

In This Issue

SOCIAL–ECOLOGICAL SYSTEMS AND EMERGING INFECTIOUS DISEASES

Five articles in this Special Issue on “Social–Ecological Systems and Emerging Infectious Diseases” resulted from a meeting held in Hawaii March 9–11, 2005, hosted by the East–West Center and the Asia-Pacific Institute for Tropical Medicine and Infectious Diseases, and funded as part of the U.S. National Institutes of Health Roadmap initiative “Research Teams of the Future.” Building on a set of approaches and models that has shown promise toward unraveling the complexities of global infectious disease emergence, the meeting focused on three globally emerging infectious diseases (EIDs) representative of the range of biological characteristics and social dimensions of such diseases—leptospirosis, dengue fever, and HIV/AIDS—holding a mini-symposium and establishing working groups to examine each in detail, in addition to a working group focused on transdisciplinary approaches to EIDs. The participants represented a wide range of disciplinary training, expertise, and sectoral experience with emerging infectious diseases. The meeting’s purpose was to explore and foster increased interdisciplinary research and collaboration using this complex systems perspective that stresses the dynamic behavior of interacting “human–natural systems.”

The first article in the collection is a Review by **Wilcox and Colwell** that draws on studies of cholera, the archetypical waterborne disease, and zoonotic and vectorborne diseases in general, and examines how the findings from the leptospirosis and dengue working groups correspond to these EID models. The authors argue for a new EID research paradigm based on biocomplexity—also encompassed by the social–ecological systems framework (SES)—that embraces the complexity

and richness of living systems, from molecules to the biosphere. They show how such a paradigm is beginning to provide the basis for a blueprint for emerging infectious disease research, including approaches and models incorporating natural and social sciences.

The article by **Parkes et al.** reports on the findings of the working group investigating the concept of transdisciplinarity and associated methods for interdisciplinary integration. Examining four case examples (Nipah virus, SARS, HIV/AIDS, and the Ertan Dam in China), the authors identify a significant need and opportunity for transdisciplinary research as a basis for disease control and prevention, and examine at least two different axes to integrating knowledge: horizontally across disciplines and sectors, and vertically among different types of knowledge users.

The article by **Spiegel et al.** examines dengue fever, and factors responsible for this globally important resurging vectorborne disease. The authors describe how a variety of converging factors explain the reemergence of dengue, including the more severe dengue hemorrhagic fever, and how social–ecological systems theory provides a useful analytical framework. They describe the reasons for the disease’s reemergence and identify the steps required for sustainable control programs on this basis.

The next article in the collection, by **Vinetz et al.**, characterizes leptospirosis as possibly the world’s most common yet neglected zoonotic disease, and presents a case study of this disease as a model for transdisciplinary EID research. The authors describe how placing this zoonotic disease in its social and ecological contexts—using Hawaii’s mountain-to-sea ecosystems as the “study system”—shows how disciplines in the social, cultural, ecological, and biomedical sciences can complement each other to improve prevention and control of this and other emerging diseases.

A final article in the collection is a Profile by **Lewis** that describes the purpose and objectives of the meeting in Hawaii, and the obstacles met in attempting a synthesis by the HIV/AIDS working group. While individual participants provided informative in-depth perspectives on the pandemic and its causes, a consensus was not reached on how to explain why efforts to contain the pandemic have failed. A follow-up project is planned to deepen the interdisciplinary dialogue and analysis of HIV/AIDS, learning from this working group's experience. The results will be published in a future issue of *EcoHealth*.

AMPHIBIAN PATHOGEN IDENTIFIED IN ITALY

Amphibian chytridiomycosis is an emerging fungal disease linked to amphibian mass mortality, population declines, and even species extinctions in the Americas and Australia. In this issue, **Simoncelli et al.** identify the pathogen that causes this disease in frogs from Italy. At the time of press, this is only the second report of the pathogen from wild frogs in Europe. Even more significant, however, is their finding that it doesn't cause death in these ranid frogs. Why is this important? Because other evidence suggests that ranids might act as carriers or reservoirs that heighten the impact of this often devastating disease.

LANDUSE CHANGE DRIVES MOSQUITO DENSITY

There is a great deal of interest in how landuse changes affect the risk of disease outbreaks and other detrimental outcomes. However, with a few noticeable exceptions, there is a surprisingly small amount of published work on the subject and the details of how these broad changes affect public health are largely lacking. In this issue, **Leisnham et al.** surveyed and analyzed the patterns of mosquito abundance and diversity across a patchwork of landscapes in New Zealand. Their data provide convincing evidence that anthropogenic modification of habitat increases the density of mosquitoes and therefore the risk to public health.

HEALTH AND ECOLOGICAL IMPACTS OF SMALL-SCALE MINING IN ECUADOR

Heavy metal pollution has led to increased concerns regarding impacts on humans, animals and biological sys-

tems—not least due to bioaccumulation of heavy metals in tissues and blood of humans and animals. **Betancourt et al.** examine these concerns through a study of the health and ecological impacts of small-scale gold mining in Ecuador. By focusing on a distinct ecological system (the Puyango River basin) to investigate possible links between critical natural resource-based economic activities (mining and agriculture), river ecological processes (erosion and sedimentation, heavy metal uptake by the food chain, etc.), and human health, their study reveals important insights into relationships between the hydrological dynamics, heavy metal flux, and human health, and identify important issues for future study in this system.

BIODIVERSITY AND HUMAN WELL-BEING IN THE BRAZILIAN ATLANTIC FOREST

The links between a global biodiversity “hotspot” and those human communities surrounding it and relying on it, are explored in the article by **Silva et al.** on protected areas in the Atlantic Forest region of Brazil. Using a study group of 178 families from two study areas, interactions were recorded to include direct exploitation of flora and fauna, over-use of pesticides in neighboring cultivated lands, unsanitary conditions associated with low levels of education, and a widespread lack of perceived value of the protected areas. Participatory approaches with ecosystem perspectives are proposed as frameworks to improve human health and raise the prospects for the quality of these protected areas.

BRIDGING HUMAN-NATURAL SYSTEMS AND SUSTAINABILITY SCIENCE IN HAWAII

The themes of biocomplexity, coupled human-natural systems, and their resilience are emerging as core principles for researchers developing “sustainability science,” as well as those bridging the ecological and health sciences. In a Profile of a new research and education initiative at the University of Hawaii, **Kaneshiro et al.** describe how this initiative is taking advantage of Hawaii's unique mountains-to-sea ecosystems and the associated cultural legacy of *ahupua'a*. These were the traditional land divisions and production systems that were integral to Hawaiian culture and have inspired a cultural renaissance that draws on the traditional knowledge and values associated with these human-natural systems. Three projects are highlighted that

demonstrate how a transdisciplinary approach, that includes indigenous knowledge, is being used to address contemporary challenges in sustainability science and education.

LINKING ECOSYSTEM AND HEALTH CONCERNS IN THE GLOBAL MERCURY PROJECT

Small-scale mining is often undertaken by workers with limited understanding of the long-term impacts of their activities on their health or the environment, and with

limited capacity to mitigate the hazards. In their Profile on the Global Mercury Project, **Spiegel and Veiga** present an innovative international project seeking to better understand and respond to the links between small-scale gold mining practices, ecosystem impacts, social dynamics, and health. Informed by an initial assessment phase, the project is now entering a new phase of community intervention and education with valuable insights for other projects that seek to integrate ecological and health principles and use a community participatory approach.

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