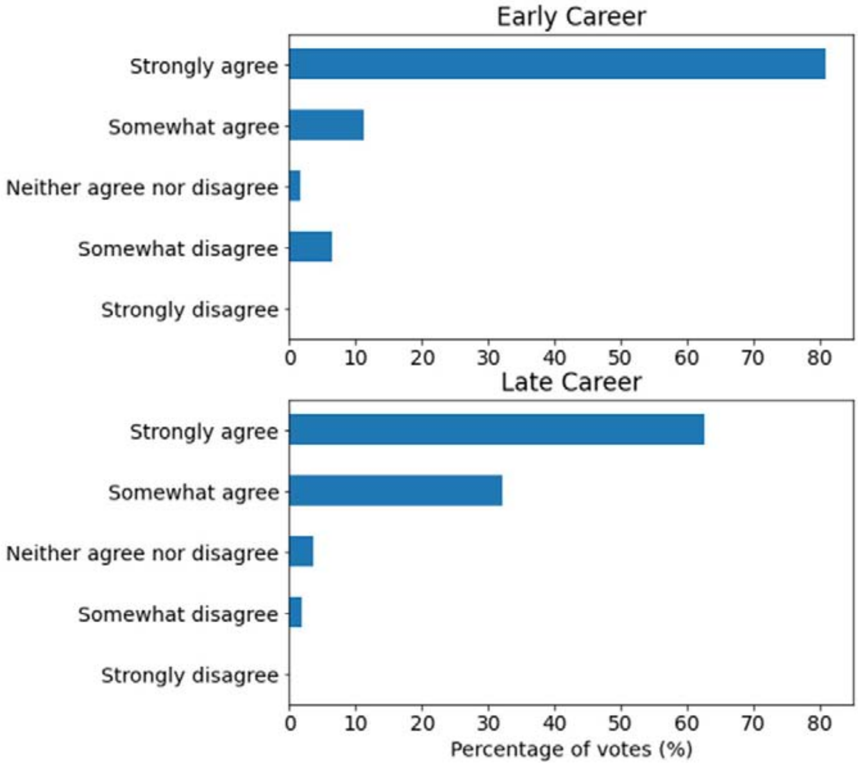


C. Survey Outcome: Mode of delivery

- The vast majority of respondents strongly (66.2%) and somewhat (25.3%) agree that they value the face-to-face component of the conference.
- This compares to just 9.4% strongly and 12.3% somewhat agreeing that they would prefer the conference to be virtual.



- *Do preferences on mode of delivery differ by career stage?*
  - Early career researchers (including graduate students) value the face-to-face component of the conference more than late career researchers.



D. Take home messages:

Timing

- **Given the overwhelming response received, the conference will be postponed to August 29th - September 2nd, 2022.**

Mode of delivery

- We do not recommend a fully virtual conference but will explore options for key events to be streamed online.
- People value the face-to-face aspect of the conference, they do not wish to see the conference being fully virtual. We also note that this conference only occurs every 3 years so it's not comparable with EGU or AGU (as noted by our members of the community as well).
- The time difference between Australia and much of the world creates difficulties when scheduling virtual events.
- There have been requests for some components to be hybrid, which will be explored by the organizing committee.
- Some colleagues brought up the carbon footprint associated with flying to conferences. While we agree that this is a vitally important issue, we note that certain parts of the world don't have the privilege to avoid flights. For those who live in remote regions of the world, in island nations, or regions of the world where there is not a high representation of urban climate researchers, some plane travel is necessary in order to attend events and contribute to impactful research in the field. This includes most countries in the southern hemisphere and south-east Asia. Even within Australia, it would take a researcher in Sydney five days to travel by land to an event in Perth. However, given that this concern is very close to the vision of our community, we will explore options for carbon offset at the conference level and advice for those travelling on how to offset their emissions.

Community engagement in 2021

- The survey comments indicate the need for virtual events in 2021 to ensure ongoing engagement in the community, this is particularly important for early career researchers.
- Options for virtual events in 2021 could include webinars, early-career networking opportunities, and special virtual sessions. These options are currently explored by the IAUC and AMS boards as well as the ICUC11 organizing committee.

