Why environmental science, including human ecology, must drive Rio+20 talks

June 19 2012

Twenty years ago, world leaders met at the UN Earth Summit in Rio de Janeiro and agreed that rising income inequality, environmental destruction, and unchecked human population growth called for a radical shift in how nations approach economic development.

And now world leaders meet in Rio de Janeiro again, at the UN Conference on Sustainable Development, or Rio+20, on 20-22 June 2012, to re-examine their commitments to sustainable development. Coinciding with Rio+20, the open-access journal PLoS Biology is publishing three articles in the June 19 issue by leaders in ecology and conservation science who raise important concerns about physical limits on resource use that should be considered at the conference—but almost certainly won't be. This is because sustainability has largely developed with little reference to the key ecological principles that govern life on Earth.

An accompanying podcast features an interview with Georgina Mace, Professor of Conservation Science and Director of the Natural Environment Research Council Centre for Population Biology, Imperial College London, who wrote an editorial that explains why nothing in sustainability science makes sense except in the light of ecology.

Robbie Burger, Jim Brown and others, from the University of New Mexico, argue in their essay that the field of sustainability science does not sufficiently take account of human ecology, especially from the big-picture perspective offered from 'human macroecology,' which aims to

understand how humans are integrated into and constrained by the Earth's systems at multiple spatial and temporal scales. They note that ultimately "we are constrained by the same physical laws and governed by the same biological principles that regulate the millions of populations of other plants, animals, and microbes on the planet," and we cannot evade them.

They use a series of cases studies to illustrate the wider detrimental impact of what appear to be locally 'sustainable' systems, and show how decreasing per-capita consumption of petroleum, fresh water, arable land, metals, phosphate, fish, and wood at the global scale indicates that the growing human population and economy have surpassed the Earth's capacity to sustain even current levels of population and socioeconomic activity, let alone future trajectories.

"We are peaking, or have surpassed peaked, production of essential resources," says Burger. "It's just going to become more and more difficult for human ingenuity to overcome these problems now that we are pushing the limits of the biosphere."

John Matthews and Frederick Boltz, from Conservation International, are equally emphatic that human economies need to be embedded in natural systems, but provide a more optimistic outlook to our future. While the concerns of Burger and colleagues are real, they argue, human ingenuity and adaptability may yet provide solutions that will allow human societies to overcome resource limitation and continue to grow. Equally, they say, environmental pessimism will have less traction in policy-making than providing positive and creative approaches to solve problems.

"We have to think about the long haul now as climates, economies, and ecosystems shift into states that have not been seen before in human history," says Boltz.

"From our work from remote villages to growing megacities, we have found an emerging consensus and political will to transition to sustainable, 'green' development," adds Matthews. "We see widespread evidence of the recurrent ability of humans to transcend crisis, come together, and learn from our mistakes."

In an accompanying editorial and podcast, Professor Georgina Mace outlines the larger context of the discussion, and explains that the difference between ecological pessimism in Burger et al. and technological optimism in Matthews and Boltz is only one of the many ways that the problem can be viewed. It is "a complex nexus of issues where ecological and evolutionary sciences, natural resource management, poverty alleviation, equitable and sustainable growth, individual rights and responsibilities, and the governance of the environment all converge."

Mace concludes that while the viewpoints presented in the two articles differ in emphasis, the science behind both ought to be considered at Rio+20 this June. "Sustainability science needs much stronger connections with environmental sciences, including macroecology," she argues. "Green economies, a major focus for Rio+20, similarly need to be embedded in ecological principles and not simply be focused on economic growth based on new, greener production systems."

As Mace notes in her podcast interview, drawing on a quote by Royal Commission on Environmental Pollution Chairman John Lawton, the cost of not incorporating environmental science is negligible compared with the cost of ignorance, and the potentially profound consequences for future generations.

More information:

Mace GM (2012) The Limits to Sustainability Science: Ecological Constraints or Endless Innovation? PLoS Biol 10(6): e1001343.

doi:10.1371/journal.pbio.1001343

Burger JR, Allen CD, Brown JH, Burnside WR, Davidson AD, et al. (2012) The Macroecology of Sustainability. PLoS Biol 10(6): e1001345. doi:10.1371/journal.pbio.1001345

Matthews JH, Boltz F (2012) The Shifting Boundaries of Sustainability Science: Are We Doomed Yet? PLoS Biol 10(6): e1001344. doi:10.1371/journal.pbio.1001344