Urban Climate News

Quarterly Newsletter of the IAUC

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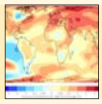
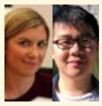
Inside the December issue...





From the IAUC President

Dear IAUC community,

Season's greetings from Phoenix, and welcome to our last issue of 2022.

Over the past year, the world has returned to a "new normal" as most countries have lifted COVID restrictions. People are traveling and socializing again, and we look back at several memorable face-to-face meetings of urban climate groups, such as the Bochum Urban Climate Summer School (BUCSS22) at Ruhr-University Bochum, Germany, the Urban Climate Course in Manizales, Colombia, and the AGU Fall meeting in Chicago, USA.

In 2023, many of us look forward to meeting at **ICUC-11 in Sydney**, our flagship conference that was originally scheduled to take place in 2021. To date, the conference organizers have received over 350 abstracts, which is similar to the prior two ICUC gatherings (the final deadline for abstract submission has been extended until the 31st of January).

Due to a five-year "conference drought" since our meeting in New York and the lack of personal interaction since then, the Board suggested to hold ICUC-12 in 2025 if possible. Please watch out for an Expression-of-Interest (EOI) call soon and start thinking about hosting ICUC-12 and forming proposal teams. Sustainability and inclusiveness are important to our organization. We are open to new formats for ICUC-12, such as multi-site events, streaming of plenaries for local "watch parties", and other hybrid formats, so please be creative!

I am delighted to announce that we have two new elected Board members. **Dan Li** and **Victoria Ramsey** will serve on the Board from 2023–2026. Dan is an Associate Professor in the Department of Earth and Environment at Boston University where he leads the Environmental Fluid Mechanics Group. His work focuses on the interaction between the atmospheric boundary layer and Earth's surface to address pressing challenges such as climate change and urbanization. Dan is the most recent recipient of the Timothy Oke Award. Victoria is a Senior Climate Scientist in the Urban Climate Services team at the UK Met Office with a background in hydrology and flood risk. Her work involves engaging with urban stakeholders to develop novel approaches in delivering climate information in a usable and tailored way to assist decision making.

Issue No. 86 contains a lot of interesting urban climate news from all over the world, including a feature on a global flux tower dataset, proposed guidelines on how to conduct microclimate observations in tropical climates, and a special report on the AGU Fall meeting that took place in Chicago last December. A special thanks to David Pearlmutter and the IAUC News team for putting together an excellent issue!

I wish all members of IAUC the very best for the New Year and a happy, healthy 2023!

– Ariane Middel
IAUC President
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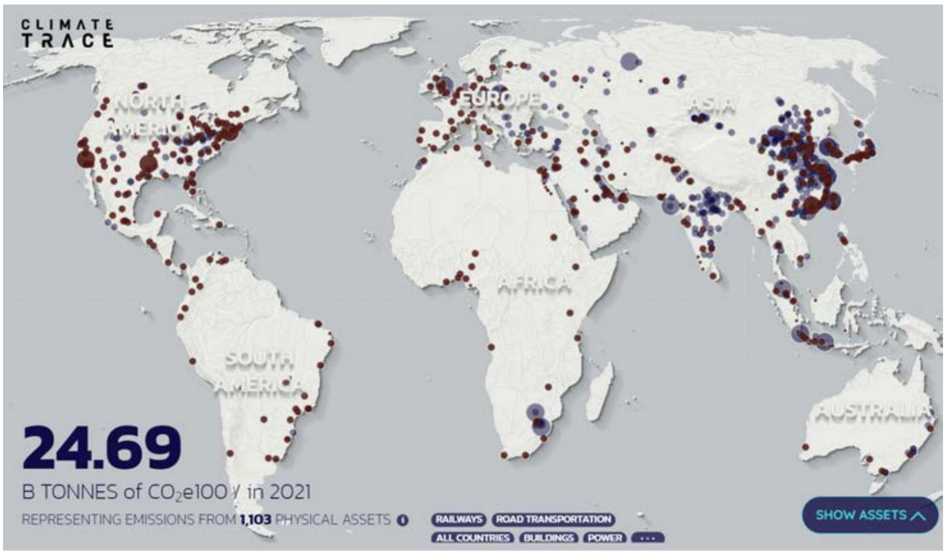
Former U.S. Vice President Al Gore helps launch a global emissions tracker that keeps big polluters honest

November 2022 — In the fight to reduce greenhouse gas emissions, one of the longstanding challenges has been figuring out who is exactly producing them and how much. Now, a new global tracker is helping to make clear exactly where major greenhouse gas emissions are originating. Created by the nonprofit **Climate Trace**, the interactive map uses a combination of satellites, sensors and machine learning to measure the top polluters worldwide.



Climate Trace interactive map, available at: https://climatetrace.org/map/

It observes how much greenhouse gases – carbon dioxide, methane and nitrous oxide – are being emitted at specific locations, such as power plants and oil refineries. Former Vice President Al Gore, who is a founding member of the initiative, said it is meant to serve as a more reliable and accurate alternative to companies self-reporting their emissions estimates. "Cheating is impossible with this artificial intelligence method, because they would have to somehow falsify multiple sets of data," he told NPR's Michel Martin on *All Things Considered*.

Gore recently returned from Egypt where world leaders have been convening to discuss the climate crisis at the annual U.N. climate conference, also known as COP27. He believes the tracker will help countries stick to their pledges to reach net-zero greenhouse emissions by 2050.

Climate Trace wants to track nearly every big source

The emissions tool employs over 300 satellites; sensors on land, planes and ships; as well as artificial intelligence to build models of emission estimates. Right now, it tracks about 72,000 of the highest emitting greenhouse gas sources. That includes every power plant, large ship and large plane in the entire world, Gore said. And that's just the beginning. By next year, Gore hopes to be tracking millions of major emitting sites. "We will have essentially all of them," he said.

Gore said 75% of the world's greenhouse emissions come from countries that have made pledges to become carbon-neutral by 2050. "Now that they know exactly where it's coming from, they have tools that will enable them to reduce their emissions," he told NPR. He added that the database, which is free and accessible online, can help inform countries about how much pollution is being emitted by the companies they are working with or considering working with.

It is not enough for companies to self-report, he said. For instance, Climate Trace found that the oil and gas industry has been significantly underreporting its emissions. "We found their emissions are three times higher than they have been telling the United Nations," Gore said. In the U.S. specifically, oil and gas producers have underreported how much methane they've been releasing, recent research suggests. That doesn't mean companies were intentionally cheating, Gore added. However, he said underreporting prevents governments and the public from staying on track with their net-zero pledge.

Six regional governments in Mexico, Europe and Africa have already entered into working agreements for using the tool, Gore said.

Gore remains optimistic about the climate future

The world is generally off track from its goal of cutting emissions that drive climate change, but Gore said he's been impressed by recent efforts around the globe to address the issue. In the U.S., Gore pointed to the Inflation Reduction Act, which includes over $360 billion to tackle climate change and incentivizes consumers to make greener choices. Gore described the law as "the biggest climate legislation in the history of the world."

He also praised Australia for voting in a new government that pledged to shift away from coal and Brazil for electing a new president who vowed to stop destroying the Amazon. "So there's great danger, but there is hope," Gore said. "If we can summon the will to act." – *Juliana Kim*

Source: https://www.npr.org/2022/11/13/1136376981/al-gore-climate-change

Eight warmest years on record witness upsurge in climate change impacts

November 2022 — The past eight years are on track to be the eight warmest on record, fuelled by ever-rising greenhouse gas concentrations and accumulated heat. Extreme heatwaves, drought and devastating flooding have affected millions and cost billions this year, according to the World Meteorological Organization's provisional State of the Global Climate in 2022 report.

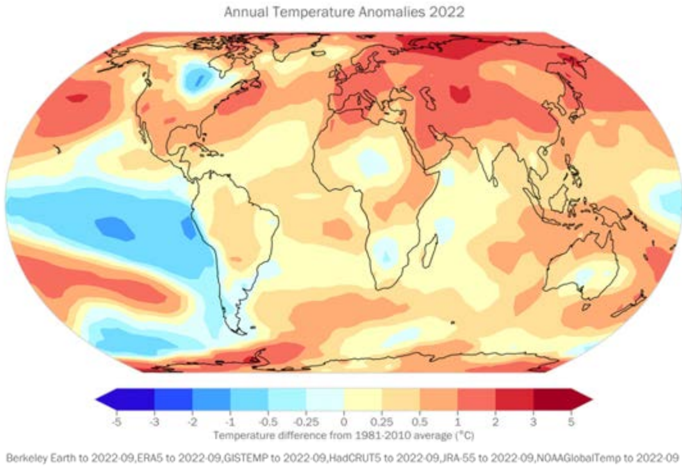
The tell-tale signs and impacts of climate change are becoming more dramatic. The rate of sea level rise has doubled since 1993. It has risen by nearly 10 mm since January 2020 to a new record high this year. The past two and a half years alone account for 10 percent of the overall rise in sea level since satellite measurements started nearly 30 years ago. 2022 took an exceptionally heavy toll on glaciers in the European Alps, with initial indications of record-shattering melt. The Greenland ice sheet lost mass for the 26th consecutive year and it rained (rather than snowed) there for the first time in September.

The global mean temperature in 2022 is currently estimated to be about 1.15 [1.02 to 1.28] °C above the 1850-1900 pre-industrial average. A rare triple-dip cooling La Niña means that 2022 is likely to "only" be fifth or sixth warmest. However, this does not reverse the long-term trend; it is only a matter of time until there is another warmest year on record.

Indeed, the warming continues. The 10-year average for the period 2013-2022 is estimated to be 1.14 [1.02 to 1.27] °C above the 1850-1900 pre-industrial baseline. This compares with 1.09°C from 2011 to 2020, as estimated by the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment report. Ocean heat was at record levels in 2021 (the latest year assessed), with the warming rate particularly high in the past 20 years.

"The greater the warming, the worse the impacts. We have such high levels of carbon dioxide in the atmosphere now that the lower 1.5°C of the Paris Agreement is barely within reach," said WMO Secretary-General Prof Petteri Taalas. "It's already too late for many glaciers and the melting will continue for hundreds if not thousands of years, with major implications for water security. The rate of sea level rise has doubled in the past 30 years. Although we still measure this in terms of millimetres per year, it adds up to half to one meter per century and that is a long-term and major threat to many millions of coastal dwellers and low-lying states," he said.

"All too often, those least responsible for climate change suffer most – as we have seen with the terrible flooding in Pakistan and deadly, long-running drought in the Horn of Africa. But even well-prepared societies



this year have been ravaged by extremes – as seen by the protracted heatwaves and drought in large parts of Europe and southern China," said Prof. Taalas.