— Conference Co-chairs


Negin Nazarian


Melissa Hart

Urban climate themes featured at PLEA 2020

By Joe McFadden, Conferences Editor

The 35th PLEA CONFERENCE ON SUSTAINABLE ARCHITECTURE AND URBAN DESIGN: Planning Post Carbon Cities was held as a virtual online gathering on September 1-3, 2020, and was dedicated to the memory of Prof. Baruch Givoni. Originally organized as an in-person international event in A Coruña, Spain, PLEA 2020 included a major emphasis on topics related to urban planning and climate.

Two of the PLEA 2020 conference awards went to presentations focused on urban climate, including a Best Paper award to **Evyatar Erell** and **Bin Zhou**, of Ben-Gurion University, for their presentation "The Effect of Increasing Vegetation Cover on Energy Demand for Heating and Cooling Buildings in a Dense Mediterranean City." Also a Poster Commendation award was received by **Shi Yin** and co-authors for "Correlative Impact of Shading Strategies on Sky Exposure and Cooling Performance at Pedestrian-level in Street Canyon."

The conference featured key tracks on building design and a broad track on "Sustainable Communities," in which a large number of talks and posters on urban climate were presented.

One group of presentations was devoted to studies of urban heat and radiation budgets, and urban morphology. It included "Integrating Landscape Tactics Into Building Energy Performance Evaluation Based On Urban Morphometry" by Ulrike Passe et al., "Characterization and Mitigation Through Urban Climatic Map. Investigations on the Climate of Curitiba - Brazil" by Lisana Schmitz et al., "Can Planning Mitigate UHI?" by Blanca Arellano et al., "Shading and Temperature of Urban Canyons: An Analysis in the Downtown Area of Passo Fundo-Brazil" by Sinara Furlani et al., "Correlative Impact of Shading Strategies on Sky Exposure and Cooling Performance at Pedestrian-level in Street Canyon" by Shi Yin et al., "The Contribution of Anthropogenic Heat on Urban Air Temperature Elevation: A Case Study of the Singapore Residential area" by Shuo-Jun Mei et al., and "Impact Of Urban Albedo On Microclimate: Computational Investigation In London" by Agnese Salvati et al.

Another set of talks and posters was focused on planning and design to ameliorate urban heat, including vegetation and human thermal comfort. These talks included "Greenway on Street Canyon of Residential Areas in Dhaka: Missing Link and Plausible Impact in Taming the Thermal Comfort" by Zarrin Tasnim et al., "Urban and Building Integrated Vegetation" by Joao Silva et al., "Urban Microclimatic Diversity and Thermal Comfort: Do Variations in Sun and Wind Conditions Correlate with PET Grades?" by Zhikai Peng and Koen Steemers, "Cooling Effect of Urban Parks in Metropolitan Region of Barcelona" by Blanca Arellano et al., "Characterising Living Wall Microclimate Modifications in Sheltered Urban Conditions: Findings From Two Monitored Case Studies" by Kanchane Gunawardena and Koen Steemers, "Thermally-Activated Water-Based Lattices: Thermal Control Of Exterior Urban Areas Through Evaporative Cooling, Shading And Ventilation" by Jose Tenorio et al., "Adaptive Thermal Comfort Model Suitable for Outdoors Considering the Urban Heat Island Effect" by Ivan Oropeza-Perez, "Analysis of Shrubby-Arborean Species as a Barrier to Wind for Comfort in Open Spaces" by Helena Zanlorenzi and Leonardo Monteiro, "Outdoors Thermal Comfort Approach in Summer Season for the City of Madrid. Influence of urban typologies in microclimate and the outdoor thermal sensation" by Helena Moreno et al., and "Contrasting The Passive Cooling Effect Produced By Courtyards Located In The Tropical And Mediterranean Climates" by Ivan Callejas et al.

A third area of contributions included posters and talks on urban air pollution and weather, including "Urban Growth with Greenhouse Gas Emissions Reductions" by Blake Jackson, "Reference Weather Data Selection in Urban Weather Generator Model" by Noelia Alchapar et al., and "'Urban Lab City': Investigating the Role of Built Form on levels of Air Pollution and Urban climates at Microscale Level" by Julie Ann Futcher and Gerald Mills.

From "Thermal Comfort in Public Spaces of a Densifying Mediterranean Business District" by Inbal Gadish et al.

Recent Urban Climate Publications

Aktas YD, Wang K, Zhou Y, Othman M, Stocker J, Jackson M, Hood C, Carruthers D, Latif MT, D'Ayala D, Hunt J (2020) Outdoor Thermal Comfort and Building Energy Use Potential in Different Land-Use Areas in Tropical Cities: Case of Kuala Lumpur. *Atmosphere* 11

Alajmi A, Zedan M (2020) Energy, cost, and environmental analysis of individuals and district cooling for a new residential city. *Sustainable Cities and Society* 54 101976.

