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Resiliência, incerteza e gestão de sistemas socioecológicos complexos. Entrevista com o professor Lance Gunderson

Resilience, uncertainty and management of complex social-ecological systems. An interview with professor Lance Gunderson

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ENTREVISTA / *INTERVIEW*

Professor Lance Gunderson
Personal Archive

Currently a Professor in the Department of Environmental Sciences at Emory University, Dr. Lance Gunderson, a world authority in the field of social-ecological resilience, has served as the executive director of the Resilience Network and as Chair of the Resilience Alliance. During his outstanding academic career, which includes serving in the Science Advisory Board of the Grand Canyon Monitoring and Research Center, as well as being the Chair of the National Academy of Sciences (see Short Bio), Professor Gunderson has authored several land-marking publications in his field. Among others, he is the author, along with renowned Prof. Buzz Holling, of the book "Panarchy" (2002). Focusing on the delicate work of integrating science and policy for the management of large-scale natural resource systems, Professor Gunderson talks in this interview with Simone Athayde, Robert Buschbacher and Paula Bernasconi about the concept of social-ecological resilience, its origins and how the it has been extended from ecological to socioecological systems. In Gunderson's opinion, the ideas of resilience and transformation suggest that management of coupled systems can have high degrees of unpredictability, making adaptive approaches that confront uncertainty more applicable. However, the application of adaptive management and adaptive governance has proven difficult in many areas (especially the US).

1. Can you briefly explain the concept of social-ecological resilience and how it originated? How has the concept been extended from ecological to socioecological systems?

The phrase 'social-ecological resilience' is used to describe the capacity of a system to respond and adapt to unforeseen events, external shocks, or surprises. Holling in 1973 used the word resilience to describe non-linear dynamics of ecosystems, as a contrast to the notion of single or global stability. Holling proposed the idea that ecosystems could configure in qualitatively different regimes, and resilience was the property that mediated the transition among these different ecosystem types. I think the extension to social-ecological systems occurred in the mid 1990's, probably with the Barriers and Bridges volume (Gunderson, Holling and Light, 1995). This volume examined abrupt and surprising changes in managed resource systems over time, and indicated that such systems are better described as social and ecological systems. Berkes and Folke published a book in 1998 on Linking Social and Ecological systems. Starting in the early 2000's, with the formation of the Resilience Alliance and the journal Ecology and Society, work on resilience of SES's has increased exponentially.

2. The resilience network is very strong in certain countries - USA, Australia, Sweden, South Africa. Why has the network developed in this way?

Perhaps one reason is that the applied ecologists who formed the original Resilience Network and Alliance were in these four countries. Researchers such as Terry Hughes (Australia), Brian Walker (South Africa and Australia) had published on ecosystems that had undergone regime shifts, either in coral reefs or semi-arid rangelands. So one argument is that the ecosystem dynamics in these areas were the basis for the geographical affinities. In the mid-1990's while Holling was at the University of Florida, he initiated work with colleagues in Sweden to study resilience of ecosystems and linked economic systems. Ecologists in Sweden were also beginning to interpret ecosystem dynamics in the Baltic using Holling's concepts of resilience.

3. How did you become involved with working on resilience?

Although I remember reading Holling's 1973 article as a graduate student at UF in the late 1970's, I didn't become involved until the mid-1990's. I was a post-doc in Buzz Holling's lab at UF, and we wrote a proposal to the MacArthur Foundation to fund the Resilience Network. That network led to numerous publications and three books on resilience; Panarchy (Gunderson and Holling, 2002), Resilience and the Behavior of Large Scale systems (Gunderson and Pritchard, 2002), Navigating Social and Ecological Systems (Berkes, Folke and Colding 2003).

4. Where and how have you applied this approach in your own research?

One example is from South Florida, where we used resilience theory to help understand a large-scale die off of seagrass in Florida Bay, that occurred in the late 1980s. Seagrass provides food and habitat for aquatic organisms, as well as stabilizing sediments and influencing water clarity. The seagrass/clear water is one of two alternative regimes in that ecosystem, the other being algal blooms/turbid water. In trying to explain the die-off/transitions between regimes, a number of competing and plausible mechanisms were identified, as is generally the case when ecological resilience transitions occur.

