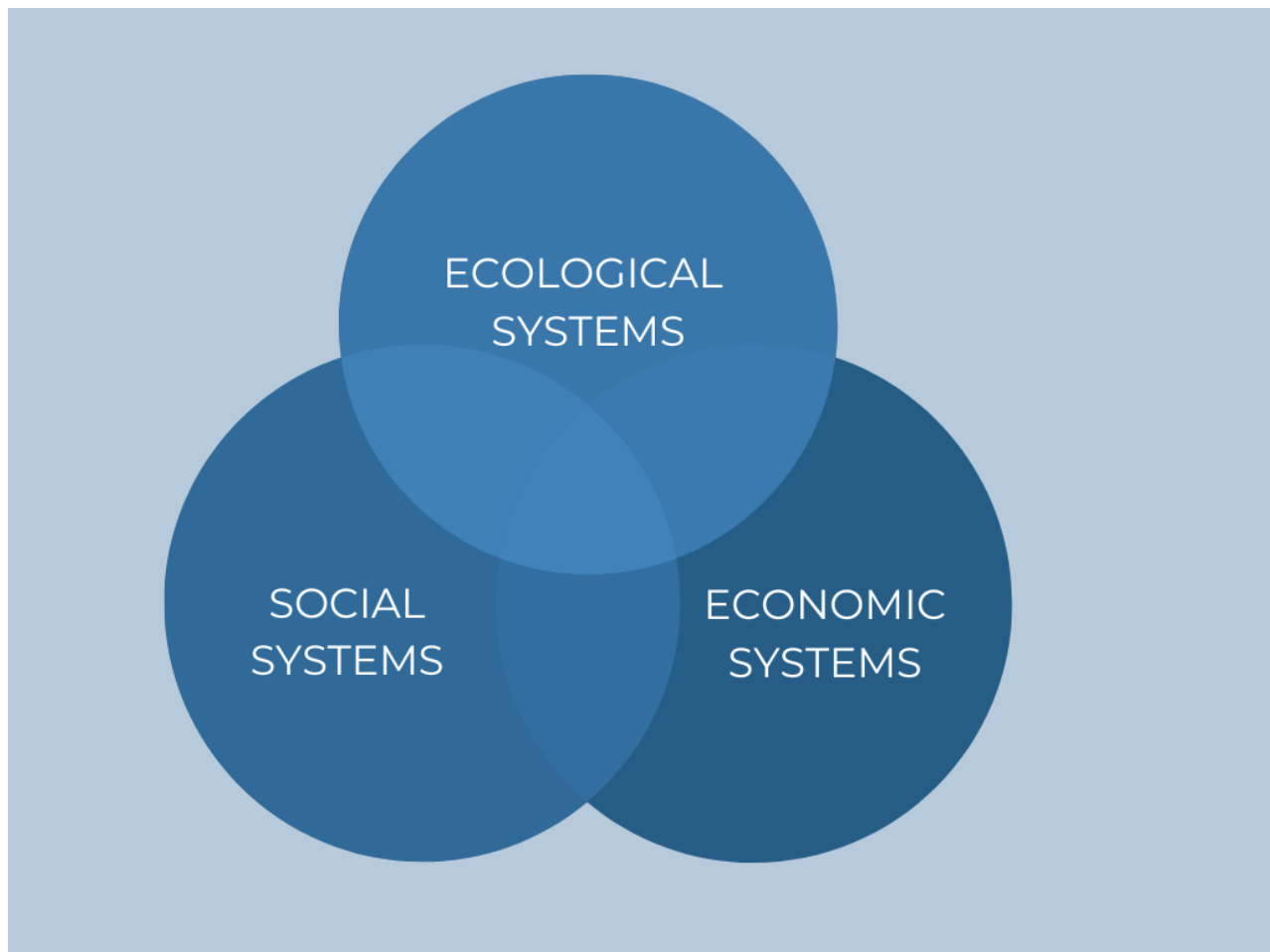


Systems Thinking: A Science for Life and Sustainability

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By Brock University



Systems thinking requires an understanding of the fact that all parts of a system work together, creating effects that are greater than the sum of the parts of that system.