Altunkasa C, Uslu C (2020) Use of outdoor microclimate simulation maps for a planting design to improve thermal comfort. *Sustainable Cities and Society* 57 102137.

Arifwidodo SD, Chandrasiri O (2020) Urban heat stress and human health in Bangkok, Thailand. *Environ Research* 185

Arub Z, Bhandari S, Gani S, Apte JS, Ruiz LH, Habib G (2020) Air mass physiochemical characteristics over New Delhi: impacts on aerosol hygroscopicity and cloud condensation nuclei (CCN) formation. *Atmospheric Chemistry and Physics* 20 6953-6971.

Ashworth K, Bucci S, Gallimore PJ, Lee J, Nelson BS, Sanchez-Marroquin A, Schimpf MB, Smith PD, Drysdale WS, Hopkins JR, Lee JD, Pitt JR, Di Carlo P, Krejci R, McQuaid JB (2020) Megacity and local contributions to regional air pollution: an aircraft case study over London. *Atmospheric Chemistry and Physics* 20 7193-7216.

Attarchi S (2020) *Extracting impervious surfaces from full polarimetric SAR images in different urban areas.* International Journal of Remote Sensing 41 4642-4661.

Atwa S, Ibrahim MG, Murata R (2020) Evaluation of plantation design methodology to improve the human thermal comfort in hot-arid climatic responsive open spaces. *Sustainable Cities and Society* 59 102198.

Augusto B, Roebeling P, Rafael S, Ferreira J, Ascenso A, Bodilis C (2020) Short and medium- to long-term impacts of nature-based solutions on urban heat. *Sustainable Cities and Society* 57 102122.

Aune KT, Gesch D, Smith GS (2020) A spatial analysis of climate gentrification in Orleans Parish, Louisiana post-Hurricane Katrina. *Environmental Research* 185

Babel MS, Shinde VR, Sharma D, Mai-Dang N (2020) Measuring water security: A vital step for climate change adaptation. *Environmental Research* 185

Bergquist D, Garcia-Caro D, Joosse S, Granvik M, Peniche F (2020) The Sustainability of Living in a "Green" Urban District: An Emergy Perspective. *Sustainability* 12

Bindajam AA, Mallick J, AlQadhi S, Singh CK, Hang HT (2020) Impacts of Vegetation and Topography on Land Surface Temperature Variability over the Semi-Arid Mountain Cities of Saudi Arabia. *Atmosphere* 11

Bouffanais R, Lim SS (2020) Cities - try to predict superspreading hotspots for COVID-19. *Nature* 583 352-355.

Bryant DJ, Dixon WJ, Hopkins JR, Dunmore RE, Pereira K,

In this edition is a list of publications that have generally come out between **May and August 2020** . If you believe your articles are missing, please send your references to the email address below with a header "IAUC publications" and the following format: Author, Title, Journal, Year, Volume, Issue, Pages, Dates, Keywords, URL, and Abstract. Important: do so **in a .bib format.**

I would also like to take the opportunity to thank Dr. Hendrik Wouters (VITO). He decided to leave, after contributing for more than 2.5 years. Thanks for your support Hendrik!

Note that we are always looking for (young) researchers to join and contribute to the Committee. If you are interested to join or would like to receive more information, please let me know via the email address below.

Happy reading,

Matthias Demuzere
Chair IAUC Bibliography Committee
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matthias.demuzere@rub.de

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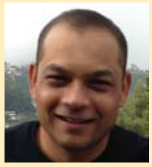
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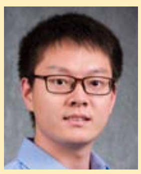
Chenghao Wang

Shaw M, Squires FA, Bannan TJ, Mehra A, Worrall SD, Bacak A, Coe H, Percival CJ, Whalley LK, Heard DE, Slater EJ, Ouyang B, Cui T, Surratt JD, Liu D, Shi Z, Harrison R, Sun Y, Xu W, Lewis AC, Lee JD, Rickard AR, Hamilton JF (2020) Strong anthropogenic control of secondary organic aerosol formation from isoprene in Beijing. *Atmospheric Chemistry and Physics* 20 7531-7552.