"Increasingly extreme weather makes it more important than ever to ensure that everyone on Earth has access to life-saving early warnings."

WMO released the provisional State of the Global Climate report and an accompanying interactive storymap on the eve of the UN climate negotiations in Sharm-El-Sheikh, COP27. UN Secretary-General Antonio Guterres will unveil an Action Plan at COP27 to achieve Early Warnings for All in the next five years. Currently half the countries in the world lack these. Mr Guterres has asked WMO to spearhead the initiative.

The WMO State of the Global Climate report is produced annually. It provides an authoritative voice on the current state of the climate using key climate indicators and reporting on extreme events and their impacts. The temperature figures used in the provisional 2022 report are until the end of September. The final version will be issued next April.

Highlights

Concentrations of the main greenhouse gases - carbon dioxide, methane, and nitrous oxide – once again reached record levels in 2021. The annual increase in methane concentration was the highest on record. Data from key monitoring stations show atmospheric levels of the three gases continue to increase in 2022.

Temperature: The global average temperature in 2022 is estimated to be about 1.15 [1.02 to 1.28] °C above the 1850-1900 average. 2015 to 2022 are likely to be the eight warmest years on record. La Niña conditions have dominated since late 2020 and are expected to continue until the end of 2022. Continuing La Niña has kept global temperatures relatively «low» for the past two years - albeit higher than the last significant La Niña in 2011.

Glaciers and ice: In the European Alps, glacier melt records were shattered in 2022. Average thickness losses of between 3 and over 4 metres were measured throughout the Alps, substantially more than in the previous record year 2003.

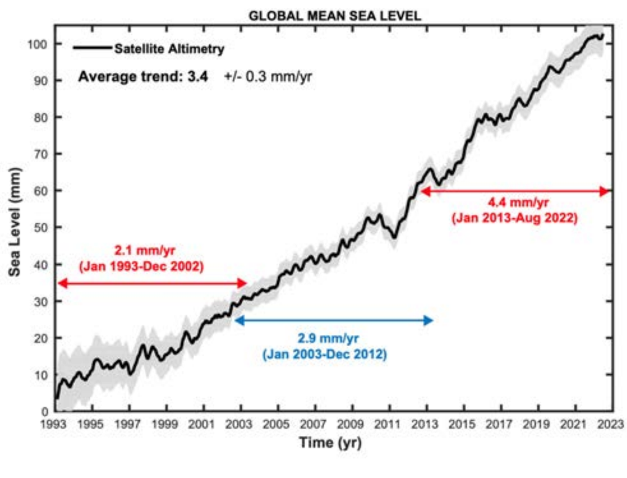
In Switzerland, 6% of the glacier ice volume was lost between 2021 and 2022, according to initial measurements. For the first time in history, no snow outlasted the summer season even at the very highest measurement sites and thus no accumulation of fresh ice occurred. Between 2001 and 2022 the volume of glacier ice in Switzerland decreased from 77 km3 to 49 km3, a decline of more than a third.

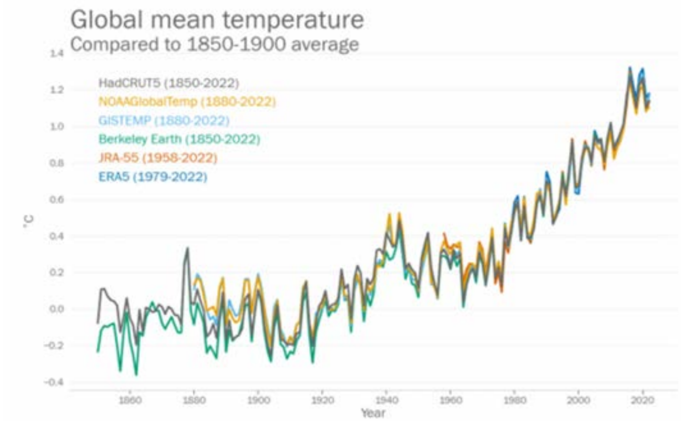
A low snowpack at the end of winter and repeated coverings of Saharan dust set the scene for unprecedented ice loss between May and early September as a result of the long and intense heatwaves.

Global Mean Sea LevelGlobal mean sea level has risen by an estimated 3.4 ± 0.3 mm per year over the 30 years (1993-2022) of the satellite altimeter record. The rate has doubled between 1993-2002 and 2013-2022 and sea level increased by about 5 mm between January 2021 and August 2022. The acceleration is due to increasing ice melt.

Ocean heat: The ocean stores around 90% of the accumulated heat from human emissions of greenhouse gases. The upper 2000m of the ocean continued to warm to record levels in 2021 (the latest year for which figures are available). Warming rates are especially high in the past two decades. It is expected that it will continue to warm in the future – a change which is irreversible on centennial to millennial time scales.

Overall, 55% of the ocean surface experienced at least one marine heatwave in 2022. In contrast only 22% of the ocean surface experienced a marine cold spell. Marine heatwaves are becoming more frequent, in contrast to cold waves. Arctic sea-ice extent was below the long-term (1981-2010) average for most of the year. The





September extent was 4.87 million km2, or 1.54 million km2 below the long-term mean extent. Antarctic sea-ice extent dropped to 1.92 million km2 on 25 February, the lowest level on record and almost 1 million km2 below the long-term average.

Extreme weather: In East Africa, rainfall has been below average in four consecutive wet seasons, the longest in 40 years, with indications that the current season could also be dry. As a result of the persistent drought and other compounding factors, an estimated 18.4 to 19.3 million people faced food "Crisis" or worse levels of acute food insecurity before June 2022. Humanitarian agencies are warning that another below-average season will likely result in crop failure and further exacerbate the food insecurity situations in Kenya, Somalia, and Ethiopia.

Record breaking rain in July and August led to extensive flooding in Pakistan. There were at least 1 700 deaths and 33 million people affected. 7.9 million people were displaced. The flooding came hard on the heels of an extreme heatwave in March and April in both India and Pakistan.

The southern Africa region was battered by a series of cyclones over two months at the start of the year, hitting Madagascar hardest with torrential rain and devastating floods. Hurricane Ian caused extensive damage and loss of life in Cuba and southwest Florida in September.

Large parts of the northern hemisphere were exceptionally hot and dry. China had the most extensive and long-lasting heatwave since national records began and the second-driest summer on record. The Yangtze River at Wuhan reached its lowest recorded level for August.

Large parts of Europe sweltered in repeated episodes of extreme heat. The United Kingdom saw a new national record on 19 July, when the temperature topped more than 40°C for the first time. This was accompanied by a persistent and damaging drought and wildfires. European rivers including the Rhine, Loire and Danube fell to critically low levels. *Source:* https://public.wmo.int/en/media/press-release/eight-warmest-years-record-witness-upsurge-climate-change-impacts

Historic heat to extreme chill: why is the US experiencing a cold snap?

Blistering cold events are becoming more stark and pose a threat not only to humans but to entire ecosystems

December 2022 — The extreme cold settling over the US in late December was biting, as a blast of arctic air and strong winds threatened to plunge several regions into subzero temperatures. Roughly 150 million people across the US were forced to face the frigid conditions, posing life-threatening dangers to anyone without shelter from the storms, wreaking havoc on holiday travel plans and possibly straining susceptible power grids.

"The shock to the system so to speak – whether that's human bodies or power grid – is going to be substantial because we haven't seen this in a long time," said climate scientist Daniel Swain, noting that, in general, numbing cold is becoming less common.

Blistering cold events aren't exactly new, but they are becoming more stark. The dramatic and sudden shift in severity, from record highs to precipitous plunges, can have a profound effect on adaptation, especially for plants, animals and ecosystems exposed to the elements. This week's winter storms may have their own connections to the climate crisis, which scientists are still discussing and debating. But it's clear that the underlying impacts caused by global heating may make them harder to endure.

The National Weather Service warned that the severe storm would produce record-breaking conditions with temperatures quickly plummeting by 25-35F, and winds gusting up to 60 mph. Moving southward across the central plains, the system would also produce heavy snowfall and blinding whiteout squalls. Every state in the continental US was expected to feel a freeze, with areas east of the continental divide bearing the brunt, and some areas reaching temperatures as low as -70F. In these cold temperatures, frostbite can occur in under five minutes, NWS said.

All this, while many areas impacted by the surge were in the midst of having record-hot Decembers. "It will be more of a drastic change from what humans and other living things have been experiencing recently," Alex Lamers, the warning coordination meteorologist for the National Weather Service's Weather Prediction Center said, adding that it "is unusual to see this magnitude of a temperature fall in such a short period of time".

Experts say that could make it harder for animals and ecosystems, even those that are typically well-adapted to the cold.

"Birds are generally able to cope with cold conditions – especially in areas where low temperatures are common," Brooke Bateman, director of Climate Science with the National Audubon Society said. "But when conditions are this cold, birds need to use more energy and require more food, which puts them at risk of not being able to sustain themselves."

An aerial photo shows cattle casting shadows on snow covered fields in Illinois. *Source:* theguardian.com

Migratory species may face greater challenges, especially those who lingered north longer because of the warmer weather. "Birds like bluebirds that tend to cue migration based on weather conditions and food availability may find themselves unable to cope with the cold snap while also trying to retreat from it," she said.

Other birds, including the chipping sparrow, Carolina wren, American robin, and northern cardinal have expanded their ranges north because of warmer winters caused by the climate crisis. They may be less equipped to handle the extreme chill. She encouraged those concerned to create bird-friendly communities with feeders and native plants that can help provide key sources of sustenance.

The abruptness of the drop in temperatures is also expected to impact aquatic life. Fish and other water bound animals typically retreat into the depths when conditions worsen. If changes happen too quickly, they may not get there in time. Several areas may emerge from the freezing conditions to find scores of fish littering their shores.

The Wildlife Rescue Association's Jackie McQuillan outpatient care lead told the Vancouver Sun at the start of this year – following another arctic blast – dramatic weather changes are impacting wildlife, but its difficult to gauge how populations maybe changed. Some species that burrow into deep snow may struggle with the sudden onslaught, if there's not enough of a bank there already, and others that have faced greater food scarcity due to changing conditions will be more vulnerable to the severe storm.

Cattle, and other animal populations raised outside, may also be stressed from the shift, even those whose thick coats typically protect them from winter weather. The NWS warned that "livestock interests will also be severely impacted". Ranchers are already rushing to move their herds to areas where they can be shielded from the storm and supplying them with more food to help make them more resilient in the extreme conditions.

"I won't say it's going to be good, but ranchers will do everything they can to make it as less bad as possible," Brett Moline, a rancher and the director of public and governmental affairs for the Wyoming Farm Bureau Federation told Wyoming Public Radio.

