Report on the 10th International Conference on Urban Climate / 14th Symposium on the Urban Environment (ICUC10)

New York, USA 6-10 August 2018

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1. Introduction

The **10th International Conference on urban Climate / 14th Symposium on the Urban Environment (ICUC10)** was held at the City University of New York (CUNY), New York, USA (6-10 August 2018). It was hosted and co-organized by the NOAA CREST Institute of the CUNY, the International Association for Urban Climate (IAUC) and the American Meteorological Society (AMS) Board on the Urban Environment. ICUC10 was also supported by international organizations including the World Meteorological Organization (WMO).

WMO was represented on the conference by Dr. R.K. Kolli, C/WCAS (WMO representative on the Official opening of the Conference), Prof. A. Baklanov, SO/RES (member of ICUC10 Organising Committee and IAUC Board), Mr. S. Muchemi, SO/PWSD.

The Conference comprised a plenary session from 8:30 to 9:30 every day, and breakout sessions held simultaneously in five different halls. There was also a poster session set out at the coffee break space. About 500 presentations were made during the 5 days of the Conference. For more information on the Conference please click here.

This report summarises the aspects of the presentations attended by the representative of the WMO Public Weather Services Delivery (PWSD) Programme. The report therefore relates to service delivery, which is the last mile in the weather and climate value chain. The main motivation for the PWSD programme to participate in the Conference was to be familiar with the emerging topics in urban meteorology with regard to the role of the WMO Public Weather Services Delivery (PWSD) programme in implementing service delivery for improved decision-making by urban authorities and populations. The areas of interest were mainly:

1. information on emerging technologies and areas for application in the development of integrated urban service delivery platforms;
2. development of partnerships and effective user engagement; and
3. development of urban services and products.

2. WMO PWSD Presentation at the ICUC10: "The Role of WMO in Enhancing Urban Service Delivery" (Samuel Muchemi, WMO)

The WMO PWSD Presentation titled, "The Role of the World Meteorological Organization (WMO) in Enhancing Urban Service Delivery" was presented at the Conference Plenary Session, which made it one of the presentations to reach all the Conference participants. The presentation cast the role of WMO in assisting Members implement urban service delivery as a

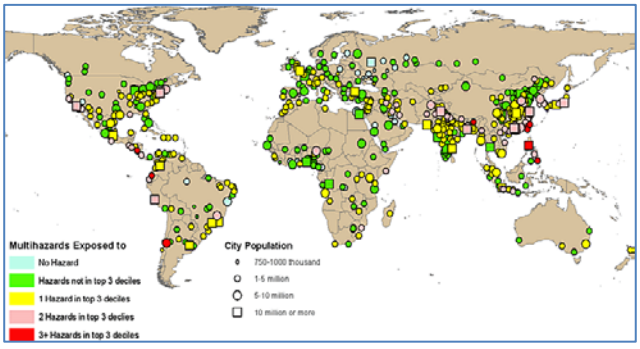

Figure 1: *Urban Agglomerations at Risk (United Nations, 2012)*

new area of focus and as an important segment of the wider service delivery role on National Meteorological and Hydrological Services (NMHSs). The presentation highlighted the urgency for NMHSs to develop their urban service delivery given the fact that the world population reached the 7 billion mark in 2011 and that it was estimated to rise to 9 billion by 2050, with 66% of the population living in urban areas. Hence the reason why WMO is addressing needs of the urban population, through its WMO Strategic Plan, as one of the key factors influencing WMO priorities and as agreed at the 17th Session of WMO Congress (Cg-17) (2015).

WMO actions contributing to advancement urban service delivery culture were highlighted and they included:

a. Urban service delivery research;
b. Gathering and sharing best practices;
c. Developing guidelines;
d. Developing platforms for provision of services;
e. Public Private Partnership (PPP);
f. Training and capacity development of Members' NMHSs and their stakeholder sectors;
g. The Global Multi-hazard Alert System (GMAS) as an authoritative source of warnings and information related to high-impact weather, water, ocean and climate events;
h. The Common Alerting Protocol (CAP)
i. Promoting Impact-based Forecast and Warning Services (IBFWS)

The video version of the presentation as recorded at the plenary session of the Conference can viewed by clicking here.