Cai C, Ming T, Fang W, De Richter R, Peng C (2020) The effect of turbulence induced by different kinds of moving vehicles in street canyons. *Sustainable Cities and Society* 54 102015.

Cappa CD, Lim CY, Hagan DH, Coggon M, Koss A, Sekimoto K, de Gouw J, Onasch TB, Warneke C, Kroll JH (2020) Biomass-burning-derived particles from a wide variety of fuels - Part 2: Effects of photochemical aging on particle optical and chemical properties. *Atmospheric Chemistry and Physics* 20 8511-8532.

Chauhan A, Singh RP (2020) Decline in PM2.5 concentrations over major cities around the world associated with COVID-19. *Environmental Research* 187

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Upcoming Conferences...

The information in this list is current as of the publication date of the newsletter, but readers should check for updated information online in the event of schedule changes due to the COVID-19 pandemic.

SUSTAINABLE, ENVIRONMENT AND ARCHITECTURE (SENVAR 20)
November 10, 2020
http://senvar.event.upi.edu/2020/

AMERICAN GEOPHYSICAL UNION (AGU) FALL MEETING
San Francisco, USA • December 1-17, 2020 (online)
https://www.agu.org/fall-meeting

AMERICAN METEOROLOGICAL SOCIETY (AMS) ANNUAL MEETING
New Orleans, Louisiana, USA • January 10-14, 2021
https://annual.ametsoc.org/index.cfm/2021/

EUROPEAN GEOSCIENCES UNION (EGU) GENERAL ASSEMBLY
Vienna, Austria • 25-30 April, 2021
https://www.egu2021.eu

INTERNATIONAL CONFERENCE ON URBAN CLIMATE (ICUC-11 HAS BEEN POSTPONED FROM THE ORIGINAL DATES OF AUGUST 30-SEPTEMBER 2, 2021)
Sydney, Australia • August 29 -September 2, 2022
https://conference.unsw.edu.au/en/icuc11

Calls for Papers...

"URBAN MICROCLIMATE AND AIR QUALITY AS DRIVERS OF URBAN DESIGN"

Special Issue of Sustainability

Anthropogenic activities are dramatically impacting the quality of our environment, and this is especially the case in cities. Factors such as the sealing of soil, contamination of water and air, and emission of atmospheric greenhouse gases are combining to make the urban environment less livable. Efforts to better understand these problems have been intensifying within the scientific community, with research focusing on topics related to environmental quality and human health, the urban heat island, outdoor thermal comfort, and urban air quality. These phenomena have been analyzed from the microscale to the city level, using approaches such as field monitoring, remote sensing, and simulation models. Unfortunately, however, these diverse aspects of urbanization are rarely integrated in a systematic way in the actual development process. This Special Issue aims to collect works that improve on this knowledge, and enrich our common understanding of how urban design can positively or negatively affect the quality of the urban environment. The focus is on outdoor thermal comfort and air quality, with emphasis placed on studies showing how research can be integrated into the design process and how policies can enhance the environmental effectiveness of concrete urban interventions.

Guest Editors: Luciano Massetti, David Pearlmutter

Deadline: January 31, 2021

https://www.mdpi.com/journal/sustainability/special_issues/Urban_Microclimate_Air_Quality

"APPLICATION OF GIS-BASED MAPPING OF LOCAL CLIMATE ZONES IN URBAN AREAS"

Special Issue of ISPRS Intl Journal of Geo-Information

The concept of local climatic zones (LCZs) has become a widely recognized standard for the description of urban climate sites, gaining substantial attention from scholars worldwide in recent years. The original concept was extended to the mapping of urban and suburban landscapes, resulting in widespread application in urban climate research and beyond. With such a radical shift in the LCZ concept, new problems were identified (e.g. the quality and level of GIS data detail, user accuracy, appropriate resolution, spatiotemporal variability, level of generalization, and standardization of classification). Most popular among authors dealing with LCZ delineation are methods based on widely available remote sensing data. The majority of such studies, however, have reported user accuracy inappropriate for recent urban climate science, demanding exact data for modeling and for application in real urban planning. We therefore have devoted this *Special Issue* to GIS-based methods of LCZ delineation and their application to the development of high-quality LCZ data. Topics of interest include, but are not limited to: Innovative GIS-based LCZ mapping methods; Analyses on producer and user accuracy for GIS-based/other methods; Studies on spatiotemporal variability of thermal exposure in LCZs; Application of LCZ concept in urban areas.