Meanwhile, Floridians are already preparing for another round of frigid iguanas to fall from the trees, as they have in the past when temperatures drop. The cold-blooded creatures, used to a more balmy climate, are typically immobilized in weather under 50F.

Beyond ecosystem impacts, the extreme cold will take a toll on people who are exposed, posing life-threatening risks for the unhoused, in areas where there are power outages, and for those risking travel through the hardest-hit regions. Agencies across the country are urging households to prepare for the worst, with strong winds adding to the possibility energy systems could fail. Extra supplies, including blankets, could mean the difference between life and death.

Coyotes seen on the road in snow-laden Lake Tahoe in California. *Source:* theguardian.com

"They may well be the coldest temperatures I ever experience for the rest of my life in this part of the world," said Swain.

As people around the world brace for more extreme heatwaves and extreme rainfall events – made more likely by the climate crisis – Swain said, we will still have to navigate these sharp shifts. "This is a reminder that we can still get these kinds of events even in a warming climate." *Source:* https://www.theguardian.com/us-news/2022/dec/21/us-winter-weather-storm-cold-snap

COP27 reaches agreement on fund for vulnerable countries

November 2022 – The United Nations Climate Change Conference COP27 closed with a breakthrough agreement to provide "loss and damage" funding for vulnerable countries hit hard by climate disasters.

"This outcome moves us forward," said Simon Stiell, UN Climate Change Executive Secretary. "We have determined a way forward on a decades-long conversation on funding for loss and damage – deliberating over how we address the impacts on communities whose lives and livelihoods have been ruined by the very worst impacts of climate change."

Set against a difficult geopolitical backdrop, COP27 resulted in countries delivering a package of decisions that reaffirmed their commitment to limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels. The package also strengthened action by countries to cut greenhouse gas emissions and adapt to the inevitable impacts of climate change, as well as boosting the support of finance, technology and capacity building needed by developing countries.

Creating a specific fund for loss and damage marked an important point of progress, with the issue added to the official agenda and adopted for the first time at COP27.

Governments took the ground-breaking decision to establish new funding arrangements, as well as a dedicated fund, to assist developing countries in responding to loss and damage. Governments also agreed to establish a 'transitional committee' to make recommendations on how to operationalize both the new funding arrangements and the fund at COP28 next year. The first meeting of the transitional committee is expected to take place before the end of March 2023.

Parties also agreed on the institutional arrangements to operationalize the Santiago Network for Loss and Damage, to catalyze technical assistance to developing countries that are particularly vulnerable to the adverse effects of climate change.

COP27 saw significant progress on adaptation, with governments agreeing on the way to move forward on the Global Goal on Adaptation, which will conclude at COP28 and inform the first Global Stocktake, improving resilience amongst the most vulnerable. New pledges, totaling more than USD 230 million, were made to the Adaptation Fund at COP27. These pledges will help many more vulnerable communities adapt to climate change through concrete adaptation solutions. COP27 President Sameh Shoukry announced the Sharm el-Sheikh Adaptation Agenda, enhancing resilience for people living in the most climate-vulnerable communities by 2030. UN Climate Change's Standing Committee on Finance was

The United Nations Climate Change Conference COP27 closed with a breakthrough agreement to provide "loss and damage" funding for vulnerable countries hit hard by climate disasters. *Source:* unfccc.int/news

requested to prepare a report on doubling adaptation finance for consideration at COP28 next year.

The cover decision, known as the Sharm el-Sheikh Implementation Plan, highlights that a global transformation to a low-carbon economy is expected to require investments of at least USD 4-6 trillion a year. Delivering such funding will require a swift and comprehensive transformation of the financial system and its structures and processes, engaging governments, central banks, commercial banks, institutional investors and other financial actors.

Serious concern was expressed that the goal of developed country Parties to mobilize jointly USD 100 billion per year by 2020 has not yet been met, with developed countries urged to meet the goal, and multilateral development banks and international financial institutions called on to mobilize climate finance.

At COP27, deliberations continued on setting a 'new collective quantified goal on climate finance' in 2024, taking into account the needs and priorities of developing countries. "In this text we have been given reassurances that there is no room for backsliding," said Stiell. "It gives the key political signals that indicate the phasedown of all fossil fuels is happening."

The World Leaders Summit, held over two days during the first week of the conference, convened six high-level roundtable discussions. The discussions highlighted solutions – on themes including food security, vulnerable communities and just transition – to chart a path to overcome climate challenges and to provide the finance, resources and tools to effectively deliver climate action at scale.

COP27 brought together more than 45,000 participants to share ideas, solutions, and build partnerships and coalitions. Indigenous peoples, local communities, cities and civil society, including youth and children, showcased how they are addressing climate change and shared how it impacts their lives.

The decisions taken here today also reemphasize the critical importance of empowering all stakeholders to engage in climate action; in particular through the five-year action plan on Action for Climate Empowerment and the intermediate review of the Gender Action Plan. These outcomes will allow all Parties to work together to address imbalances in participation and provide stakeholders with the tools required to drive greater and more inclusive climate action at all levels.

Young people in particular were given greater prominence at COP27, with UN Climate Change's Executive Secretary promising to urge governments to not just listen to the solutions put forward by young people, but to incorporate those solutions in decision and policy making. Young people made their voices heard through the first-of-its-kind pavilion for children and youth, as well as the first-ever youth-led Climate Forum.

In parallel with the formal negotiations, the Global Climate Action space at COP27 provided a platform for governments, businesses and civil society to collaborate and showcase their real-world climate solutions. The UN Climate Change High-Level Champions held a two-week programme of more than 50 events. This included a number of major African-led initiatives to cut emissions and build climate resilience, and significant work on the mobilization of finance.

"We have a series of milestones ahead. We must pull together, with resolve, through all processes, may they be national, regional, or others such as the G20. Every single milestone matters and builds momentum," said Stiell. "The next step for change is just around the corner, with the United Arab Emirates' stewardship of the First Global Stocktake. For the very first time we will take stock of the implementation of the Paris Agreement. It will independently evaluate the progress we have made and if our goals are adequate. It will inform what everybody, every single day, everywhere in the world, needs to do, to avert the climate crisis."

Stiell reminded delegates in the closing plenary that the world is in a critical decade for climate action. A stark report from UN Climate Change underpinned his remarks, as well as discussions throughout the two-week conference. According to the report, implementation of current pledges by national governments put the world on track for a 2.5°C warmer world by the end of the century. The UN's Intergovernmental Panel on Climate Change indicates that greenhouse gas emissions must decline 45% by 2030 to limit global warming to 1.5°C.

COP27 President Sameh Shoukry said: "The work that we've managed to do here in the past two weeks, and the results we have together achieved, are a testament to our collective will, as a community of nations, to voice a clear message that rings loudly today, here in this room and around the world: that multilateral diplomacy still works…. despite the difficulties and challenges of our times, the divergence of views, level of ambition or apprehension, we remain committed to the fight against climate change…. we rose to the occasion, upheld our responsibilities and undertook the important decisive political decisions that millions around the world expect from us."

Speaking about the year ahead, Stiell said UN Climate Change will help Parties and future COP Presidencies to navigate this path to the new phase of implementation.

A summary of some of the other key outcomes of COP27 follows below.

Technology

COP27 saw the launch of a new five-year work program to promote climate technology solutions in developing countries.

Mitigation

COP27 significantly advanced the work on mitigation. A mitigation work programme was launched in Sharm el-Sheikh, aimed at urgently scaling up mitigation ambition and implementation. The work programme will start immediately following COP27 and continue until 2026 when there will be a review to consider its extension. Governments were also requested to revisit and strengthen the 2030 targets in their national climate plans by the end of 2023, as well as accelerate efforts to phasedown unabated coal power and phase-out inefficient fossil fuel subsidies.

The decision text recognizes that the unprecedented global energy crisis underlines the urgency to rapidly transform energy systems to be more secure, reliable, and resilient, by accelerating clean and just transitions to renewable energy during this critical decade of action.

Global Stocktake

Delegates at the UN Climate Change Conference COP27 wrapped up the second technical dialogue of the first global stocktake, a mechanism to raise ambition under the Paris Agreement. The UN Secretary-General will convene a 'climate ambition summit' in 2023, ahead of the conclusion of the stocktake at COP28 next year.

Snapshot of other announcements

- Countries launched a package of 25 new collaborative actions in five key areas: power, road transport, steel, hydrogen and agriculture.
- UN Secretary-General António Guterres announced a USD 3.1 billion plan to ensure everyone on the planet is protected by early warning systems within the next five years.
- The UN Secretary-General's High-Level Expert Group on Net-Zero Commitments published a report at COP27, serving as a how-to guide to ensure credible, accountable net-zero pledges by industry, financial institutions, cities and regions.
- The G7 and the V20 ('the Vulnerable Twenty') launched the Global Shield against Climate Risks, with new commitments of over USD 200 million as initial funding. Implementation is to start immediately.
- Announcing a total of USD 105.6 million in new funding, Denmark, Finland, Germany, Ireland, Slovenia, Sweden, Switzerland, and the Walloon Region of Belgium stressed the need for even more support for the Global Environment Facility funds targeting the immediate climate adaptation needs of low-lying and low-income states.
- The new Indonesia Just Energy Transition Partnership, announced at the G20 Summit held in parallel with COP27, will mobilize USD 20 billion over the next three to five years to accelerate a just energy transition.
- Important progress was made on forest protection with the launch of the Forest and Climate Leaders' Partnership, which aims to unite action by governments, businesses and community leaders to halt forest loss and land degradation by 2030.

Source: https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries

A new open collection of 20 flux tower datasets from global cities†

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Urban climate plays a crucial role in human wellbeing. While significant progress has been made in recent decades, urban areas remain underrepresented for certain meteorological observations compared with natural landscapes. For example, there are few openly available measurements of energy and mass exchange between the urban surface and atmosphere, observable at local scales (of order 0.5 km) with flux towers. These flux observations are critical to understanding meteorological, hydrological, biophysical and anthropogenic processes, and for developing and evaluating surface-atmosphere exchange models.

To observe fluxes in cities is challenging because of the complexity and variety of urban surfaces, their flux sources and sinks. As the sensors need to be within the inertial sublayer (ISL), tall towers are needed to mount the instruments, but it can be difficult to gain the approval for installation or access to existing towers without major bluff bodies disrupting the flow. Further challenges are associated with building and maintaining the towers and sensors at those elevated heights and obtaining the limited long-term funding opportunities available for urban flux measurements. The urban flux towers that have been established are thanks to the dedication of principal scientists, and the hard work and good will of many others involved in the funding, site approval, equipment installation, maintenance, data collection, processing and curation (histories of urban flux tower measurements are reported in Arnfield, 2003; Grimmond, 2006; Velasco and Roth, 2010; Feigenwinter et al., 2012; Grimmond and Christen, 2012; Christen et al., 2013; Grimmond and Ward, 2021).

