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**Title: Re-Framing Urban Ecology: Towards a Science of Cities as Hybrid Ecosystems**

A theory of cities as coupled human natural systems has yet to be developed and tested. The rapid progress made over the last two decades in studying the interactions between human and ecological systems has significantly expanded our knowledge on the changes that the “great acceleration” of human activities has placed on ecosystem functions. The advancement of urban ecology has provided significant insights on the mechanisms linking urban development to ecosystem services. Yet it has failed to explain how cities as novel ecosystems emerge and evolve. Urban ecology lacks a theory of the human habitat comparable to the study of habitats of other species. Most empirical research is still grounded in a paradigm that disregards the fundamental fact that cities are designed and built to best support human functions and wellbeing. A science of cities requires a framework that incorporates human functions and wellbeing as key drivers of the alternative ecosystem state and behaviors that control ecosystem dynamic in urbanizing regions.

This paper provides a synthesis of the emerging evidence and anomalies that challenge the current scientific paradigm applied in urban ecology and frames the basis for a theory of cities as hybrid ecosystems. Integrating humans in ecosystem science implies reframing not only the agents and mechanisms governing their dynamics. It requires to redefine system boundaries, scales, and reference conditions. To develop and test a theory of urban ecology, we need to redefine methods and experiments as well as rewrite the protocols for collecting and synthesize data. Several methodological challenges have become evident in the study of urban ecosystems: the complex dynamics and multiple confounders in determining causal effects, the difficulty to generalize across regions and across scales, the scale mismatches across human and ecological system domains, the lack of predictability and uncertainty, and the problem of quantification of human wellbeing. We also need to move beyond idiosyncratic studies towards integrated, cross-regional comparisons. Building on examples linking human wellbeing to ecosystem function in urbanizing regions, I develop testable hypotheses and a lay out a research plan for testing such hypotheses.