

# Measuring the Urban Heat Island Intensity: Challenges with “Urban-Rural” Differentiation and the East Asian City

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Urban climatologists have observed and documented the urban heat island (UHI) effect in hundreds of cities worldwide. These observations comprise an extensive literature that aims to measure UHI “intensity” across diverse and complex settings. UHI intensity is traditionally defined as a simultaneous “urban-rural” air temperature difference at standard screen-level height, with “rural” understood as the open countryside and “urban” as the built-up environment of the city. This definition is seemingly intuitive and simple, yet its operational use in urban climate literature is confusing and inconsistent. This confusion is attributed to two factors. First, the literature is ambiguous in differentiating “urban” and “rural” landscapes that define UHI intensity in cities around the world. “Urban-rural” differentiation is especially challenging in East Asian cities, whose “rural” peripheries are distinguished by high population densities and intensive land-use mixtures. Second, the literature is incomplete in its reporting of “urban” and “rural” site characteristics—notably surface cover and site exposure—that strongly influence UHI intensity. Failure to report such critical metadata in turn provokes unsubstantiated inter-city comparisons of heat island intensity. These arguments, which are supported by evidence from a literature synthesis of nearly two hundred empirical UHI studies worldwide, and from recent visitations to UHI field sites in Europe, North America, and East Asia, call for a re-definition of UHI intensity. An alternative to “urban-rural” differentiation is proposed in the form of a multidimensional site-classification scheme. The scheme is based not on subjective assessments of UHI measurement sites as “urban” or “rural,” but instead on objective standardization of sites by climatologically relevant surface parameters.