Standardised or harmonised collections made up of individual sites help expand our knowledge of ecosystem and climate system science. Regional networks such as AmeriFlux, AsiaFlux, OzFlux, EuroFlux and CarboAfrica (Valentini, 2003; Yamamoto et al., 2005; Bombelli et al., 2009; Beringer et al., 2016; Novick et al., 2018) have contributed to the global network FLUXNET (Pastorello et al., 2020), which has steadily increased flux tower data availability through large standardised and open collections. However, of the hundreds of sites registered with FLUXNET, only one is classified as an urban site (https://fluxnet.org/sites/site-list-and-pages/). The lack of openly available urban flux data has limited the benefits of these collections for the urban research community.

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Table 1. Location of sites in the Lipson et al. (2022a) collection, and the included observation period. Some sites have longer periods available from data providers. Resolution is 30 minutes (or 60 minutes if denoted by *). Source: Lipson et al. (2022a).

Sitename	City	Country	Observed period	Latitude	Longitude	References
AU-Preston	Melbourne	Australia	Aug 2003 – Nov 2004	-37.7306	145.0145	(Coutts et al., 2007a, b)
AU-SurreyHills	Melbourne	Australia	Feb 2004 – Jul 2004	-37.8265	145.099	(Coutts et al., 2007a, b)
CA-Sunset	Vancouver	Canada	Jan 2012 – Dec 2016	49.2261	-123.078	(Christen et al., 2011; Crawford and Christen, 2015)
FI-Kumpula	Helsinki	Finland	Dec 2010 – Dec 2013	60.2028	24.9611	(Karsisto et al., 2016)
FI-Torni	Helsinki	Finland	Dec 2010 – Dec 2013	60.1678	24.9387	(Järvi et al., 2018; Nordbo et al., 2013)
FR-Capitole	Toulouse	France	Feb 2004 – Mar 2005	43.6035	1.4454	(Masson et al., 2008; Goret et al., 2019)
GR-HECKOR	Heraklion	Greece	Jun 2019 – Jun 2020	35.3361	25.1328	(Stagakis et al., 2019)
JP-Yoyogi	Tokyo	Japan	Mar 2016 – Mar 2020*	35.6645	139.6845	(Hirano et al., 2015; Ishidoya et al., 2020)
KR-Jungnang	Seoul	South Korea	Jan 2017 – Apr 2019	37.5907	127.0794	(Hong et al., 2020; Jo et al., n.d.)
KR-Ochang	Ochang	South Korea	Jun 2015 – Jul 2017	36.7197	127.4344	(Hong et al., 2019, 2020)
MX-Escandon	Mexico City	Mexico	Jun 2011 – Sep 2012	19.4042	-99.1761	(Velasco et al., 2011, 2014)
NL-Amsterdam	Amsterdam	Netherlands	Jan 2019 – Oct 2020	52.3665	4.8929	(Steeneveld et al., 2020)
PL-Lipowa	Łódź	Poland	Jan 2008 – Dec 2012*	51.7625	19.4453	(Fortuniak et al., 2013; Pawlak et al., 2011)
PL-Narutowicza	Łódź	Poland	Jan 2008 – Dec 2012*	51.7733	19.4811	(Fortuniak et al., 2013, 2006)
SG-TelokKurau06	Singapore	Singapore	Apr 2006 – Mar 2007	1.3143	103.9112	(Roth et al., 2017)
UK-KingsCollege	London	UK	Apr 2012 – Jan 2014	51.5118	-0.1167	(Bjorkegren et al., 2015; Kotthaus and Grimmond, 2014a, b)
UK-Swindon	Swindon	UK	May 2011 – Apr 2013	51.5846	-1.7981	(Ward et al., 2013)
US-Baltimore	Baltimore	USA	Jan 2002 – Jan 2007*	39.4128	-76.5215	(Crawford et al., 2011)
US-Minneapolis	Minneapolis	USA	Jun 2006 – May 2009	44.9984	-93.1884	(Peters et al., 2011; Menzer and McFadden, 2017)
US-WestPhoenix	Phoenix	USA	Dec 2011 – Jan 2013	44.9984	-93.1884	(Chow, 2017; Chow et al., 2014)

A new urban flux data collection

In our recent open-access publication (Lipson et al., 2022a), 28 scientists have collaborated to provide data from 20 urban flux towers in a new quality-controlled, harmonized and gap-filled collection. The 20 sites (Table 1) are diverse in location, built density and climate (Figure 1). The observations from these sites span 50 years, and include upward and downward radiant fluxes, sensible and latent heat fluxes, air temperature, humidity, wind and other meteorological variables. Site characteristics are described in standardised metadata, including land cover fractions, urban morphology, anthropogenic heat flux estimates, satellite and site imagery. A key motivation for creating this collection is the evaluation of land surface models, so we provide continuous gap-filled timeseries for incoming radiation fluxes and other meteorological variables, using a combination of nearby observations and bias corrected reanalysis data. A 10-year spin-up period using the bias corrected reanalysis data are also prepended to the observed timeseries to allow modelled soil moisture and other conditions to equilibrate with local conditions. Other variables (turbulent and upwelling radiation fluxes) are not gap-filled, so they can be used to evaluate the performance of land surface models in simulating land–atmosphere energy exchanges, or in observational synthesis studies.

Included sites

We initially collated these data for use in the current Urban-PLUMBER multi-site model evaluation project (project website https://urban-plumber.github.io/). The sites are chosen to represent a diversity of climate and urban characteristics, with a preference for longer and more complete timeseries to allow assessment of seasonal and inter-annual variability. The sites are reasonably distributed across mean temperature and precipitation for global urban locations, but gaps remain, particularly in warm, wet and very cold climates (Figure 2). In addition, most urban flux towers have been installed in countries with higher average wealth, leaving other regions with significant urban environmental challenges understudied. Some flux observations that could com-

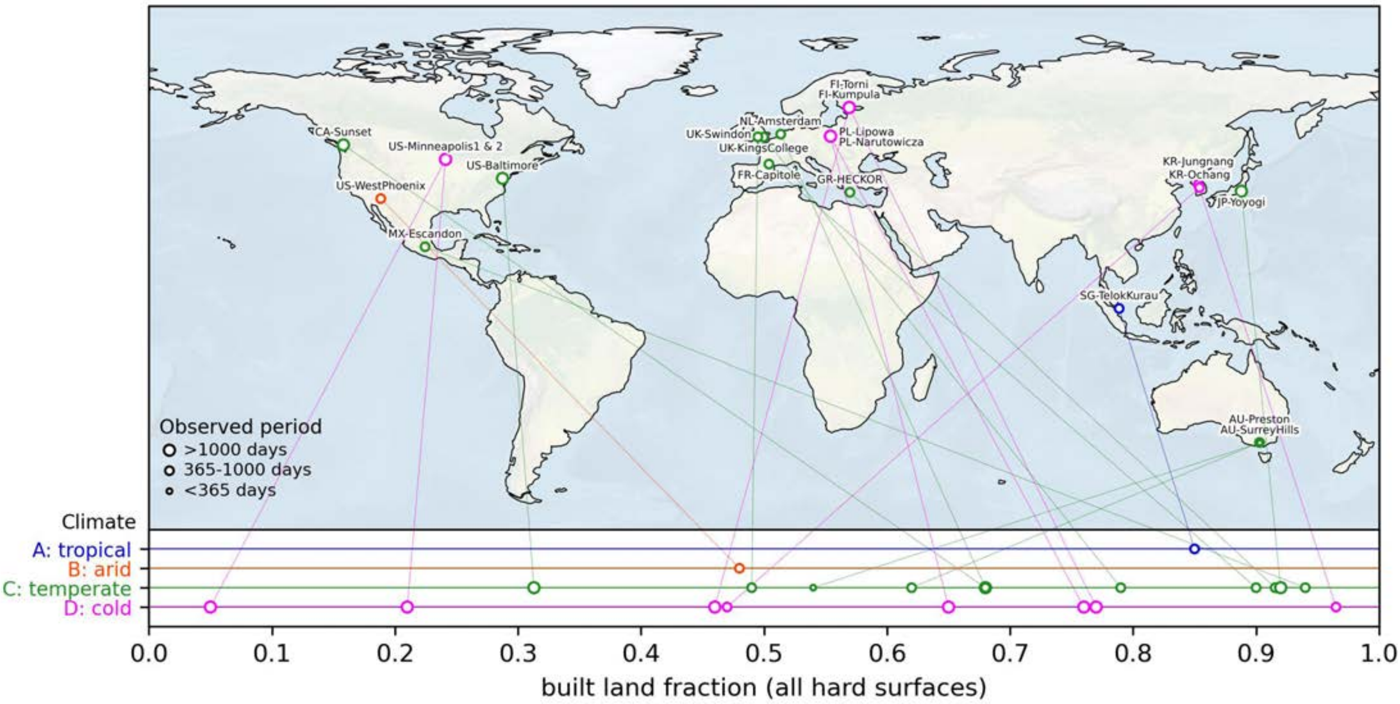

Figure 1. Location of flux tower sites in the Lipson et al. (2022a) collection. Each site Köppen-Geiger climate classification (Beck et al., 2018) and the built (impervious) land fraction around the tower are indicated at the bottom of the figure. Source: Lipson et al. (2022a).

