Osaka Metropolitan University

POZNAŃ UNIVERSITY OF LIFE SCIENCES

Online Bilateral Academic Seminar Program

Urban Climate Adaptation Across Buildings and Landscapes

Friday 27 November 2026

09:00-11:00 Poznań | 17:00-19:00 Osaka

Online via Zoom

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Passcode: **030941**

Department of Living Environment Design
Graduate School of Human Life and Ecology
Osaka Metropolitan University

and

Department of Landscape Architecture
Faculty of Agriculture Horticulture and Biotechnology
Poznań University of Life Sciences

Seminar Program

The seminar brings together researchers and students from Osaka and Poznań to exchange current work on urban climate adaptation, environmental design, sustainable cooling, landscape architecture, and related fields. Each speaker has 15 minutes for the presentation followed by 4 minutes for discussion.

Poznań time	Osaka time	Presenter	Presentation
09:00-09:04	17:00-17:04	Coordinators	**Welcome and opening remarks**
09:04-09:23	17:04-17:23	**Craig Farnham**	**1.** The Current State of the Art of Water Mist Sprays for Urban Cooling
09:23-09:42	17:23-17:42	**Xiong Xiao**	**2.** Drivers of urban heat island in Osaka: Morphology versus green-blue infrastructure
09:42-10:01	17:42-18:01	**Nagisa Kishimoto**	**3.** Signage Planning in Commercial Districts: Proposal for a Unified Design Framework for Storefronts
10:01-10:20	18:01-18:20	**Iwona Pińskwar**	**4.** Future extreme conditions and its impact on wildfires and heat waves in Poland
10:20-10:39	18:20-18:39	**Marta Golis**	**5.** Fourth nature in urban spaces: potential, challenges and perspectives
10:39-10:58	18:39-18:58	**Szymon Krawiec**	**6.** Greywater Treatment on Wetland Roofs for Reuse in Food Production on Green Walls: An Ongoing Doctoral Research Project
10:58-11:00	18:58-19:00	Coordinators	**Closing remarks**

Presentation format 15 minutes presentation and 4 minutes discussion

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PRESENTATION 1

The Current State of the Art of Water Mist Sprays for Urban Cooling

Craig Farnham

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Abstract

Evaporative cooling with water sprays and mists is an increasingly common method of urban cooling. It is inexpensive, easy to use, and easy to maintain. The use of mist in pedestrian spaces is becoming widespread in hot cities. It is often employed in spaces such as outdoor malls, parks, stadiums, and other outdoor gathering spaces that become uncomfortably or dangerously hot, where standard air conditioning would be impractical or expensive.

Air temperature is reduced by about 2-6 °C in most typical urban deployments depending on the local environment, with a proportional increase in humidity. Reception is strongly positive in most surveys of mist cooling use. Costs depend on the scale and the desired level of control, but running costs are quite low.

The evaporative cooling effect produced by water mist can be over 200 times higher than the electric power consumed by the water pumps to create it. Furthermore, as air temperatures rise in urban heat islands, and relative humidity can decrease (the Urban Dry Island effect), the cooling potential of evaporation tends to increase. Evaporation cooling is perhaps unique in that it can be more efficient and more effective as the urban heat island effect worsens.

The benefits, costs and limitations of water sprays and mists for cooling outdoor urban spaces in various worldwide climates are explained. Multiple examples of successful installations worldwide climates are summarized, as well as concerns that must be addressed during planning and operations for safe and effective use of these systems.

Keywords *Urban heat island, evaporation, cooling, thermal comfort, mist, low energy*

Biography

I am a Professor in the Dept. of Living Environment Engineering in the School of Human Life and Ecology at Osaka Metropolitan University. My research is mainly in detailed evaluation of the physics and physiology of evaporation cooling with mist for living spaces to increase thermal comfort and as a heat stroke countermeasure. Recently, I've also done corporate research on mist cooling for greenhouses and food storage. I teach courses on building facilities, living environment experimental methods, and simulations of buildings, energy use, and CFD. My primary goal is saving energy.