Our work highlighted that it is very important to carefully try to determine which one of those mechanisms seems to be sustained by data and observations, because depending upon which one was true, we would have different management recommendations. For example, one of the explanations was that there wasn't enough freshwater coming into the bay, and it was the hyper salinity that led to seagrass mortality. And this was the hypothesis that the managers picked as the correct one. So, they ended up adding more freshwater into the bay, which did not solve the problem. Our work showed that this did not make a lot of sense, and that we could not really account for the die off by that explanation. Also, the managers thought that the seagrass populations would naturally grow back in the system, which they did. Our management recommendations were to put herbivores back into the system (such as manatees), and actually create small-scale disturbances in the bay. We think that artisanal fishermen create small-scale disturbances that would allow for the re-growth of seagrass. But at that time, the Park managers did not implement our recommendations, and the interesting thing is that this is happening again, right now. One of the problems with management, is that managers do not want to do anything unless they absolutely have to, and unless they are certain about the outcomes (risk-free management "culture"), which level of predictability does not apply to complex social-ecological systems such as Florida Bay.

5. In your opinion, how might the resilience approach contribute to improved governance and adaptive management of social-ecological systems?

I think the ideas of resilience and transformation suggest that management of coupled systems can have high degrees of unpredictability. Hence adaptive approaches that confront uncertainty are more applicable. However, the application of adaptive management and adaptive governance has proven difficult in many areas (especially the US).

6. Can you give some examples based on real-world cases?

I would point to cases of the South African Parks System as an interesting application of adaptive management, and the Great Barrier Reef as an example of adaptive management and adaptive governance.

The African Parks story is really interesting, and it was associated with the end of the apartheid as a window of opportunity. That window opened with a constitutional revision, which allowed leaders and managers of South African Parks to revise their goals, policies and practices, incorporating concepts of resilience, thresholds and adaptive management. This was also a result of prior social problems they had faced with people and wildlife conflicts, especially elephants. There were heated discussions around what the elephant populations should be, because if there were too many elephants, they would cause these regime shifts between rangelands, savannas and other ecosystem types. It was also an important shift away from species and populations-based management, towards an ecosystem-based approach to management. In re-doing their management policies, they focus their management and monitoring activities on these thresholds or transitions between regimes, rather than focusing on the more "stable" state of the regimes. Another important component of this process was that they made it much more participatory; rather than having it more bureaucratic and government-led, they promoted engagement of local people (people who lived there, hold important knowledge of the system and were affected by the decisions and policies implemented in these parks) in decision-making, management and conservation of these protected areas. This is a one example involving a clear recognition of these alternatives states, and of using resilience theory to manage around thresholds.

Another example involves the management and re-zoning of the Great Barrier reef in Australia that occurred roughly ten years ago. The Great Barrier Reef Marine Park management group regularly monitors the ecosystem, collecting data on the status and conditions of the reef. They made this data available to other scientists and researchers working at government labs, research centers and universities. These scientists started to notice small-scale regime shifts, indicating that the reef was near a tipping-points or transition involving the loss of coral. Some of those scientists had worked in other regions, mainly in the Caribbean, where they had studied such transitions. Thus, they had experience of what happens with that ecosystem when a threshold is exceeded. So, they implemented a government-led, but very participatory planning process, which led to a re-zoning of human activities across the reef ecosystem. In essence they set up a large-scale adaptive management program to evaluate influences of fishing pressure on different areas of the reef, since fishing pressure was identified as one important driver of resilience loss. In this case, the window of opportunity was created when political leaders wanted to avoid impending large-scale reef degradation.

7. Related to the question above, do you think that the resilience approach is equally applicable in developing countries, as opposed to in more developed countries where governance and capacity are greater?

I suspect that there may be more flexibility in developing areas. Most of the developed areas are caught in bureaucracy traps, where powerful economic interests and stakeholders drive management decisions. These interests and the bureaucracies combine to limit new, novel and flexible approaches to management.

8. The adaptive cycle seems particularly relevant in frontier regions, for example the Brazilian Amazon, which has gone through a series of economic cycles. But given that this region faces increasing threats from globalization, climate change and industrial development, we have been grappling with the question of whether fundamental change is possible without a major collapse. What has your experience studying system change told you about this question?

