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Sander van der Leeuw is the founding director of the School of Human Evolution and Social Change at ASU, and the emeritus dean of its School of Sustainability. He currently is a Foundation professor in both Schools. Prior to joining ASU, van der Leeuw taught in Amsterdam, Leyden, Cambridge and Paris (Sorbonne), and conducted archaeological studies in the Near East, the Philippines, Syria, Holland, France, and Mexico.

Van der Leeuw's expertise lies in the role of invention, sustainability, and innovation in societies around the world. He is a corresponding member of the Royal Dutch Academy of Arts and Sciences and an external professor at the Santa Fe Institute. In 2012, the United Nations Environment Program named van der Leeuw the "Champion of the Earth for Science and Innovation" for his work on human-environmental relations. He currently directs the ASU-SFI Center for Biosocial Complex Systems at ASU.

## *A Co-evolutionary Perspective on Urban Dynamics*

Growing urbanization is one of the most stable and predictable dynamics known to the social sciences, for now nearly 7000 years. But for most of history, cities resembled what we would currently call 'slums'. Why would people want to live in them?

Societies are dynamic flow structures that organize the world around them. They are held together by the fact that their members share ways of processing information: ideas, institutions, language(s), ways of creating material culture, etc. Above a certain size, cities play a fundamental role in maintaining social integration by promoting and facilitating interaction among the people involved, and notably by facilitating innovation that keeps the members of society interested in being part of it. The fundamental underlying dynamic is a feedback loop that spreads organization (information processing capacity) from the urban centres outward, harnessing the environment to extract resources from it that are concentrated into the cities to enable the population to survive. That dynamic is responsible for the co-evolution of cognition, social organization, communication, technology and the environment from earliest times to the present, transforming societies from small settlements to a global network of mega-cities across the globe.

That growth has been facilitated since c. 1750 by the harnessing of fossil energy - thus lifting the energy constraint on urbanization. The ICT revolution is enabling the decoupling of information processing intensity from co-location, and thus, in principle, facilitating much more distributed settlement patterns. This might lower the per capita cost of resources by substituting some local resources for distant ones, in particular in the domain of energy and primary resources (food, water, etc.). The prediction that by 2050 80% of the human population will live in cities needs therefore to be reconsidered.

To do so, we need to conceive of the global urban system as a Complex System in the technical sense of the word, developing a "Global Systems Science" of urban

dynamics that learns from the past about the present and for the future. It must favor out-of-the-box thinking by beginning with the question "What kind of future do we want?" and developing a multiple set of potential trajectories to achieve that goal. Much of the debate around that question will be dominated by a redefinition of the 'value space' of our societies, with major implications for economies and societies.