

# Resilience

Resilience is a notion originally used in physics in order to designate resistance of a material to shock. In ecology, it takes a different meaning: in its traditional acceptation, it measures the time a system takes to return to balance after a perturbation. Since the years 1970, its definition has considerably changed. The one commonly admitted today is formulated by Holling (1973), who defines resilience as the ability of a system to integrate a perturbation in its working, without for that changing its qualitative structure.

The traditional definition of resilience in ecology relies on the idea of a system in a stable balance whose behaviour is predictable, and in this acceptation, resilience becomes an equivalent of the notion of stability of a system around an equilibrium point. The recent acceptation of resilience relies on the idea that after a perturbation the system is not characterised by a return to balance, as an expression of a behaviour of resistance, but on the opposite reacts in an often positive, creative way, thanks to multiple changes and adjustments. Resilience is the property of a system which, adapting its structure to change, nonetheless retains the same trajectory after a perturbation. In this way, the system preserves its qualitative structure, and hence, its macro-geographical properties if this relates to a spatial system. The term resilience thus implies that the system maintains its structure and ensures its continuity, not by preserving an unchangeable balance or by returning to the same state as before the perturbation, but on the contrary by integrating changes by evolving. In this perspective change, and the perturbation which triggers it, are unavoidable elements and sometimes necessary to the system dynamics and to its preservation. According to this approach, the perturbation is not necessarily a "trauma", but on the opposite takes a part in the working even if locally, inside the system, effects might be difficult to assimilate for some of its elements or individuals.

This meaning of the concept of resilience thus goes against the traditional point of view according to which only one equilibrium situation may be conceived in an open system. Resilience is a concept that is integrated in the theoretical framework of dissipative structures and of complex systems far from equilibrium, developed in particular by the "Ecole de Bruxelles". Today, the limits of the paradigm based on balance for open systems and the idea that systems are only very rarely and for a short time in a balance state are generally acknowledged. It relies on the idea that there exist on the contrary several possible situations that also imply the possibility for a system to be situated far from equilibrium without collapsing for that reason.

Resilience links to the issue of sustainable development. It can be observed indeed that since ten years or so sustainable development (a highly political notion) and resilience (mainly used in the world of researchers) are very often mentioned in the same contexts. Since the notion of sustainable development has taken an increasing place in national and international political contexts, research works on resilience of systems have been multiplied.

## Bibliographie