



Implementing Urban Climatology in the 'Real World' - Theory and Practice

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The overall goal of this lecture is to provide insights on how knowledge of urban climate can be applied in practice to inform the design in real-world projects, with the aim of achieving specific objectives such as energy conservation in buildings or pedestrian thermal comfort.

Modern architecture and urban planning is carried out by teams of professionals from diverse fields, in a process that is typically driven by economic forces in response to market demand for housing, retail space and other uses. Generally, the input regarding climate will be sought in response to proposals generated by the architect. To be effective, this input must recognize the other issues that the planners must resolve in the preparation of a town plan or an architectural design. In addition, multiple and sometimes contrasting information has to be reconciled.

The lecture will discuss the following issues:

- impediments to transfer of theoretical knowledge of urban climate from consultants to other members of the design team
- defining objectives for micro-climatic design
- scales of intervention in space and time
- description and analysis of strategies and tools available to planners

In addition, the talk will present case studies to illustrate the necessity for a comprehensive approach. The studies focus on the effects of vegetation, of high-albedo surfaces and of urban density on both pedestrian thermal comfort and on heating and cooling buildings. Although they were carried out in arid and Mediterranean locations, the findings are relevant, in principle, to other regions. The research, which combines modeling and field monitoring, demonstrates that careful study may often yield counter-intuitive findings, suggesting 'conventional' solutions may not always be best suited to the particular design problem at hand.

References

- Erell E. and Williamson T. (2006) "Simulating air temperature in an urban street canyon in all weather conditions using measured data at a reference meteorological station", *International Journal of Climatology*, 26(12):1671-1694. DOI: 10.1002/joc.1328
- Erell E. (2008) "The application of urban climate research in the design of cities", *Advances in Building Energy Research*, 2:95-121. DOI: 10.3763/aber.2008.0204
- Erell E., Pearlmutter D. and Williamson T. (2010) Urban climate: Designing Spaces Between Buildings. Earthscan/James & James Science Publishers, London, 266p.
- (See especially Chapters 7-11, and case studies in Chapters 12-13)
- Erell E., Eliasson E., Grimmond S., Offerle B. and Williamson T. (2010) "The effect of stability on estimated variations of advected moisture in the Canyon Air Temperature (CAT) model". The 9th AMS Symposium on the Urban Environment, Keystone, Co., Aug. 2-6 2010.
- Erell E., Pearlmutter D., Boneh D. and Bar-Kutiel, P. (2013) "Effect of high-albedo materials on pedestrian thermal sensation in urban street canyons in hot climates". Proceedings of the 29th PLEA International Conference – Sustainable Architecture for a Renewable Future, Munich, Germany, Sept. 10-12 2013.
- Kalman Y., Pearlmutter D. and Erell E. (2013). "Impact of increasing the height of Tel Aviv buildings on pedestrian comfort and building energy efficiency". Proceedings of the 29th PLEA International Conference – Sustainable Architecture for a Renewable Future, Munich, Germany, Sept. 10-12 2013.
- Mills G., Cleugh H., Emmanuel R., Endlicher W., Erell E., McGranahan G., Ng E., Nickson A., Rosenthal J. and Steemer K. (2010) "Climate Information for Improved Planning and Management of Mega Cities (needs perspective)". *Procedia Environmental Sciences*, 1:228-246.
- DOI: <http://dx.doi.org/10.1016/j.proenv.2010.09.015>
- Shashua-Bar L., Pearlmutter D. and Erell E. (2009). "The cooling efficiency of urban landscape strategies in a hot dry climate". *Landscape and Urban Planning*, 92(3-4):179-186. DOI: <http://dx.doi.org/10.1016/j.landurbplan.2009.04.005>
- Shashua-Bar L., Pearlmutter D. and Erell E. (2011). "The influence of trees and grass on outdoor thermal comfort in a hot-arid environment". *International Journal of Climatology*, 31(10): 1498–1506. DOI: 10.1002/joc.2177
- Snir K., Pearlmutter D. and Erell E. (2013). "The moderating effects of desert ground cover plants on pedestrian thermal sensation". Proceedings of the 29th PLEA International Conference – Sustainable Architecture for a Renewable Future, Munich, Germany, Sept. 10-12 2013.
- Williamson T. and Erell E. (2008). "The Implications for Building Ventilation of the Spatial and Temporal Variability of Air Temperature in the Urban Canopy Layer". *International Journal of Ventilation*, 7(1):23-35. DOI: 10.5555/ijov.2008.7.1.23