

Title: Technology and social-ecological change: Scale mismatch, synergy and conflict in poor rural communities

Authors: Helene Ahlborg and Sverker Molander

Affiliation: Environmental Systems Analysis, Department of Energy and Environment, Chalmers University of Technology, Göteborg, Sweden

Abstract:

There is little communication and bridging between the research fields of social-ecological and socio-technical systems approaches, while both fields construct systems that share characteristics such as complexity, uncertainty and multi-actor involvement. Beyond that, little conceptual work has been done to understand socio-technical-ecological dynamics. In the real world, however, processes of socio-technical change are at the heart of human use of and relations to natural resources and environments. In this paper we argue that there is need to engage theoretically and empirically with the interfaces between society, technology and nature, to identify how these system conceptions overlap, where and how pressures and feedbacks emerge and what synergies, trade-offs and conflicts that appear as a result of interactions.

In this paper, we aim to take the conceptual discussion forward by highlighting where the current discussion may be misleading and by providing an empirical example of how socio-technical change and social-ecological dynamics can be studied and analyzed together. In order to achieve this we draw on socio-technical systems thinking, the concept of scale mismatch and literature on common pool resources (CPR). Our conceptual points are developed using an empirical case study of an NGO-led micro-hydropower development project in Tanzania. The fieldwork took place in 2012-2013 over a period of three months, and multiple data sets were gathered; 142 semi-structured interviews, documentation from participatory observation, group discussions, workshops and documentation (project reports, a GIS study of soil erosion risk, a baseline study of local livelihoods).

This case study of a small-scale decentralized energy system problematizes a proposal made recently by some socio-technical scholars: that collective action and CPR theories are relevant to apply in analyses of decentralized energy systems. These attempts at bridging theoretically between fields are valuable. However, the system characteristics are sometimes similar only at the surface, and the application of CPR theory can in some cases be misleading and theoretically flawed, in cases where the technology is poorly understood. Based on our case study and conceptual discussion, we conclude that introduction of a new technology can motivate influential members of a community to engage in natural resource management and environmental protection, also when this generates social conflict and has negative implications for local food security. Theoretically, we conclude that developed understanding of non-human

elements, scale and relations of power are critical to advancing the bridging work while keeping complementary analyses genuinely grounded in the theoretical base of each field.