3. Takeaways from ICUC10 Applicable to WMO Urban Service Delivery Initiatives

The five breakout sessions of the Conference were centred on research and addressed research advancements and findings in the following areas:

a. Urban climate processes;
b. Climate change adaptation & mitigation in urban environments;
c. Urban planning and governance;
d. Numerical studies of urban environments;
e. New observational techniques to study urban climate;

While there was no session that addressed service delivery as a subject in terms of user engagement, development of products, service delivery channels etc, there were nonetheless presentations whose focus could benefit urban service delivery advancement immensely.

Below are the takeaways related to service delivery that were addressed at the Conference:

3.1 **Integrated Urban Weather, Environment and Climate Services (IUWECS): WMO Guidance and Best Practice Cities Examples (**C. S. B. Grimmond, Univ. of Reading, Reading, U.K.; and V. S. Bouchet, L. T. Molina, P. Joe, and **Alexander Baklanov)**

Dr Baklanov (WMO) described the importance of research in urban processes and development of service delivery as a cross-cutting WMO priority within WMO Strategy in the areas of: Integrated Urban Weather Water, Environment and Climate Services (IUWECS) including MHEWS; Integrated urban GHG information system (IG3IS); Climate Services; and Impact –based Forecast and Warning services (IBFWS).

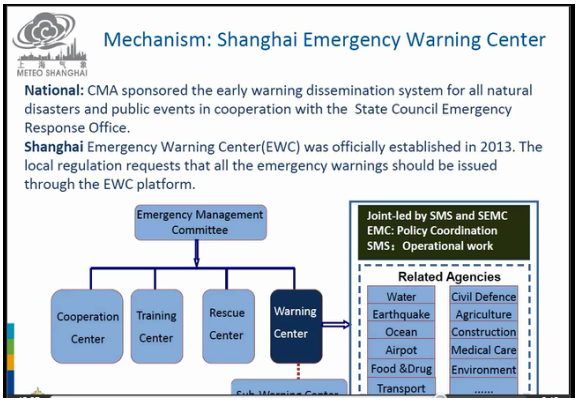

Figure 2: *Shanghai Emergency Warning Centre: example of an integrated urban service delivery platform*

He laid out questions relevant to the implementation of IUWECS which relate directly to operational service delivery, an excellent cross-cutting example of WMO programmes. The following were particularly relevant the PWSD Programme:

a. Development of integrated decision support systems;
b. communication and management of risk;
c. Targeted and customised delivery platforms; and
d. considering the impact of cities on weather and climate and factoring this to service delivery;

Other important areas in the implementation of IUWECS include:

a. enhancing and using observations of urban weather and climate;
b. modelling for urban scale environment;
c. impact of changing climate and role of NMHSs in providing support for adaptation strategies; and
d. considering major geophysical hazards and how they interact with meteorology.

The full video recording of the presentation may be viewed here.

3.2 **Beyond the Question, "Does Urbanization Affect Precipitation?": What's Next?** (Prof. J. Marshaell Shepherd, University of Georgia)

This presentation demonstrated the effect of urbanization leading to the modification of precipitation at the urban scale. It posed the question of application of this finding to city planning. It would be interesting to consider what role NMHSs could play in service delivery to city planners to enable them make decisions as to where to locate rainfall-sensitive facilities such as water supply reservoirs etc.

Description:

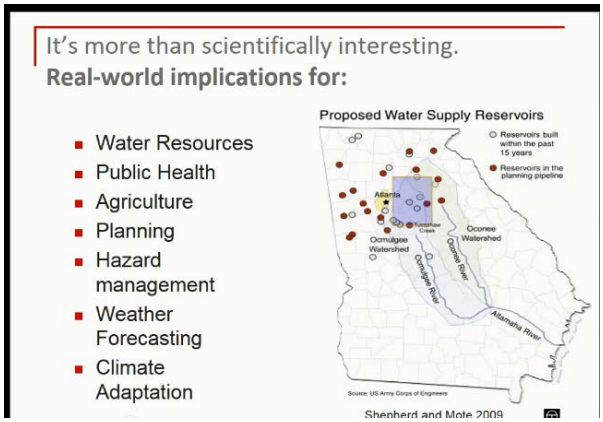

Figure 3: *Slide showing possible applications to the effect of urbanization on weather and climate – Prof. J. M. Shepherd*

Urban climatology is a broad area that spans various scales and processes. For many decades, researchers have applied a variety of methodologies to investigate whether urban environments can initiate, alter, or enhance precipitation. The underlying premise herein is that such questions have been answered by the literature. Not only do individual cities or urban climate archipelagos (clusters of cities acting as a system) interact with or force precipitating systems, there is fundamental understanding emerging of the physical processes associated with such interactions. After a brief review of the most compelling evidence of the "Urban Precipitation Effect" within the literature, the discussion pivoted toward the future of urban hydrometeorological studies. Key questions can now be formulated to study the relative roles of urbanization on large-scale weather systems, severe weather, frozen precipitation, landfalling hurricanes and land surface hydrology. Emerging research, associated challenges, and opportunities were discussed based on several ongoing projects at the University of Georgia and its partners.