PRESENTATION 2

Drivers of urban heat island in Osaka: Morphology versus green-blue infrastructure

Xiong Xiao
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Abstract

Urban heat mitigation requires evidence on how urban form and green-blue infrastructure relate to surface thermal conditions. This presentation reports a published study of ward-level relationships between satellite-derived land surface temperature (LST), urban morphology, and land-cover indices in Osaka Prefecture, Japan. Landsat observations from winter (2–3 January) and summer (30–31 August) 2025 were processed using R-based geospatial analysis. The indicators comprised building cover ratio, mean building height, sky view factor, the Normalized Difference Vegetation Index (NDVI), the Normalized Difference Water Index (NDWI), and the Normalized Difference Built-up Index (NDBI).

Pearson correlations showed positive summer associations between LST and building cover ratio ($r = 0.466$) and NDBI ($r = 0.722$), and negative associations with sky view factor ($r = -0.404$), NDVI ($r = -0.337$), and NDWI ($r = -0.722$). Winter associations were stronger for NDBI ($r = 0.932$), NDVI ($r = -0.760$), and NDWI ($r = -0.932$). Spectral indices exhibited stronger ward-level associations with LST than the morphology indicators examined, particularly in winter.

The findings inform locally targeted green-blue infrastructure and surface-material strategies within broader research on urban heat mitigation and building energy performance. Interpretation remains exploratory: spatial autocorrelation was not modeled, correlations do not establish causation, and satellite LST is distinct from near-surface air temperature. Building energy savings were not directly evaluated in this study.

Keywords *Urban heat island; land surface temperature; urban morphology; green-blue infrastructure; remote sensing; Osaka*

Biography

I am a PhD candidate in the Department of Living Environment Design, Graduate School of Human Life and Ecology, Osaka Metropolitan University, Japan. My doctoral thesis is titled “Research on design methods aimed at reducing the urban heat island effect and improving the energy performance of buildings.” My research examines urban morphology, green-blue infrastructure, and urban thermal environments, with the aim of informing design methods for heat mitigation and building energy performance.

PRESENTATION 3

Signage Planning in Commercial Districts: Proposal for a Unified Design Framework for Storefronts

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Abstract

This study focuses on revitalizing a traditional shopping street in Kyoto, Japan, through improved sign design. As many such streets face decline due to competition from large shopping malls and e-commerce, effective store signs can attract pedestrians and help sustaining community life. The research targeted a 400-meter-long shopping street with about 30 stores, aiming to create signs that both represent each store's unique offerings and contribute to a cohesive visual identity. Fieldwork was conducted to identify the characteristics of each store and test different sign designs. Three sign size variations were created, and visual clarity was assessed under real-world conditions. We also conducted a survey of store managers to gather feedback on the design, desired features, and store categories, and made revisions based on their requests. Stores were grouped into four categories - food service, groceries, retail, and services - with each assigned a distinct color. Colors were selected from traditional Japanese palettes and carefully tested using the Color Simulator app to ensure visibility and differentiation across various types of color vision. The final color choices were tsutsuji (azalea) for food service, kōji (citrus) for groceries, turquoise green for retail, and kikyo (bellflower) for services. According to Space Syntax, a method of spatial structure analysis, reducing the structural "depth" from the street to the storefront makes it possible to more effectively guide customers into the store. Looking ahead, we plan to examine the effectiveness of these store signs in attracting pedestrians from the perspective of "depth" in Space Syntax.

Keywords *shop sign, color coding, shopping street revitalization, Space Syntax*

Biography

I am Nagisa Kishimoto, and I am a first-year doctoral student in the Graduate School of Human Life and Ecology at Osaka Metropolitan University. I specialize in design and ergonomics. I am conducting research on the relationship between visual design and the surrounding spatial design using spatial structure analysis.

PRESENTATION 4

Future extreme conditions and its impact on wildfires and heat waves in Poland

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Abstract

The rise in temperature contributes to a higher incidence of wildfires and more severe heat waves. Wildfire conditions in Poland were changed from the past to now and the fire frequency will increase according to an ensemble climate model projections (CMIP6). Conditions influencing wildfire hazard have changed since the 1970s and may intensify in the near and far future. Future wildfire risk linked with maximum temperature may rise with the current 99th percentile (32°C) to future threshold of 99th percentile by 2.5 to 5.3-fold over the next 30 years and 10.4 to 14.5-fold over the far future threshold of 99th percentile of 2061 to 2090 depending on the climate change scenarios.

