

Open team science: A new team-based research methodology for socio-environmental cases in the open science era

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This paper presents a methodological hypothesis of open team science as a new research paradigm created by integrating transdisciplinary team science and open science theories.

Social issues caused by environmental degradations are usually so complex that solution-oriented research is always team-based and involves research experts from different domains in interdisciplinary (ID) projects (Repko & Szostack 2017), as well as practitioners such as government functionaries, funders, industries, non-profit organizations, and civil members in transdisciplinary (TD) projects (Hadorn et al. eds. 2007). Such team science is often disrupted by information asymmetry (in which one party has relevant information, whereas the others do not; see Akerlof 1970) between participants as actors with different values, knowledge, and socioeconomic status. This asymmetry leads to different understandings of focal issues and other actors.

In our working hypothesis, information asymmetry can be reduced through a combination of (1) **diversion**, an adaptive governance approach to transform the source of existing conflicts or obstacles among actors, by exploring a common goal to tackle together; (2) **participation and empowerment** of marginalized (or “small voice”) actors; (3) fair **data visualization**; and (4) **dialogue**. These approaches work to reduce the domination of dominant actors (i.e., decision makers).

As an example of the holistic approach to *diversion*, the switched explanation in which results are explained by counterpart experts is applied to ID projects. **Civic tech**, a participatory co-production of solutions for local issues by self-motivated civic engineers using information and communication technologies and open data (Boehner & DiSalvo 2016), is applied as appropriate to the TD cases. The FAIR data principles (findable, accessible, interoperable, and reusable; see Wilkinson et al. 2016) are introduced to encourage researchers to provide their data to the public in case they are reluctant to follow the open data license *in sensu stricto*, by which “anyone can freely access, use, modify, and share for any purpose” (Open Knowledge International 2015).

This working hypothesis is tested on issue-driven ID and TD projects of the Research Institute for Humanity and Nature. Subsequently, the effect of information asymmetry reduction is assessed in terms of the project's performance and participants' perceptual transformation through participatory observation, semi-structured interviews, and periodical questionnaire surveys.

Keywords: Open Science, Transdisciplinary research, Team science, Socio-environmental cases, Stewardship