The full video recording of the presentation may be viewed by clicking here.

3.3 Urban Climate Services at the German Meteorological Service - the Example of KLIMPRAX (Authors: Heike Noppel, DWD; Meinolf Kossmann; Saskia Buchholz)

This presentation, on KLIMPRAX which centred on 2 German cities, Wiesbaden and Mainz, demonstrated how NMHSs can start to prepare for: improved transfer of meteorological information into urban planning practices; improvement of the basis for balancing different concerns (e.g. human health); and improved integration of urban climate concerns into municipal processes. It gave a basis for partnership development between a meteorological service, municipal authorities and other stakeholders including the energy sector.

A planned guideline for climate adaptation in cities coming from this work will be important for PWSD to consider in advancing urban service delivery.

Description:

KLIMPRAX (Klima in der Praxis) stands for “climate in (municipal) practice” and is a project initiated and coordinated by the environmental agency of the German federal state of Hessen.

The aim of KLIMPRAX is to improve the consideration of urban climate - including adaptation to climate change - in the processes of municipal planning. This is achieved by analyzing the planning processes in the two cities.

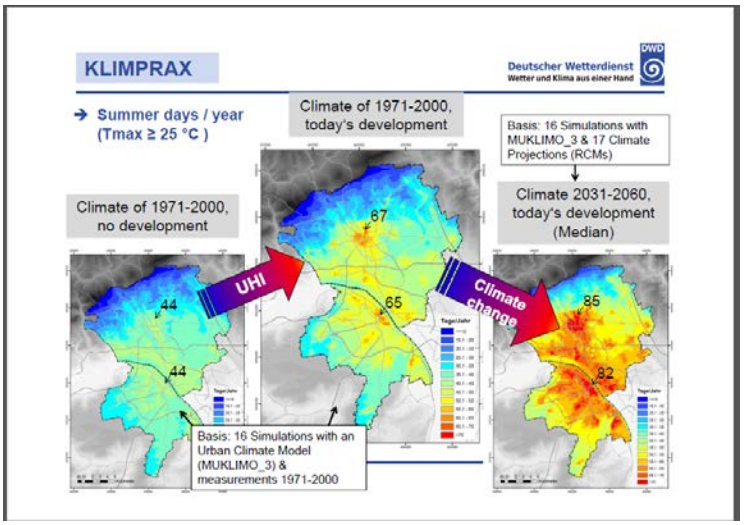

Figure 4: *UHI evolution in Wiesbaden and Mainz*

DWD provides meteorological information about the current and future urban climate in both cities with the focus on heat load. The microscale urban climate model MUKLIMO_3 and the so called “cuboid method” were used for downscaling from an ensemble of 17 regional climate projections to the urban scale. The results show that in densely built up areas the increase in the number of summer days (T_{max}≥25 °C), hot days (T_{max}≥30 °C), and so called tropical nights (T_{min}≥20 °C) due to urban development is comparable with the increase due to climate change from 1971-2000 to 2031-2060.

Other work packages deal with the improvement of the transfer of meteorological results into planning processes, the question of how local climate issues are taken into account within municipal processes, and the improvement of the basis for the balancing of reasons. The results will be incorporated into a guideline for climate adaptation in cities.

The full presentation may be accessed by clicking here.

3.4 **A Case Study of Interactions between Heatwave and Urban Heat Island in Beijing** (Dr. Shiguang Miao, Director, Institute of Urban Meteorology (IUM), China Meteorological Administration, in Beijing - dedicated to urban research and operational weather forecast for Beijing)

This Poster presentation of a case study of the interaction between a heatwave and Urban Heat Island over Beijing, China, demonstrates the social significance for issuing forecasts of Heat Index in summer. This is important to PWSD as we consider service delivery by NMHSs to urban populations.