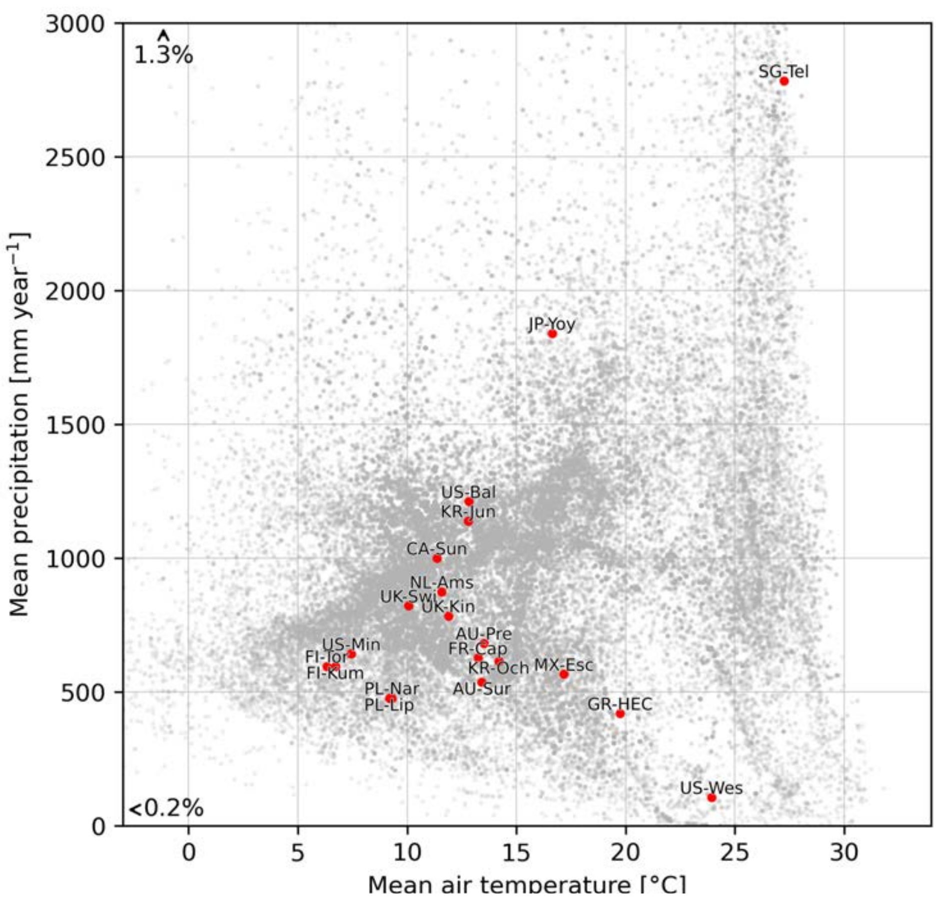

Figure 2. Climatology of included Lipson et al. (2002a) sites compared with the ERA5 climatology of more than 70,000 global urban areas from GRUMP (Center for International Earth Science Information Network - CIESIN - Columbia University et al., 2017).

Significant gaps in urban climate observations remain, particularly for warm, wet and very cold cities. Source: Lipson et al. (2022a). Numbers in left hand corners indicate percentage of urban areas beyond plot margins.

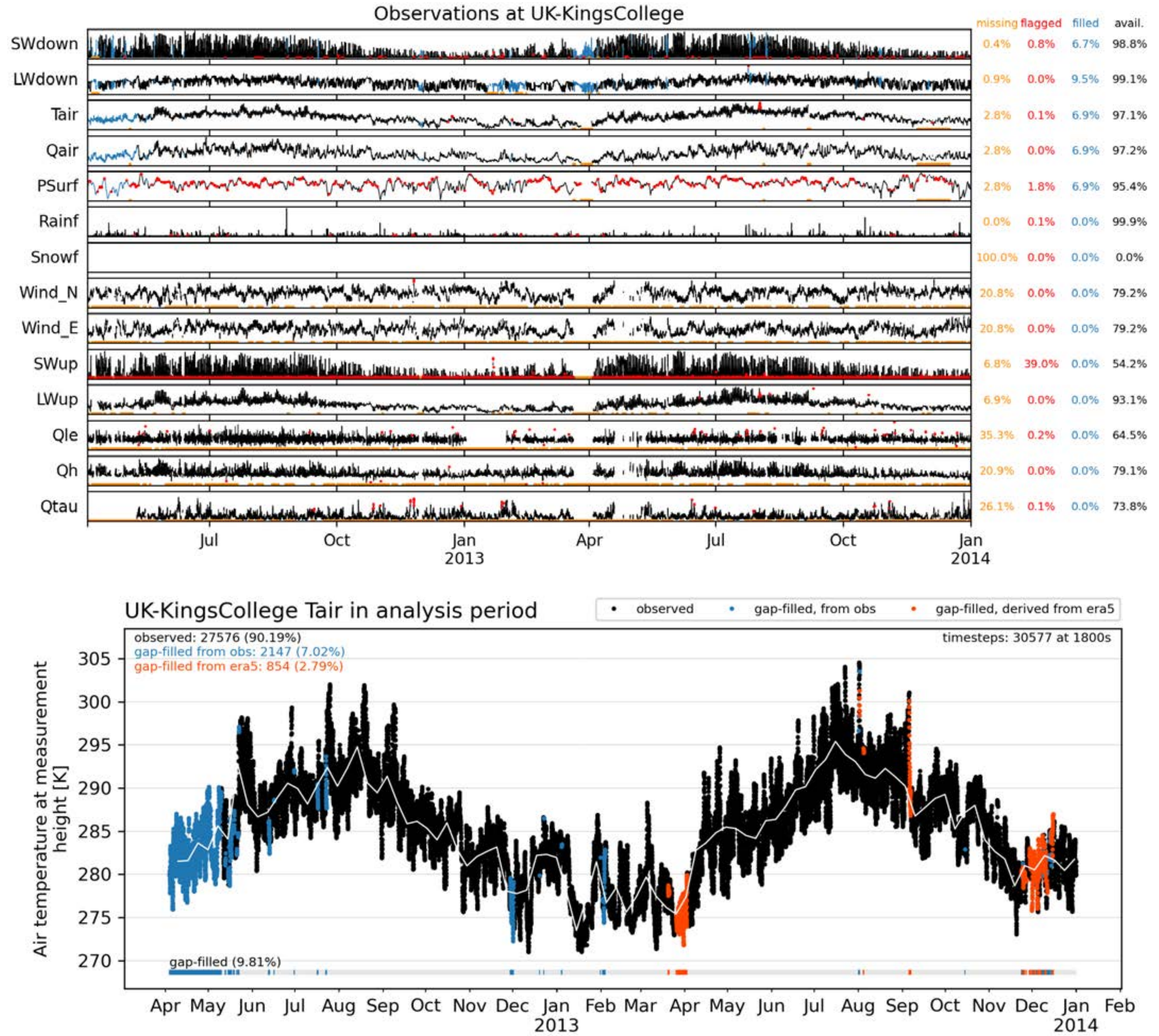

Figure 3. Available, missing, flagged and filled observations for an example site (King's College London) for all variables (upper panel), and the detail of air temperature at 50 m above ground (lower panel). Other site and variable plots available within the collection and on the project website: https://urban-plumber.github.io/sites. Source: Lipson et al. (2022a)

plement this data collection to add diversity in environments represented (e.g. Africa: Ouagadougou (Offerle et al., 2005), South America: São Paulo (Ferreira et al., 2013), China: Guangzhou (Shi et al., 2019) and Beijing (Dou et al., 2019)) are not included because of their shorter duration, or some certain key variables being unavailable when this collection process began. Since then, some of these sites have extended observations, and others have become available (e.g. Duan et al., 2022) which could be considered in future studies

Quality control and gap-filling

For each site, the 30- or 60-min variables are calculated by site data providers from high-frequency samples after applying their own quality control measures. We then apply additional project-wide quality control to remove unphysical and suspicious values using statistical and visual methods (Lipson et al., 2022a). Quality control that eliminates observations at particular times (e.g., at night or after rainfall) can introduce biases, and so the quality-controlled data may not be appropriate for some types of analyses. We therefore provide timeseries before and after quality control. Additionally, the collection and project website (https://urban-plumber.github.io/sites) include plots for each variable identifying the datapoints removed through quality control, original gaps, and periods of gap-filling (e.g. Figure 3).

Gap filling is applied using the following methods, in

Table 2. Site descriptive metadata included in the Lipson et al. (2022a) collection.
Source: Lipson et al. (2022a)

ID	Parameter	Units	Description
1	latitude	degrees_north	Latitude of tower
2	longitude	degrees_east	Longitude of tower
3	ground_height	m	Height above sea level of base of tower
4	measurement_height_above_ground	m	Height above ground level (agl) of eddy covariance equipment on tower
5	impervious_area_fraction	1	Plan area fraction of all impervious (hard) surfaces, including roofs, roads, paths and paved areas
6	tree_area_fraction	1	Plan area fraction of tree canopy (> 2 m)
7	grass_area_fraction	1	Plan area fraction of grass or other vegetation (< 2 m)
8	bare_soil_area_fraction	1	Plan area fraction of bare soil
9	water_area_fraction	1	Plan area fraction of water
10	roof_area_fraction	1	Plan area fraction of roofs (λ_p)
11	road_area_fraction	1	Plan area fraction of roads
12	other_paved_area_fraction	1	Plan area fraction of hard surfaces on ground excluding roads (e.g. paths, plazas, carparks etc)
13	building_mean_height	m	Mean height above ground of buildings (H_{ave})
14	tree_mean_height	m	Mean height above ground of trees
15	roughness_length_momentum	m	Aerodynamic roughness length for momentum as reported in literature or provided by data providers
16	displacement_height	m	Zero-plane displacement height as reported in literature or advised by data providers
17	canyon_height_width_ratio	1	Mean building height to mean street canyon width (distance between buildings) ratio (H/W)
18	wall_to_plan_area_ratio	1	Sum of wall surface area to plan area ratio (λ_w)
19	average_albedo_at_midday	1	Median site albedo at midday (local standard time) for available observations
20	resident_population_density	person km^{-2}	Resident (night) population density
21	anthropogenic_heat_flux_mean	W m^{-2}	Anthropogenic heat flux annual mean
22	topsoil_clay_fraction	1	Clay fraction of topsoil
23	topsoil_sand_fraction	1	Sand fraction of topsoil
24	topsoil_bulk_density	kg m^{-3}	Bulk (dry) density of topsoil
25	building_height_standard_ deviation	m	standard deviation of building heights (σ_H)
26	roughness_length_momentum_mac	m	Aerodynamic roughness length for momentum calculated by the Macdonald morphometric method
27	displacement_height_mac	m	Zero-plane displacement height calculated by the Macdonald morphometric method
28	roughness_length_momentum_kanda	m	Aerodynamic roughness length for momentum calculated by the Kanda morphometric method
29	displacement_height_kanda	m	Zero-plane displacement height calculated by the Kanda morphometric method

priority order (Lipson et al. 2022a):

1. nearby flux tower or weather observing sites (if available)

2. small gaps (≤ 2 h) linearly interpolated from adjoining observations

3. remaining gaps filled with reanalysis data after local site bias corrections

Reanalysis products assimilate satellite, atmospheric, surface and ocean observations to constrain numerical weather prediction models, producing complete and continuous model output with global coverage. These products are therefore useful for filling missing periods in tower timeseries, and have thus been used in previous studies (Vuichard and Papale, 2015; Kokkonen et al., 2018; Pastorello et al., 2020; Ukkola et al., 2022). Here we use hourly surface-level data (Hersbach et al., 2018) from the ERA5 reanalysis product (Hersbach et al., 2020), available at 0.25° spatial resolution. However, the ERA5 data has several incompatibilities with the urban flux tower observations, including:

1. The ERA5 grid cell area is much larger than the turbulent and radiative flux footprints of the observational data.

2. The ERA5 outputs are near-surface variables (2 or 10 m above ground level), while urban tower observations are located within the inertial sublayer (2-5 times average building height).