Especially important for mortality among society is the number of years with occurrence of very high anomaly, i.e. when the yearly maximum of 7-day moving average maximum temperature will be higher more than 10°C above the average from the reference period (1971-2000) or the yearly maximum of 14-day moving average maximum temperature will be higher more than 8°C above the average. Meanwhile for the near future projections showed from 6 to nearly 8 such events for both indices during 30 years, i.e. nearly every five or even four years. Similar for far future and both indices these conditions are also projected under SSP1-2.6, but under the both higher SSPs (3-7.0 and 5-8.5) such heat waves may occur from 18 to 22, what means that only few years may not experience a dangerous heat waves.

Keywords *wildfires, heat waves, CMIP6, future extreme meteorological conditions, maximum temperature*

Biography

Iwona Pińskwar has a PhD in agricultural sciences (management of the natural environment; thesis title: "Projections of changes in precipitation extremes in Poland"). She is interested in past and future climate extremes based on climate model projections and its impact on society and environment.

PRESENTATION 5

Fourth nature in urban spaces: potential, challenges and perspectives

Marta Golis
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Abstract

Fourth nature refers to plants that grow spontaneously in urban areas, such as abandoned sites, former industrial areas and railway surroundings. These spaces can support biodiversity and may play a useful role in urban green infrastructure and climate adaptation.

This presentation will discuss the potential of fourth nature in cities, using selected examples from Poznań, Poland. It will focus on its possible role in urban landscapes, particularly in relation to landscape architecture and maintenance.

The presentation will be based on existing literature and selected examples of fourth nature in Poznań. Its aim is to introduce the topic, highlight possible benefits and challenges, and discuss how spontaneously growing vegetation could be considered in future urban planning and design.

Keywords *Fourth nature, spontaneous vegetation, green infrastructure, climate adaptation*

Biography

I am affiliated with Poznań University of Life Sciences. I previously worked at the Provincial Office for the Protection of Monuments and the Roads and Greenery Authority. My academic interests are related to the natural environment, urban landscapes and the relationship between nature and human activities. I am interested in learning more about environmental processes and different approaches to landscape development. I am particularly interested in how natural elements are perceived and considered in contemporary urban spaces.

PRESENTATION 6

Greywater Treatment on Wetland Roofs for Reuse in Food Production on Green Walls: An Ongoing Doctoral Research Project

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Abstract

This ongoing research investigates a building-integrated greywater reuse system combining wetland roofs with vertical edible gardens in a temperate climate. The project explores how integrating water treatment and urban cultivation within buildings can support resource-efficient design and urban climate adaptation.

The main objective is to develop and evaluate a system in which greywater is treated using selected substrates and wetland plants before being reused to irrigate edible crops. The research examines the influence of substrate composition and plant selection on treatment efficiency, alongside contaminant accumulation in edible plant tissues and the quality of harvested produce.

The methodology combines a systematic literature review with a field experiment established at the Marcelin Nature Education Centre of Poznań University of Life Sciences, Poland. The review addresses greywater characteristics, filtration substrates, wetland vegetation, and operational challenges in temperate conditions. The experimental framework compares substrate-based and planted treatment configurations linked to vertical cultivation of lettuce, onion, and strawberry. Monitoring includes substrate properties, physicochemical and microbiological water quality, nutrient and contaminant concentrations, and indicators of plant growth and produce quality.

The expected outcome is a framework for designing and assessing building-scale greywater reuse systems that connect wetland roofs with vertical edible gardens. The study considers their potential to reduce freshwater demand and create multifunctional green infrastructure in densely built urban environments, while treating seasonal performance and food safety as essential requirements to be experimentally verified.

Keywords *Greywater reuse; wetland roofs; vertical edible gardens; urban climate adaptation; temperate climate; food safety.*

Biography

Szymon Krawiec is an architect, landscape architect, and doctoral researcher at Poznań University of Life Sciences, Poland. He holds degrees from universities in Poland and China. His research focuses on building-integrated greywater treatment and reuse through wetland roofs and vertical edible gardens in temperate climates. His current project examines how filtration substrates and plant selection influence water treatment performance, alongside contaminant accumulation and produce quality in edible crops irrigated with treated greywater.