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## Book review

R.M. Leichenko, K.L. O'Brien, *Environmental Change and Globalization: Double Exposures*<sup>\*</sup>, Oxford University Press, New York (2008), 192 pp., Price: US\$ 74.00, ISBN: 978-0-19-517732-9

While environmental change and globalization have long histories, their capacity to affect markets, governments, and landscapes today is unprecedented. Environmental and economic processes overlap, yet scholars have struggled to develop tools to analyze these interacting layers of global change. In *Double Exposures*, geographers Robin M. Leichenko and Karen L. O'Brien present a framework within which to comprehend the speed, scale, and extent of both environmental change and globalization. The authors apply this framework to three case studies in order to demonstrate its ability to reveal the processes, contexts, and outcomes of global change. Beyond establishing a new conceptual instrument, the authors hope *Double Exposures* "elicit[s] new insights and research questions beyond those associated with separate framings and discourses" (p. 33).

Leichenko and O'Brien regard the historical trajectories of research in globalization and global environmental as growing ever more entrenched in disciplinary traditions. In their opinion, social scientists and natural scientists have offered multiple perspectives on the individual strands of global change, but have not weaved these together to understand the interplay between them. Scholars have characterized globalization as benign, malignant, or transformative depending on its perceived benefits or consequences, while global environmental changes have been interpreted in terms of biophysical phenomena, reflective of the overall human–environment relationship, or as issues of justice and equity. Consequently, Leichenko and O'Brien contend that although social and natural scientists have developed frameworks to measure vulnerability, resilience, and sustainability, these analyses do not allow for integrated approaches to global environmental and economic change.

In light of this contention, the authors introduce their own conceptual framework, carefully defining its components—feedbacks, exposure units, contexts, responses, and outcomes—as they offer terminology suited to describing the dual nature of global change. *Feedbacks* are characterized as collective sets of activities that continually produce large-

scale transformations. These are manifest as shocks to natural and social systems, including hurricanes and market crashes. *Exposure units* "may be individuals, households, social groups, administrative units, communities, ecosystems, or species" (p.35). The presence of this component allows users to witness the variance in exposure across the array of exposure units. *Contexts* are understood as an integrated set of conditions that can dampen or amplify the degree of exposure to some variable of global change. The contextual environment, in the authors' view, is populated by social, economic, biophysical, technological, institutional, political, and cultural elements. These contexts contribute to the type of *response* a unit takes, whether that is a decision, policy, or behavior targeted toward adapting to or mitigating stressors and shocks. The authors define *outcomes* as measurable and observable effects of global change processes that are negotiated in accordance with the contextual environment.

Leichenko and O'Brien assert that this framework brings into focus several questions typically left unanswered by other process-, impacts-, or vulnerability-based frameworks (for example, IMAGE and IPCC). The authors identify who benefits from global change, who does not, and why the distribution of outcomes falls more heavily in some places than others. In addition, they maintain attention on the interplay between globalization and environmental change, asking how these individual processes influence one another and what opportunities or obstacles they create. This approach highlights issues of vulnerability, equity, and justice, while avoiding a one-sided view of global change as though it were inherently positive or negative.

To illuminate these questions and the power of the framework, the authors provide three case studies. Each of the case studies corresponds roughly with what the authors call a *pathway* of double exposure. Leichenko and O'Brien examine rural livelihoods under pressure from trade liberalization and climate change in agricultural India. Here, the authors home in on uneven outcomes related to global change, relying on remote sensing imagery to visually represent disparities in response capacity between two neighboring Indian communities. They then shift their gaze toward the urban environment of New Orleans as a lesson in how changing contextual environments can yield exacerbated vulnerabilities. The aftermath of hurricane Katrina is dis-

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sected geographically and socially to inspect why certain populations were more sensitive to natural disasters than others. Finally, the authors travel to the Arctic region to interrogate how feedback loops can regulate the intensity of globalization and environmental change processes. Based on the *pathway* through which double exposure occurs, the Indian case study is labeled as *outcome double exposure*, the New Orleans example as *context double exposure*, and the Arctic model as *feedback double exposure*.

Through its approach and its content, *Double Exposures* makes a substantial contribution to scholarship. The authors' review of the discourses of global change is helpful in reorganizing the complexity of exposures resulting from global environmental change and globalization processes. It also makes evident the tight bonds between discourse and academic research. By uncovering these bonds, the authors show how the technique of discourse analysis can reveal the major theories and theorists involved in global change scholarship as well as highlighting current gaps in knowledge about global change.

Yet *Double Exposures* goes further than merely recognizing knowledge gaps; it also attempts to close them. To this end, the authors adopt an interdisciplinary approach to global change which, they assert, bridges between natural and social sciences. While they often do not make clear the tools in their interdisciplinary tool kit, the approach in this book is itself an exemplar for thinking "outside of the boxes" of disciplinary traditions, discourses, and research agendas.

The Double Exposure framework is the heart of Leichenko and O'Brien's work and thus deserves critical examination. They illustrate it with a remarkably simple schematic diagram showing the relationship between the components within the framework. This is a major achievement: the authors have simultaneously made global change more complex (scholars must approach it from a new perspective) and more straightforward (scholars can deploy this framework in their remodeled studies). But the framework implies a linear sequence and may obscure the relationships and feedbacks among processes, contexts, exposure units, responses, and outcomes: while the framework may be constructed for the reader to comprehend the *concept* of double exposures, it undermines the discussion of the *relatedness* of double exposures.

Moreover, the intention behind the delivery of the framework is not explicit, which leaves some questions about applicability unanswered. The authors utilize case studies at three different scales—city (New Orleans), nation-state (India), and region (the Arctic). The reasoning behind the choice of these scales and exposure units is unclearly presented in the book. We speculate that the cases were selected for their capacity to demonstrate the intricacies of the outcome, context, and feedback pathways of the framework. But what is the appropriate scale of study unit? The city-level study (New Orleans) has the most comprehensive and refined

analysis of the three. The India and – even more – the Arctic examples may be too broad for apprehending the interconnectedness of the framework components.

Leichenko and O'Brien's framework tends to find negative outcomes for both exposures, regardless of the geographic location or scale of the exposure unit. While the authors do note certain benefits related to globalization, a discussion of how exposures may be positive for *both* the environment and the economy—or certain actors, even if others clearly do not benefit—is missing. The authors end their book by pointing to areas of hope for global futures, but these conclusions are reached without reference to the structure of the double exposure framework. The absence of this reference suggests that more research is needed in order to discover "positive-positive" (environment and economy) scenarios, keeping in mind that these are likely to be dependent on scale, location, and the actors involved. If these more positive scenarios exist, the framework as presented in this book may be a dramatization of the negativity of global change. If they do not exist, a more complete picture of double exposures may still be developed. Either way, more research along these lines should surely lead to a richer understanding of double exposures and inform the construction of increasingly sophisticated and powerful frameworks.

One of the major aims of this book is to catalyze new research agendas that incorporate the double exposure framework. But the tools and techniques that will be needed, and details of appropriate research methods, are buried in footnotes and gestures of gratitude to other research partners. This is regrettable given that it seems that available methodologies for *disciplinary* research are likely ineffective if applied to this framework. This criticism aside, *Double Exposures* presents not only an exciting new program for conceptualizing global change—it also issues a call for creativity and cooperation in interdisciplinary scholarship.

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