



# Resilience

**The resilience of a social-ecological system consists of its capacity to absorb and recover its structure and functions after facing a shock or perturbation. Resilience describes the auto organization, learning and adaptation capacities of a system in the face of a new context. It implies dealing with complexity, uncertainty and surprise.**

Resilience involves the capacity of a system to adapt and transform when subjected to disturbances. Temporal change may imply the system's tendency to return to a state prior to the perturbation or to adopt a whole new state. In the first case, the system activates certain mechanisms to remain within a limited range of structure or functioning. In the second example, a new configuration takes place when the resilience mechanisms are intentionally or unintentionally outmatched.



In the context of social-ecological systems, resilience is a multidimensional concept which involves attributes that may be social (education, development), economical (capital fluxes, per capita earnings) or environmental (biodiversity, food production). The term was initially introduced as a way to understand an ecosystem's ability to persist within a state when subjected to disturbances. At present, resilient thinking offers a theoretical framework structured and built upon multiple fields of knowledge which attempts to generate original inter and transdisciplinary synthesis during the study and management of social-ecological systems.



## Key References

Biggs, R., Schlüter, M., Schoon, M.L., eds. (2015). *Principles for building resilience. Sustaining ecosystem services in social-ecological systems*. Cambridge: Cambridge University Press.

Chapin III, F.S., Carpenter, S.R., Kofinas, G. P., Folke, C., Abel, N., Clark, W.C., Olsson, P., Stafford Smith, D.M., Walker, B.H., Young, O.R., Berkes, F., Biggs, R., Grove, J.M., Naylor, R.L., Pinkerton, E., Steffen, W., Swanson F.J. (2010). Ecosystem stewardship: sustainability strategies for a rapidly changing planet. *Trends in Ecology and Evolution*, 25, 241-249.

Folke, C. (2016). Resilience (Republished). *Ecology and Society*, 21(4), 44. <https://doi.org/10.5751/ES-09088-210444>

Holling, C.S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1-23.

Walker, B.H., and Salt, D. (2006). *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. Washington, D.C.: Island Press.



Foto documental de resultados del taller "Desenredando la resiliencia: Entre la memoria y el olvido", realizado en el Instituto SARAS, en Junio del 2018

Resilience can be understood as an approach to organize and manage social-ecological systems with emphasis on the capacity for renewal, reorganization and development, where disturbances (e.g. extreme weather events) are part of the system's dynamics and represent opportunities for change or innovation.

Resilience can be considered a positive attribute when the objective is to conserve the configuration of the system, for example, a body of water without cyanobacteria blooms. In other circumstances, resilience is understood as a negative attribute or an obstacle to overcome, for example overcoming feedback (e.g. high birth rates) in the fight against extreme poverty. The term "systemic resilience" has recently been introduced, a concept that simultaneously considers a set of external disturbances, generally of very different nature, that govern the dynamics of the systems.

La evolución reciente del pensamiento resiliente puede ser explorado en la obra reciente de Biggs et al. (2015) donde se analizan los principios fundamentales de la capacidad de resiliencia de sistemas socio-ecológicos. The recent evolution of resilient thinking can be explored in the recent work of Biggs et al. (2015) where the funding principles of resilience within social-ecological systems are analyzed.

- 1) maintain diversity and redundancy,
- 2) manage connectivity,
- 3) manage slow variables and feedbacks,
- 4) foster an understanding of SES as complex adaptive systems (CAS),
- 5) encourage learning and experimentation,
- 6) broaden participation
- 7) promote polycentric governance systems.

In a world characterized by accelerated changes, extreme events and uncertain trajectories, resilience becomes a fundamental propriety for the sustainable management of social-ecological systems as a way to ensure the future provision of ecosystem services.

## Additional suggested readings

Folke, C. (2006). Resilience: the emergence of a perspective for social-ecological systems analysis. *Global Environmental Change*, 16(3), 253-267.

Folke, C., Biggs, R., Norström, A. V., Reyers, B., Rockström, J. (2016). Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society*, 21(3), 41. <http://dx.doi.org/10.5751/ES-08748-210341>

Gunderson, I. (2000). Ecological Resilience in Theory and Application. *Annual Review of Ecology and Systematics*, 425-439.

Gunderson, L.H., and Holling, C.S., eds. (2002). *Panarchy*. Washington, D.C.: Island Press.

Holling, C.S. (1996). Engineering resilience versus ecological resilience. In P. Schulze (ed.). *Engineering within ecological constraints*, 31- 44. Washington, D.C.: National Academy Press.

Mazzeo N., Zurbriggen, C., Trimble, M., Bianchi, P., Gadino, I., Steffen, M. (2017). *Sostenibilidad ambiental del Uruguay: aportes desde el pensamiento resiliente*. Bella Vista (Uruguay): Instituto Sudamericano para Estudios sobre Resiliencia y Sostenibilidad (SARAS).

Scheffer, M. (2009). *Critical transitions in nature and society*. Princeton: Princeton University Press.

Stockholm Resilience Centre (2017). *Poniendo en práctica el pensamiento resiliente. Siete principios para desarrollar la resiliencia en los sistemas social-ecológicos*. <http://applyingresilience.org/es/start-es>.

Walker, B.H., Holling, C.S., Carpenter, S.R., Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society*, 9(2): 5. <http://www.ecologyandsociety.org/vol9/iss2/art5>.