3. The ERA5 systems do not include an urban land surface model, so urban-induced warming, diurnal phase shifts and wind effects are not represented in ERA5.

The resulting errors can be reduced via bias correction using local observations. Several methods for bias correcting reanalysis data used in previous (non-urban) studies were evaluated (e.g. Vuichard and Papale, 2015; Cucchi et al., 2020) but we found that the set of methods described below had overall better error reductions:

a) For incoming longwave radiation, air temperature, specific humidity and air pressure, the mean bias between ERA5 and local flux tower observations are calculated for each hour and each day of a representative year in a 60-day rolling window. The calculated bias is then subtracted from the complete ERA5 timeseries to create a new corrected timeseries.

b) For wind components, differences in modelled and observed height above ground, along with differences in surface roughness, are corrected using a logarithmic wind profile assuming neutral conditions. The method ensures mean reanalysis speeds match observed speeds while conserving the wind variability in reanalysis data.

c) The long term (10-year) precipitation bias is calculated using nearby rain gauges from the Daily Global Historical Climatology Network (GHNCD; Menne et al., 2012), and used to correct ERA5 precipitation. Snowfall from ERA5 is used to gap-fill observations, with a water-equivalent correction for rainfall to maintain observed total precipitation mass balance.

d) Incoming shortwave radiation from ERA5 is left without bias correction as the techniques tested did not consistently reduce errors.

The inclusion of timeseries before and after quality control and gap-filling allows researchers to apply their own preferred gap-filling method if the above methods are considered unsuitable.

Site characteristics

Within the collection, each site has an associated comma-separated file containing the standardised site metadata (Table 2). These site characteristics are useful for interpreting timeseries data and are fundamental to application and configuration of land surface models. The metadata were drawn from published sources or were advised by the data providers. Where not known, metadata are estimated from high-resolution global datasets or derived using empirical relations. The sources for metadata are described in more detail in the associated collection paper (Lipson et al., 2022a) and individual parameter sources are included in the data collection (Lipson et al., 2022b).

The underlying studies from which the metadata are extracted may differ in the methods used to estimate parameter values or the assumptions made during footprint analyses. Standardizing the method to determine metadata across sites was beyond the scope of this work, so users should be mindful of differences and refer to Lipson et al. (2022a) and individual site publications for additional details. This exercise demonstrates that further work and collaborations are needed by experimentalists and modelling researchers to help standardise methods to describe site metadata across sites.

Accessing and using the data

The collection can be accessed from https://doi.org/10.5281/zenodo.7104984 (Lipson et al., 2022b). From there, two data archives are available, the "full collection", and a smaller "obs only" subset of data.

Full collection

The full collection contains all data required to configure, run and evaluate a land surface model. Data are separated into folders for each site. Within each site folder, an 'index.html' file provides a summary of available observations, metadata, plots and site imagery (as on the project webpage). The timeseries folder includes:

- raw observations: observed tower data before project quality control and gap filling (in netCDF and plain text)
- clean observations timeseries: observed tower data

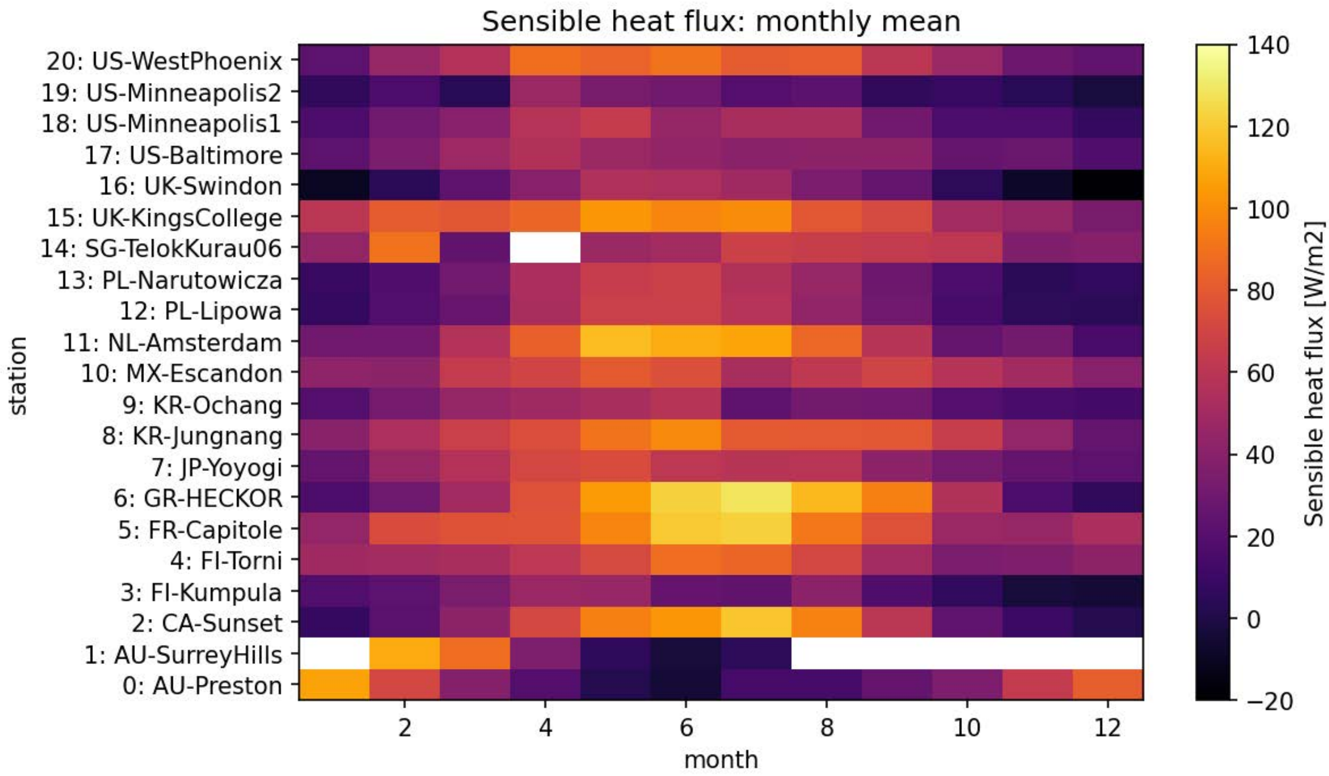

Figure 4. Output from the example Python code: Monthly mean sensible heat flux for each site. White indicates missing data.

```
import xarray as xr
import matplotlib.pyplot as plt

# open local standard time dataset and get monthly mean of sensible heat flux for each site
ds = xr.open_dataset('UP_all_clean_observations_localstandardtime_v1.nc')
grp = ds['Qh'].groupby('time.month').mean()

# plot mean value for each month and each station
fig,ax = plt.subplots(figsize=(8,5))
grp.plot(ax=ax,cmap='inferno', vmin=-20,vmax=140, cbar_kwargs={'label': 'Sensible heat flux [W/m2]'})
ax.set_title(f'Sensible heat flux: monthly mean')
ax.set_yticks(range(0,21))
ax.set_yticklabels([ds.station.station_ids[i] for i in range(0,21)])
fig.savefig('Qh_monthlymean.png', bbox_inches='tight', dpi=150)
```

after project quality control and before gap filling (in netCDF and plain text)

• metforcing: cleaned tower observations used to force land surface models, combined with reanalysis data for gap-filling and prepended with a 10-year spin-up period (netCDF and plain text)

• ERA5 corrected: continuous timeseries (1990-2020) of bias corrected ERA5 reanalysis data used for gap-filling observed data (netCDF)

The site folder also contains a comma separated (csv) file for site metadata (Table 2).

"Obs only" collection

The "obs only" collection is a smaller subset of data useful for analysing observations. Data meet quality control, but are not gap filled (i.e. this collection matches the "clean observations" timeseries in the full collection).

Two netCDF timeseries files with different time stamps are provided: (1) universal coordinated time (UTC), and (2) local standard time. Having all data in a single netCDF file reduces the number of steps needed by researchers for processing and analysis. For example, the Python code shown above reproduces Figure 4.

All data (Lipson et al., 2022b) are openly available under a Creative Commons by Attribution licence (CC-BY-4.0). We recommend data users consult with site contributing authors and/or the coordination team early (i.e. planning stage) in projects that plan to use these data. Relevant contacts are included in the site metadata. To acknowledge the immense work and expertise that made each individual flux dataset possible (often with significant contributions from early career scientists and PhD students), it is vital the relevant individual papers are cited (per Table 1) when the data are used.

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Proposed guidelines on microclimate measurements in tropical cities

This report is based on: Liu Z, Cheng KY, He Y, Jim CY, Brown R, Shi Y, Lau K and Ng E (2022) Microclimatic measurements in tropical cities: Systematic review and proposed guidelines. *Building & Environment* 109411
https://doi.org/10.1016/j.buildenv.2022.109411

Background

Field measurements are fundamental to urban microclimate studies. The advantages include acquiring direct evidence of the 'real-world' microclimate conditions, and portraying reliable results with a high temporal resolution as first-hand information. Microclimate studies that assess the thermal or human-biometeorological effects of the urban environment are often based on field measurements. Existing guidelines and standards for meteorological observations serve to clarify and standardize the measurement process. These include *The Guide to Instruments and Methods of Observation* (WMO No. 8 guideline), ISO 7726 and ISO 7730 Standard, and the ASHRAE handbook.

However, a review of field measurement studies over the last five years has identified four common pitfalls that call for improvement: (1) measurement designs; (2) field measurement preparations; (3) operational procedures; and (4) metadata records. The primary concerns are the inappropriate application scale and location, and the lack of a systematic workflow, both of which can limit data quality and applications. To address the lack of comprehensive and systematic guidelines, researchers from Hong Kong collaborated to propose a guideline with a systematic and actionable workflow of microclimate field measurement procedures for application in urban areas.

Introduction of the guideline

This guideline proposed a systematic approach to conduct microclimate field measurements at the pedestrian level in cities. It aims to ensure the systematization and reliability of observations by standardization, preparation, and precaution. The guideline is based on research experiences in the tropical zone, applicable sections from existing guidelines/standards, and recommendations from professionals. The complex and heterogeneous environment in urban areas was carefully evaluated to hone the data acquisition campaign and ascertain data quality. Four steps in microclimate field measurements were elaborated: formulating a field measurement plan, preparing for field measurements, sustaining measurement quality, and curating data (Fig. 1).

In the first step, *formulating a field measurement plan*, the guideline listed seven aspects that should be carefully considered before conducting measurement campaigns. These include: establishing clear measurement objectives, determining field measurement type, selecting and characterizing field study sites, ascertaining microclimate variables and instruments, selecting a reference station, choosing the field day weather, and deciding the field date and time.