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Since the 15th Century, western science has been based on the idea that people and nature work like machines and can be understood in terms of simple cause-effect relationships. This mechanistic view assumed that the behaviour of living systems could be predicted with deterministic research (preconditions dictate outcomes), and that living systems are no more than the sum of their parts. This scientific perspective was accompanied by the belief that humans were separate from—and could control—nature. The mechanical view of life also influenced the social sciences. This led to the development of simplistic economic theories that externalized the costs of exploiting nature for financial gain and the contributions of households and communities to the economy. This means that the significant contributions of people and nature to the economy are considered “free” (gratis) resources. The mechanistic perspective of life and economy provides the technology and exploitative worldviews necessary for industrialization, globalization, and consumption. It has resulted in an endless growth mindset and the accumulation of

economic power by industrial societies, corporations, and individuals. While modern science and technology have produced many benefits, both have also increasingly isolated people from nature. Each has also served to enhance the belief that people can dominate nature, and that nature (and all of its benefits) can be replaced or replicated by human ingenuity and technology.

The modern industrial worldview stands in marked contrast to older philosophies of Ancient Greece, Buddhism and Taoism, and the cosmologies of Indigenous People who view humans as an interdependent part of the community of life. In these worldviews, the relationship between people and the rest of nature is based on reciprocity (of giving, as well as taking) in order to achieve balance and well-being for all. It is not the one-way flow of exploitation needed to support the goal of endless economic growth. These older systems of worldviews and ethical values have enabled people to survive for thousands of years, drawing on knowledge passed down as oral traditions from one generation to the next. Many remnants of these old cultural systems still persist today, in concepts such as “buen vivir” (or good living), which is incorporated into the constitution of Bolivia and Ecuador, for example.

Linear thinking as the foundation of modern western science gave us the industrial revolution: both the benefits from it and the undesirable environmental consequences that followed. We now know, however, that everything is connected through systems. Indeed, systems are everywhere and affect every aspect of our lives. To a large extent, we use and live in these systems without even being aware that we are doing so. Systems vary from the simple mechanical systems that regulate the temperature in our home to the highly complex laws and policies that regulate our lives. We also have systems of values and beliefs that define acceptable behaviour within society.

Systems are comprised of interacting parts that relate to each other through reinforcing or balancing “feedback”. Reinforcing feedback increases the effects of one part on another. For example, the development of new technology supports economic growth, and economic growth, in turn, supports investment in technology. Balancing feedback brings a system to a desired goal, such as policy that sets the quantity of greenhouse gases that can be permitted in the atmosphere. Biological and bio-economic systems are complex and self-organizing. Feedback and non-linear patterns of behaviour are always present—even if we don’t see it. This means that we should never think about living systems as linear and simple.

Systems thinking is profoundly different. It requires us to understand that all the parts of a system work together, creating effects that are greater than the sum of the parts of that system. Systems thinkers consider how a change in one component may have major effects on the system in its entirety. Using climate change as an example, the release of carbon from fossil fuels into the atmosphere has warmed the Earth’s climate with profound effects on almost every aspect of life on the planet. Learning how to think in systems is an essential skill for finding our way back to sustainability. Online courses that teach the basics of feedback are also becoming more common and are even being promoted as basic education for elementary school-aged children. Systems thinking, as it applies to our understanding of the process of life, only emerged in the 1970’s. With new

mathematical theories and models that enable us to understand the patterns and processes of change in the evolution of life, however, we can now reflect the way that our actions may have consequences not only on us, but also on other people — or even the world.

1 Francis Bacon (1561-1626) was the "father" of empirical science that would improve life for people by giving them power over nature <https://hesiodscorner.wordpress.com/2018/07/11/francis-bacons-conquest-of-nature/>

2 Raworth "Doughnut Economics: Seven Ways to Think Like a 21st Century Economist" Random House, Business.

3 Weak sustainability versus Strong Sustainability
<https://sustainabledevelopment.un.org/content/documents/6569122-Pelenc-Weak%20Sustainability%20versus%20Strong%20Sustainability.pdf>

4 <https://www.rapidtransition.org/stories/the-rights-of-nature-in-bolivia-and-ecuador/>

5 The dominant influence of Descartes (1596-1650) and Newton (1642-1727) on the philosophy of western science that viewed nature as a machine is described by Capra and Luisi 2014 "[The Systems View of Life](#)" Cambridge University Press

6 <https://futurice.com/blog/systems-thinking-and-sustainability#:~:text=What%20is%20systems%20thinking%20in,create%20and%20how%20we%20innovate.>

7 <http://www.clexchange.org/>