Description:

A severe heat wave event occurred in Beijing during July 09 to 13, 2017. To investigate the interactions between heat wave and urban heat island intensity (I_{UHI}) during this heat wave event, observations from high density Automated Weather Stations (AWS), as well as analysis data from National Centers for Environmental Prediction (NCEP) were applied in the research. Results show that the heat wave event was arisen from dry adiabatic warming by katabatic winds. A high-pressure system governed Beijing area during the heat wave event and trapped the heat in the boundary layer. The situation was aggravated by the increased relative humidity in the later days, resulting in historically high records of heat-index. The diurnal cycle of I_{UHI} in Beijing apparently had two peaks in a day, with a strong peak in the nighttime and a weak peak in the daytime. The I_{UHI} was largely enhanced in the heat wave event compared to decadal average and reached up to 8.05 ℃ at 23:00 in July 10. The main result was that the daily maximum power load time series showed more agreement to heat-index time series than temperature time series, which indicates the social significance for forecasting the heat-index in summer. (*NB/Full presentation not available for this report*)

3.5 **Applying MUKLIMO_3 urban climate model in prediction mode –evaluation of UHI effect in Austrian cities for heat wave events (**Brigitta Hollósi and Maja Žuvela-Alois)

This presentation demonstrated the value of an improved prediction and forecast tool in reducing negative health impacts of extreme heat load in urban areas, through the application of early warning systems that use weather forecast models to predict forthcoming heat events. It demonstrates a good example for application in service delivery to urban populations.

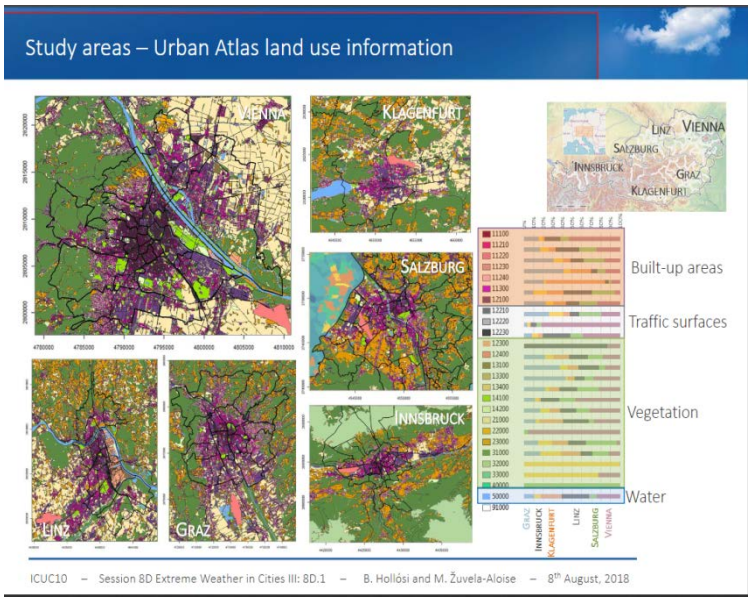

Figure 5: *The study area*

The value of the study may be summarized as:

WHY?: To address negative impacts on human health and wellbeing caused by extreme heat load as a significant threat to the environment and society;

WHAT?: Scientific basis for predicting hazards; and

FOR WHOM?: For operational weather forecasters, the public, rescue and civil protection organizations

Description:

In the state-of-the-art operational heat warning systems the meteorological information relies on the weather forecast from the regional numerical models and monitoring stations that do not include details of urban structure. In this study, the dynamical urban climate model MUKLIMO_3 of the German Weather Service is coupled with the hydrostatic ALARO numerical weather prediction model to simulate the development of the thermal environment on a daily basis. The aim is to evaluate the performance of the urban climate model, so far applied only for climatological studies, in weather prediction mode during the heat wave of 2015 as a test period. The method was applied for larger Austrian cities, including Vienna, Graz, Klagenfurt, Linz, Salzburg, as well as Innsbruck with more complex terrain.

The information obtained in this study can be used to support urban planning strategies and to improve existing practices to alert decision-makers and the public to impending dangers of excessive heat.

The video recording of the presentation may be accessed by clicking here.

4. Conclusion:

The attendance of a PWSD representative at the ICUC10 was beneficial because the representative was exposed to a wide range of emerging urban service related advancements in the areas of urban-scale weather and climate research, tools under development for application for the improvement of products and services for warning services to urban authorities, disaster management services, health, environmental services and energy. This experience will serve the PWSD Programme well in executing its role of assisting NMHSs develop their national urban service delivery platforms and services.