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The world is round; the economy should be circular

Thomas Tunstall

Entropy, life-cycle accounting and the circular economy are terms and concepts indicative of how society looks at the world differently than previous generations. As the global population pushes toward 10 billion by the end of this century, thoughtful approaches to sustainability will become ever more essential to policymakers. Yet a coherent narrative remains elusive.

Industrialized countries continue to operate very far from a circular economy. Instead, they rely heavily on a linear economy, where the make-use-dispose product life cycle dominates. A circular economy, by contrast, encourages product reuse and longevity, not disposability and planned obsolescence.

Efforts by communities and policymakers to develop circular economies and maintain the viability of natural ecosystems in the United States and other countries take many forms. Several cities around the U.S., including San Antonio, have made it a priority to implement policies aimed at long-term sustainability.

For example, in August 2016, the city of San Antonio adopted its SA Tomorrow Sustainability Plan intended to prepare the city for smart, sustainable growth in light of the prospect of an additional million residents by 2040. The plan is a fuller elaboration of past efforts such as Mission Verde and SA2020. For 14 months, the city of San Antonio engaged a broad range of stakeholders in a variety of venues to solicit input and develop the plan. Focus areas include energy, food systems, green buildings, infrastructure, land use, transportation, natural resources, public health and solid waste resources. Cross-cutting themes include air quality, economic vitality, equity, resilience and water resources.

On a global basis, some of the most systematic research dealing with sustainability comes from the Stockholm Resilience Centre, which examines planetary boundaries affected by our waste outputs and attempts to gauge those most at risk. The boundaries include stratospheric ozone depletion, which filters out ultraviolet radiation; loss of biosphere integrity, which is necessary for biodiversity; chemical pollution; climate change; ocean acidification; the freshwater cycle; land system change, when forests, grasslands wetlands, coastal fisheries, savannas and other habitats that recycle are converted to municipal, industrial or agricultural use; the nitrogen-phosphorous cycle, or fertilizer runoff; and atmospheric aerosol loading.

What is most telling about research on sustainability is that economics and ecosystems are closely interlinked. Modern economic systems require low-entropy inputs — for example, solar radiation, oil and gas — to provide useful services. As a result, high-entropy waste outputs return to ecosystems and impact planetary boundaries. In [previous columns](#), I have noted that economic theory leaves out such considerations, treating waste or high-entropy outputs simply as negative externalities — largely absent from economic models.

Preliminary work by researchers demonstrates that current pricing for industrial activities such as solid waste combustion, coal-fired electric power generation and sewage treatment are negative from an air quality standpoint alone. Essentially, this means the services are underpriced. This is very analogous to the way most of us now realize that we underprice clean water relative to its long-term value. A full set of environmental accounts would more appropriately track not only air, but also water pollution, solid waste and hazardous waste as part of the national economic accounts

system. Currently, no such function exists at the federal level in the Bureau of Economic Analysis.

For the most part, economic theory and ecosystem theory remain disconnected — even at odds with one another. Increasing awareness of this implication would better guide policymakers in the future. As an attempt to highlight the issue in a more accessible format, I developed a fictionalized scenario in Texas called [“The Entropy Model.”](#) Perhaps for public policy discussions, a story can resonate better than a dry research paper.

Only time will tell whether sustainability efforts will be sufficient to correct the long-term environmental trends that began with large-scale industrialization barely more than a hundred years ago. A circular economy that reduces our waste outputs as close to zero as possible should become a key policy objective for every industry.

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