I think the key is to look for windows of opportunity for change. Such windows can be unpredictable – but I am convinced that they will occur. The history of the Klamath River basin and the Great Barrier Reef are good examples of systems that seemed to be very resistant to change, but windows opened up.

The Klamath River runs through the west coast of the US, mostly in the State of Oregon. It is a river that has been dammed for water control, and used for agriculture in its upper regions, around other commercial and competing uses of water. The great environmental issue there was the presence of some (3-5) endangered fish populations. It was this classic water context or battle between agriculture and environment: who could use the water, what should it be used for, etc. There were a series of lawsuits under the US Endangered Species Act to get more water for the fish, that were not really successful, but it helped to inform an agreement to consider large-scale management practices, adaptive or not, that could meet these different stakeholder needs. Rather than looking for integrative solutions, where everybody benefits, or the trade-offs are at least discussed in a venue outside of courts. What happened was in the middle of this conflict, a few years ago, a group of native American tribes asserted their water rights. They went to court and said: “we are the first group there, we have been there before the Europeans, and therefore we are entitled to water.” It was the court agreeing with their assertion, that they were entitled to some of the water, that created a window of opportunity. The farmers were afraid that their water was going to be taken away, the environmentalists

were afraid that the water would be used for something else, so everybody came to the table and said: “look, let’s try to negotiate some solution.” More recently, the government, under Obama administration, essentially came in and said: “we are going to remove some dams, it is the only way through which we can save some of these endangered fish species.” So that was part of the agreement, which benefitted the whole system and various stakeholders, and which occurred after decades of stalemate and inaction.

Lance Gunderson / Perfil

O Professor Lance Gunderson é um dos precursores da abordagem da resiliência nos Estados Unidos e no mundo. Possui bacharelado e mestrando em Botânica, e doutorado em Engenharia Ambiental, todos cursados na Universidade da Flórida. Atualmente, Gunderson atua como professor titular no Departamento de Ciências Ambientais da Universidade de Emory nos Estados Unidos, sendo também co-editor chefe do periódico internacional Ecology and Society (www.ecologyandsociety.org). Gunderson possui uma notável experiência acadêmica e profissional, desempenhando um papel crítico no estabelecimento do grupo Aliança para a Resiliência, e tendo servido como diretor executivo da Rede para a Resiliência, coordenador da Aliança para a Resiliência, e membro do comitê científico do Centro de Pesquisa e Monitoramento do Grand Canyon, além de outras posições de destaque. Desde o início de sua carreira acadêmica como estudante e então pesquisador de pós-doutorado na Universidade da Flórida, o Dr. Gunderson tem produzido uma extensa quantidade de livros e artigos sobre a temática da ecologia e dinâmica de sistemas socioecológicos complexos, tendo organizado, juntamente com o Prof. Buzz Holling, o livro “Panarchy” em 2002 (Panarquia em português), que trata do estudo da dinâmica multi e trans-escalar de sistemas complexos. Em 2007, ele foi condecorado com o título de Beijer Fellow, pelo Instituto Beijer de Ecologia Econômica da Academia de Ciências da Suécia (www.beijer.kva.se). O seu trabalho é voltado para a integração entre ciência e políticas públicas para a gestão de sistemas naturais de larga escala.

Lance Gunderson / Short Bio

Lance Gunderson holds a BS and MS in Botany and PhD in Environmental Engineering Sciences from the University of Florida. He worked for over a decade as a botanist with the US National Park Service in the Everglades regions of southern Florida. He then worked for a decade as a research scientist in the Dept. of Zoology at the University of Florida. He is currently a Professor in the Department of Environmental Sciences, Emory University. He has served as the executive director of the Resilience Network, as Chair of the Resilience Alliance and on the Science Advisory Board of the Grand Canyon Monitoring and Research Center, and Chair of the National Academy of Sciences, National Research Council Committee on Ecological Impacts of Road Density. He is also Co-Editor in Chief of the online journal Ecology and Society (www.ecologyandsociety.org). In 2007 he was named a Beijer Fellow, of the Beijer Institute for Ecological Economics Swedish Royal Academy of Sciences, (www.beijer.kva.se). His scholarly work is on integrating science and policy for the management of large-scale natural resource systems.