In *preparing for field measurements*, the guideline emphasizes the significance of instrument calibration and maintenance. Precautions for developing a weather monitoring system are introduced. The guideline also offers detailed memoranda of organizing measurements, such as seeking permission for site access, preparing accessories and spare parts, and preliminary testing.

In *actual measurement campaigns*, the guideline pinpoints four aspects demanding careful consideration. These include checking equipment and data storage regularly, keeping an observation log, responding to unexpected conditions, and collecting meteorological data for the field day.

In the *data curating process*, the guideline highlights some issues that may affect data analysis, such as formatting data, processing data, and controlling data quality.

Unique features of the guideline

Focusing on urban-environment characteristics at the micro-scale

The urban microclimate is a complex and heterogeneous consequence of diverse parameters involving a wide range of natural and urban processes. The microclimate of high-density cities is strongly affected by high-rise buildings, narrow street canyons, inhomogeneous urban fabric, changeable anthropogenic heat/cooling/moisture, diverse vertical and horizontal exchanges of momentum, and complex human activities. Therefore, the complicated urban milieu is not amenable to many existing guidelines for site selection and instrument exposure. Therefore research design should consider specific principles and concepts unique to urban areas to ensure meaningful observations. This guideline avoids offering rigid rules due to considerable spatio-temporal variations in the environment. Instead, it guides researchers towards intelligent and flexible applications to match the complex and often unique realities of the specific study site.

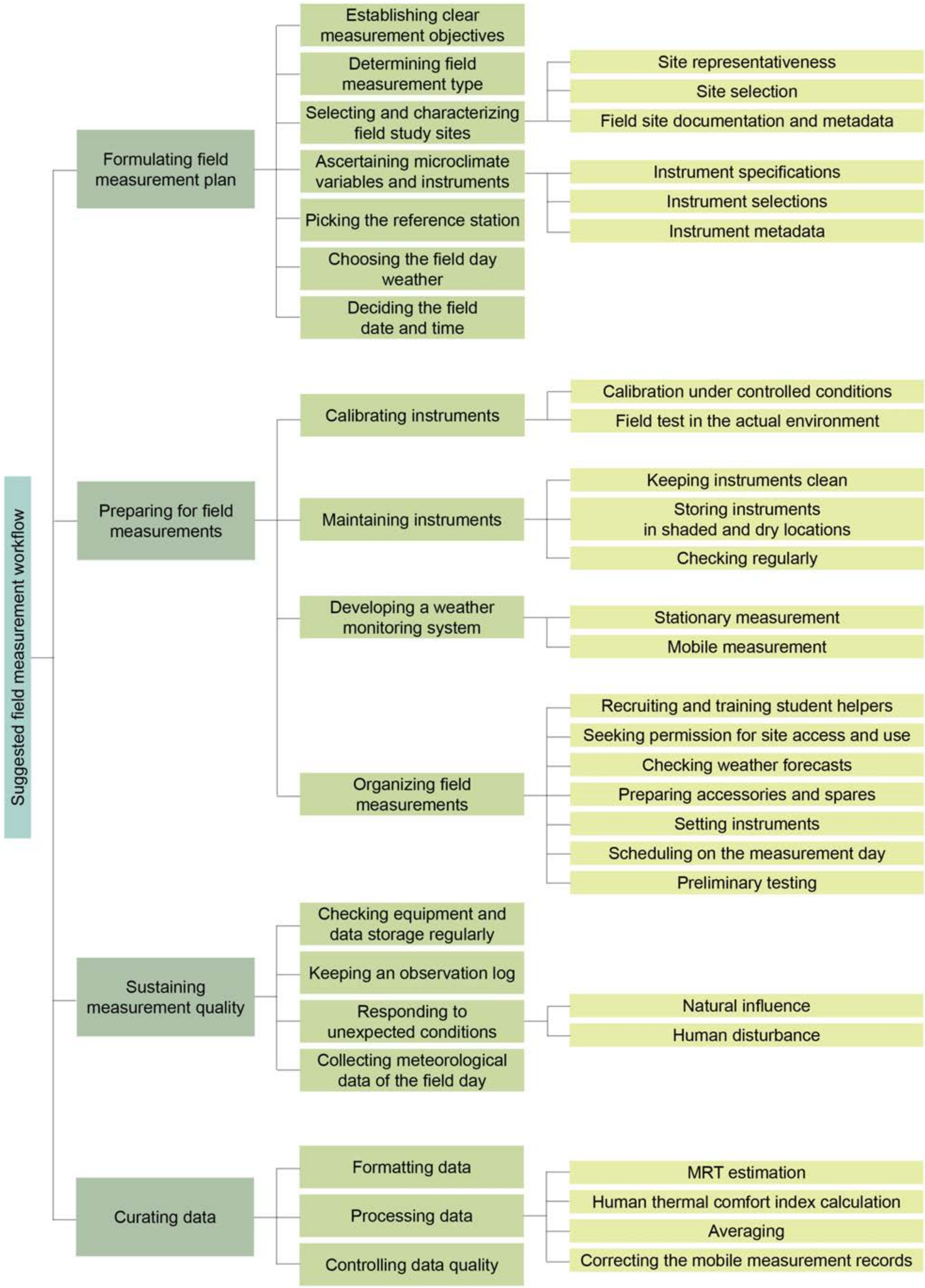

Figure 1. The suggested field measurement workflow and proposed steps.

Designing a systematic workflow and comprehensive information protocol

In conducting field measurements in urban areas, it is necessary to adopt a flexible approach and apply guiding principles rather than rules. This guideline provides researchers with a systematic and comprehensive field measurement workflow, providing a clear path to consider every detail in urban microclimate field measurements. It presents a holistic experimental workflow, including the pre- and post-processing. Relevant concepts and practices learned from existing guidelines and standards, experiences from actual field studies, and recommendations from professionals are distilled and incorporated into the document.

Emphasizing the need to keep complete metadata

According to the WMO (World Meteorological Organization), all information or data about observations, e.g., how, where, when and by whom the data were recorded, gathered, transmitted and managed, is called metadata. It is essential to keep a complete metadata record because any absent or missing parts could incur difficulties attributing any variations over time to changes in climate. The Global Climate Observing System (GCOS) Climate Monitoring Principle describes the significance of metadata as "(Metadata) should be documented and treated with the same care as the data themselves". However, almost none of the reviewed articles reported comprehensive metadata. Further, the significance of a complete report, i.e., incorporating the full metadata, has seldom been prescribed or stressed in previous field measurement studies. This pitfall has been duly emphasized in our guidelines. A comprehensive metadata checklist, including all necessary items, definitions, and examples, has been provided for reference. Complete metadata can ensure comparability among studies, enabling further meta-analysis.

Providing enriched materials for illustration and reference

Detailed hints, precautions, recommendations, examples, and checklists are provided in the guideline as a helpful and actionable package of research procedures. Examples of quantitative local meteorological descriptions, site aerial photographs and ground images (Fig. 2), self-developed weather monitoring systems (Fig. 3-4), etc., are provided for illustration and reference. With these enriched materials, researchers can obtain clear and direct prompts to design their studies.

Epilogue

This proposed guideline significantly contributes to refining systematic field measurement methods at the microscale in urban environments. Researchers are recommended to consult this guideline in planning the collection of urban microclimate field data.

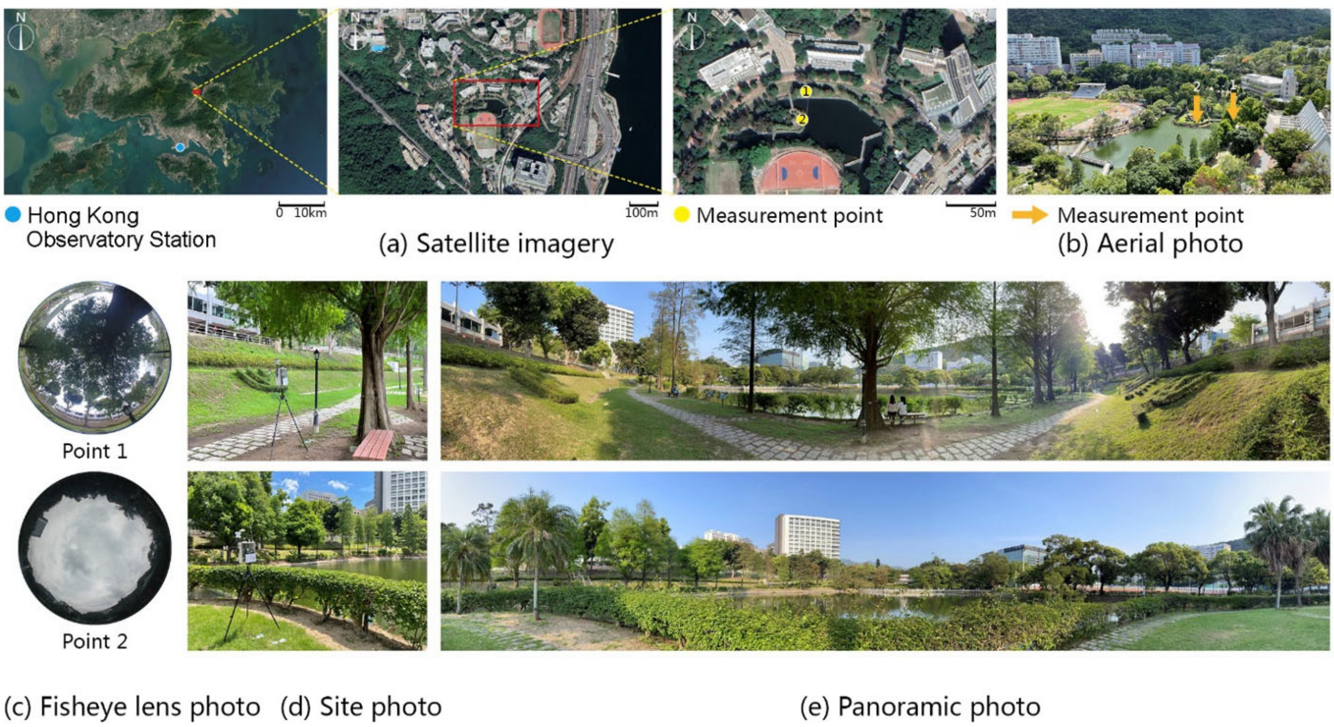

Figure 2. Examples of site aerial photographs and ground images in the guideline.

