Rethinking Environmental Justice in Sustainable Cities: Insights from Agent-Based Modeling

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Book Review

Rethinking Environmental Justice in Sustainable Cities: Insights from Agent-Based Modeling. New York: Routledge. 228 pages. ISBN 9780415657440, £90.00 hardback. Heather E. Campbell, Yushim Kim, and Adam Eckerd, eds., 2015.

Many of the phenomena studied by public administration and policy researchers emerge as a result of complex interactions between various factors over time. That is, these phenomena are systemic and display properties of complex systems. As a consequence, they cannot be explained in a simple way by inquiring into the net effect of a variable on some outcome of interest. Instead, it requires researchers to use frameworks, theories, and methods that heed the complexity.

This is what Heather Campbell, Yushim Kim, and Adam Eckerd do in their book Rethinking Environmental Justice in Sustainable Cities: Insights from Agent-Based Modeling. The authors study the phenomenon of environmental justice (EJ) in urban areas by applying agent-based modeling (ABM). Their aim is to use ABM for analyzing EJ as a systemic and emergent outcome, so as to better understand environmental justice and offer insights to public administrators and policy makers for combatting the problem of environmental injustice more effectively. In doing so, the authors intend to illustrate the value of ABM for urban policy and planning.

The book commences with a review of the standing EJ literature. As the authors explain, environmental justice is about the equal distribution of environmental quality among residents in a certain urban area. Injustice occurs when the distribution favors certain resident groups to the detriment of others. Campbell and colleagues argue that the EJ literature finds itself in a theoretical impasse of little help to policy makers and urban planners. Although the conventionally applied statistical methods have helped to identify and establish the problem of environmental injustice, practical progress in actually reducing the problem is slow or absent. An important reason for this current state of affairs is that most of the standing EJ literature uses theories and statistical methods that ignore the complexity of the urban system in which injustice can manifest itself. Such studies

find that minority races or poorer people receive more harmful environmental effects than white majorities and higher income households. This leads to arguments, e.g., that firms locate their polluting facilities based on racist considerations. However, as the authors argue, although the fact that race or income co-varies with environmental quality in certain urban areas can be established with conventional statistical methods, it is rather farfetched to consequently claim that environmental injustice is explained by firms exhibiting racist behavior. To understand why minority and poorer resident groups enjoy less environmental quality than others, the actual decision-making behavior of the agents within the urban systems—the firms, residents, and policy makers and planners—and the ways in which their decisions interact with each other and the changing environment, need to be understood.

In Chapters 3–7, the authors explain what ABM is and how it works, and show different applications of ABM to study different conjectures held in EJ or related theories. Basically, ABM is a simulation approach based on agents that are in pursuit of their own agenda, and that are located in a socio-physical environment which restricts the decision-making options the agents have. By tracking the interactions between the agents and with their environment over time, researchers can study the patterns and outcomes (in this case, environmental justice) that emerge. Campbell and colleagues start with a simple model, and gradually increase the complexity of the model in the later chapters by adding theoretical assumptions about the agents' behaviors. Each of the chapters focuses on testing a different (set of) theoretical assumption(s). For instance, besides residents' race and income, they investigate what happens when firms make siting choices for polluting facilities based on economic, political, or racist motives, and what happens if these motives interact with residents' preferences to live in neighborhoods with less or more people of the same race (Chapter 4). Another example is Chapter 5, which investigates how the choices of residents to want to live in areas that have low house prices, have high environmental quality, or are close to their job location, affect environmental equality when these choices interact with firms' choices to site new facilities in either low-priced plots, away from majority groups, or close to minorities.

By modeling the interactions between the considerations of firms to site facilities in a certain location and the considerations of residents in choosing a particular residential location, the authors explain the complex decision-making dynamics in urban systems that lead to a certain level of environmental (in)equality. Moreover, the authors investigate what happens to the distribution of environmental quality in the urban system when agents alter the motives or preferences on which the siting or residency choices they make are based. The results show that the problem of environmental injustice indeed cannot be simply explained by pointing to race, income, or even racism as causes of injustice. Agents' choices in systems interact in complex ways, simultaneously affecting and being affected by the environmental quality in the urban system, leading to a certain level of environmental justice over time. Some of the more concrete findings are, inter alia, that injustice is less severe in diverse communities and that it is less severe when the minority group is larger. The results also show that environmental injustice is asymmetric: both poorer and also

often richer people enjoy less environmental quality than the middle class. More detailed findings about the effects of specific interactions between agents' motives and preferences are presented in the different book chapters.

From a policy-making and urban planning perspective, Chapters 8 and 9 are of particular interest. These two chapters model what happens when governments apply local zoning policies to protect urban areas from pollution (Chapter 8) or when governments decide to remediate polluted sites (Chapter 9). Chapter 8 shows, inter alia, that it is better to have a zoning policy than no zoning policy, and Chapter 9 finds that cleaning up polluted sites benefits all residents in the urban system, irrespective of income or race. These are hopeful results, and it would be worthwhile further testing these findings with empirical research.

Before I started reading the book, I was somewhat skeptical about the ability of ABM to study complex systems meaningfully. My main doubt was that agent-based modelers do not use real, empirical data to study their phenomenon of interest. Having read the book, I am now less concerned. One reason is that in Chapter 10 it is shown, by means of a case study on citizen responses to the planning of a large infrastructure project near Los Angeles, how ABM can be combined with empirical data about a specific local context. Further, Campbell, Kim, and Eckerd have been able to firmly ground their models' assumptions on existing research (with a focus on the United States) and clearly and convincingly explain and illustrate the value of ABM to model complex behavior that is otherwise difficult to study and understand using more simplistic methods. The book shows that ABM can generate interesting insights for public administrators and policy makers beyond what is possible with methods that do not heed to the complexity of urban systems.