



## Managing Geoparks as complex systems

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There is an emerging need for rethinking the general approach regarding natural, geological, cultural heritage conservation and sustainable development. Communication, interpretation and management usually treat protected areas or sustainable development regions as linear systems, with reductionist views on separate domains such as: biodiversity, geology, economy or culture. Such areas express a natural intrinsic complexity which is often incompatible with exclusive multi-disciplinary fragmentation. A transdisciplinary and holistic approach is better suited for areas where complex interactions and dependencies occur between humans and environment. Such a methodology has been already proposed for geodiversity interpretation (Toma, 2016) but it can be extended to protected area management and governance (IUCN, 2015) or regional development strategies. Understanding nonlinear dynamics in complex systems (such as Geoparks or protected areas) can create better management techniques that adapt to complicated network behavior, phase transitions, tipping points, self-organization, climate and environmental change, political, cultural or economical change, or emerging conflicts. The complexity perspective offers tools for working from multiple points of view: an area manager will seek to understand the most efficient ways of achieving conservation and development goals; local communities can benefit from education to adapt in front of uncertainties and change or to observe new opportunities; stakeholders can discover and understand processes that maintain the general health of such an area in order to act in a synchronous manner. Given the premises of a good management strategy that includes the local community's contribution and develops high quality communication with stakeholders, there is an inevitable necessity to incubate a shift from gaining chunks of information to gaining complex knowledge of a system that has open borders, and exists within higher complex systems: a geopark is not to be treated exclusively within its administrative borders but also as an organ within a complex society and environment. Its frontiers exchange energy and information through road networks, energy grid, tourism, workforce travel, weather and climate, traditions, resources, culture, external laws and regulations, industry and so on. As a conclusion, we propose a series of management perspectives that treat both the internal complexity of a geopark and its exchanges with the exterior.

### References:

- Toma, C., & Andrasanu, A., (2017) - Steps in creating a methodology for interpreting a geodiversity element - integrating a geodiversity element in the popular knowledge, Geophysical Research Abstracts Vol. 19, EGU2017-282, 2017 EGU General Assembly 2017
- IUCN (2015) – Protected Area Governance and Management, ANU Press, The Australian National University, Canberra ACT 0200, Australia