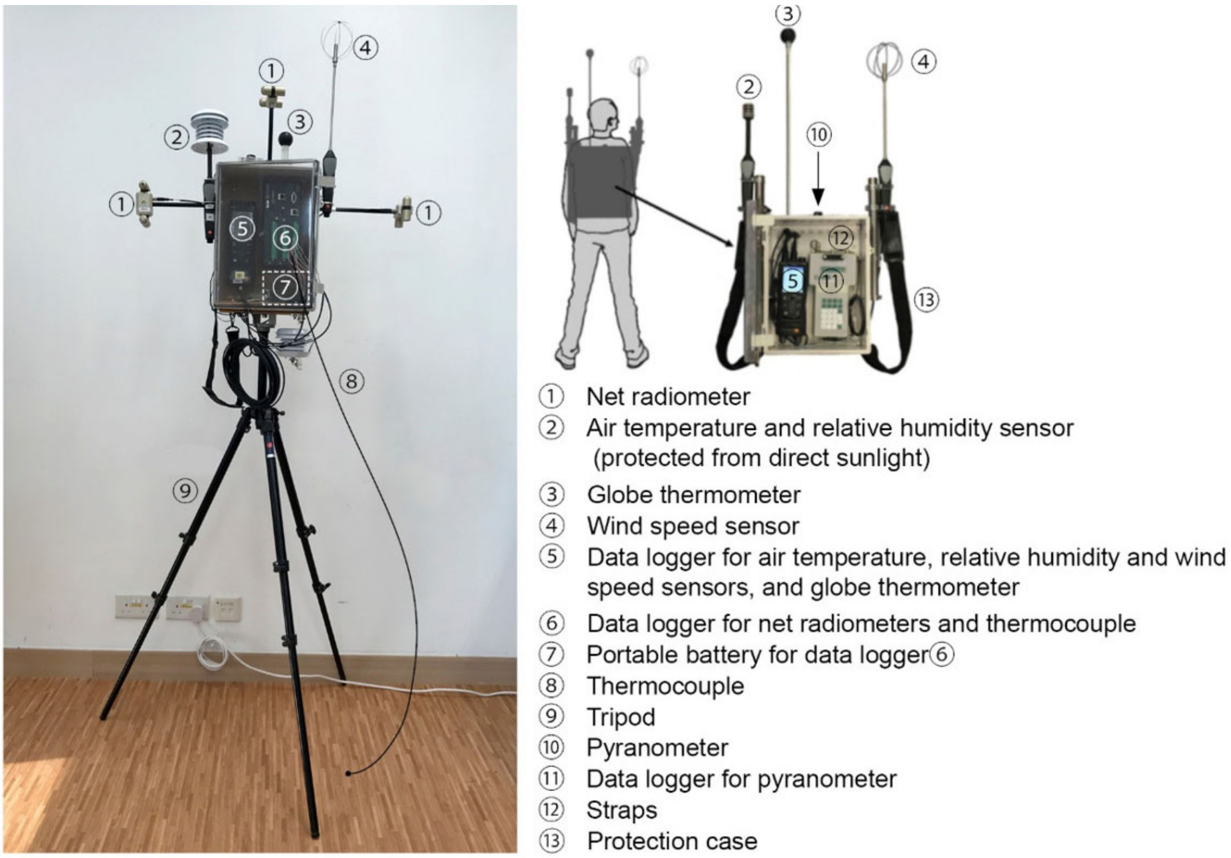

Figure 3. An example of the self-developed weather monitoring systems in the guideline.

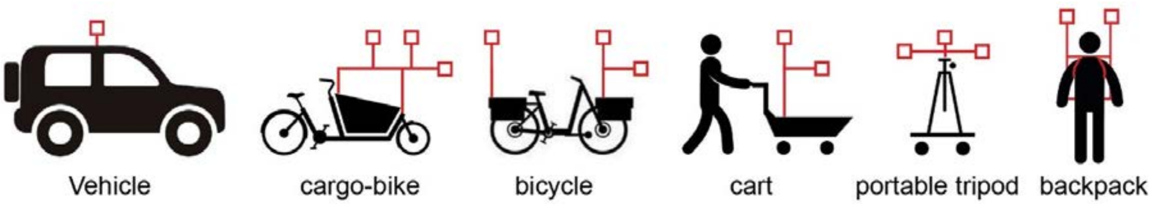

Figure 4. Various mobile measurement systems showed in the guideline.

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Urban Areas and Global Change sessions at the AGU Fall Meeting

By Lei Zhao (University of Illinois Urbana-Champaign)

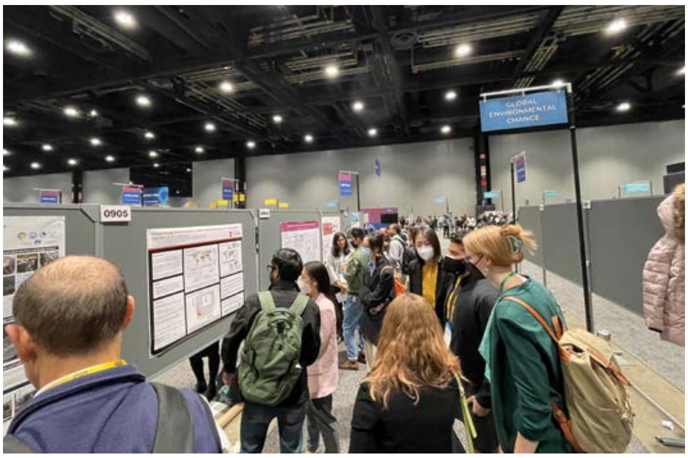
The 2022 American Geophysical Union (AGU) annual Fall Meeting was held in Chicago, IL, USA from December 12-16 in a successful hybrid format, with most attendees joining in person. Among the more than 1,900 scientific sessions was a series of sessions on Urban Areas and Global Change, convened by Prof. **Lei Zhao** (University of Illinois Urbana-Champaign), Dr. **Tirthankar Chakraborty** (Pacific Northwest National Laboratory), Prof. **Galina Churkina** (Technische Universität Berlin), and Prof. **Burak Güneralp** (Texas A&M University).

The Urban Areas and Global Change sessions invited submissions of new results based on observational, modeling, and/or data-driven studies of biogeochemical, biophysical, hydrological, or ecological interactions of human-land-atmosphere systems in urban areas; and of socio-institutional and technological components affecting the spatiotemporal patterns of carbon emissions. The sessions encouraged submissions from natural and social scientists, engineers, and modeling groups that incorporate urban processes in various models and from researchers who develop and deploy new measurement and scaling methods in complex urban environments. This year in AGU the Urban Areas and Global Change sessions had three oral sessions with a total of 20 talks and two poster sessions, one online and one in-person, with a total of 28 posters. The oral sessions were convened on Wednesday from morning to late afternoon in the middle of the conference week. Two invited talks were presented by Dr. **Yun Qian** (Pacific Northwest National Laboratory) on "Overview of Urbanization Impact on Regional Climate and Extreme Weather" and by Prof. **Alessandro Ossola** (University of California, Davis) on "Big data analytics for urban global change research".

Xuewei Wang presents the work of her team at AGU2022.

All of the sessions, oral and poster, were well attended, representing a highly interdisciplinary and inter-sector research community. Many members of IAUC have been among those presenting and attending at the Urban Areas and Global Change sessions at the AGU Fall Meeting.

The Urban Areas and Global Change sessions at the 2022 AGU Fall Meeting followed a multi-year series of similarly organized sessions over the past several years. The organizers indicated that they wish to continue this series at the 2023 AGU Fall Meeting, which will return to San Francisco in the newly renovated Moscone Center on December 11-15, 2023. They welcome the continued strong participation of the international urban climate community at the 2023 meeting.



AGU2022 delegates discuss poster presentations on topics including global environmental change.

The conference center in Chicago illuminates the surroundings after a light snow fall.

Recent Urban Climate Publications

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Upcoming Conferences...

EUROPEAN GEOPHYSICAL UNION (EGU) GENERAL ASSEMBLY: SESSION ON AIR-LAND INTERACTIONS (INCLUDING VEGETATED AND/OR URBAN SYSTEMS)
Vienna, Austria • April 23-28, 2023
https://meetingorganizer.copernicus.org/EGU23/session/46795
General Session, co-sponsored by ICOS and iLEAPS. Conveners: Natascha Kljun, Anne Klosterhalfen, Matthias Mauder, Christoph Thomas. Keynote speaker: Andreas Christen, University of Freiburg

JOINT URBAN REMOTE SENSING EVENT (JURSE)
Heraklion, Crete, Greece • May 17-19, 2023
http://jurse2023.org

ASIA OCEANIA GEOSCIENCES SOCIETY (AOGS) 20TH ANNUAL MEETING: SESSION ON "CITIES, EXTREME WEATHER, AND CLIMATE CHANGE"
Singapore • July 30 - August 4, 2023
https://www.asiaoceania.org/aogs2023/

Calls for Papers...

Special issue on "Remote Sensing of the Urban Environment: Beyond the Single City" in *Remote Sensing of Environment*
Submission Deadline: January 31, 2023 (Note to authors: Please email an abstract in advance of a full manuscript to the guest editors and EiC for preliminary evaluation)
https://www.journals.elsevier.com/remote-sensing-of-environment/forthcoming-special-issues/remote-sensing-of-the-urban-environment-beyond-the-single-city

Special issue on "Recent progress in atmospheric boundary layer turbulence and implications to surface-atmosphere exchange" in *JGR Atmospheres*
Open for Submissions: September 1, 2022
Submission Deadline: August 31, 2023
https://agupubs.onlinelibrary.wiley.com/hub/jgr/journal/21698996/features/call-for-papers

ELEVENTH INTERNATIONAL CONFERENCE ON URBAN CLIMATE (ICUC-11)
University of New South Wales (UNSW)
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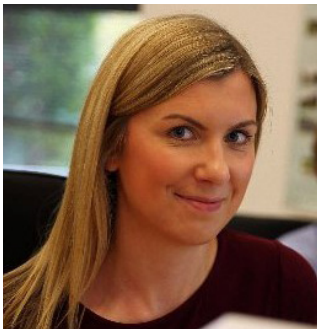
Welcome, new Board members



Victoria Ramsey
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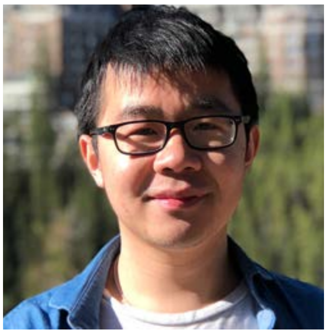

Dan Li
Boston University

Bucharest at dusk, October 2022

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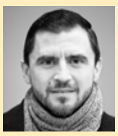

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The next edition of *Urban Climate News* will appear in late March. Contributions for the upcoming issue are welcome, and should be submitted by April 30, 2023 to the relevant editor.

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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