Guest Editors: Michal Lehnert, Jan Geletič, Stevan Savić

Deadline: February 28, 2021

https://www.mdpi.com/journal/ijgi/special_issues/Climate_Urban

IAUC announces this year's award recipients

Timothy Oke Awards

In this first year of the IAUC **Timothy Oke Award** for Original Research in the Field of Urban Climatology, we are delighted to announce that two 2020 awards will be made, to **Scott Krayenhoff**, Assistant Professor of Atmospheric Science at the University of Guelph, and **Chao Ren**, Associate Professor of Faculty of Architecture at the University of Hong Kong. These two highly deserving early-to mid-career researchers both have outstanding publication records which demonstrate the quality, relevance and value of their research contributions.

Since being awarded his PhD in 2015, Scott has built upon his innovative work on modelling vegetation at micro- and local-scales to also consider climate change and sustainable urban design. He leads a small research group at the University of Guelph and collaborates widely both with former colleagues and with new users and developers of his models. His combination of creativity, careful analytical skills and an excellent knowledge of the literature has resulted in several high-quality, high-impact, lasting contributions to urban climatology. He is well-known as an approachable and committed member of the IAUC community.

Chao is an extremely successful mid-career researcher dedicating herself to cross-disciplinary research activities, engagements and design guideline development. She has already received numerous prizes and awards for her high-quality research which has an international impact and plays a key role in advising policy and planning, particularly in densely built sub-tropical cities. Her impressive publication record focuses on spatial variations in the urban thermal and wind environment and their health impacts and how these relate to urban morphology and built environment. She is a highly engaged researcher and member of the urban climate community and has served on many advisory boards including IAUC and WMO. She is an emerging leader in the field of urban climate, and several of her students have also been awarded for their research.

2020 Luke Howard Award

Alberto Martilli, recipient of the 2020 Luke Howard Award

We are delighted to announce Dr **Alberto Martilli**, at the Center for Research in Energy, Environment, and Technology (CIEMAT), Madrid, as the winner of the **2020 Luke Howard Award** for Outstanding Contributions to the Field of Urban Climatology.

Combining a systematic and thorough approach with a deep knowledge of urban turbulence, Alberto has made significant, long-lasting and high-impact contributions to urban climatology. His work not only advances our fundamental understanding of interactions between the urban canopy and the atmosphere, but also has great relevance to a number of more applied topics including weather forecasting, air quality, thermal comfort and urban planning.

Over the last two decades, Alberto has pioneered the development of complex urban canopy models, starting with his seminal work on development of an urban turbulent parameterization for mesoscale atmospheric

Luke Howard Award (continued)

models undertaken during his PhD at the Swiss Federal Institute of Technology of Lausanne (EPFL). This internationally renowned and highly successful Building Effect Parameterisation (BEP) uses a multi-layer approach to represent the impact of the urban canopy structure on turbulent kinetic energy, momentum and temperature. BEP is implemented in many mesoscale models and is thus used by groups all over the world to address a variety of topics. Alberto and his collaborators continue to develop and further improve BEP's capabilities, adding vegetation and, most notably, the Building Energy Model (BEM), which simulates the anthropogenic energy input resulting from energy use in buildings. Capturing feedbacks between the outside weather and energy needed to maintain thermal comfort indoors is critical for sustainable urban development and urban planning applications.

Since being awarded his PhD in 2001, he has worked at the University of British Columbia, visited the University of Strasbourg and the National Center for Atmospheric Research and joined CIEMAT in 2005 where he now leads urban climate research. Despite the fact that CIEMAT does not award degrees, Alberto has taken opportunities to advise and mentor many students, several of whom have made substantial contributions to the field themselves. Since 2012 he has applied his high standards and expertise as Associate Editor of *Urban Climate*, playing an important role in shaping the journal into one of the key outlets for urban climate research. From 2010-2014 he served on both the IAUC Board and the AMS Board for the Urban Environment, helping to ensure the IAUC and AMS work together.

In summary, Alberto's innovative approaches to challenging problems, outstanding publications of great impact and valuable contributions to the urban climate community make him a highly deserving recipient of the 2020 Luke Howard Award.

Urban Climate News – The Quarterly Newsletter of the International Association for Urban Climate

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The next edition of ***Urban Climate News*** will appear in late December. Contributions for the upcoming issue are welcome, and should be submitted by November, 2020 to the relevant editor.

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

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