

Final Progress Report
Sustainability Science Program, Harvard University
Term: September 1, 2010 – August 31, 2011
Submitted: July 2011

Name: Bernhard Truffer

Your field(s):

Sustainability transitions, innovations studies, urban water management

Your degree program, institution and graduation date:

Habilitation, Economic Geography, University of Bern, 2006

Ph.D., Economic Geography, University of Fribourg (Switzerland), 1993

Faculty host(s) at Harvard name and department:

Bill Clark (HKS) and John Briscoe (SEAS)

Description of SSP-related research activity:

Title: Sustainable Transitions in Urban Water Management

Abstract: Urban water management structures are increasingly challenged by climate change, strained public finances and rapid urbanization processes around the globe. Despite the remarkable success story of conventional urban water management systems over the past century, doubts about their longer term sustainability have recently been raised. New technologies enabling high quality onsite water treatment and the increasing possibilities to decentralize intelligence, (including new sensors and control technologies), open up radically new and potentially more sustainable alternatives to provide water services to households and industries. However, implementation of these alternatives has remained marginal, so far. The project analyzed industrial activities for onsite technology development in different countries identifying resources and deficits of emerging industry formation in the field of onsite water treatment technologies. Emerging industry formation was analyzed using the conceptual framework of technological innovation systems. According to this literature, early industry formation often not only suffers from market failures but also from system failures (i.e. capability, coordination or institutional deficits). Based on this framework, an integrated assessment of the industry's development potential was carried out for successfully developing and marketing onsite solutions. Empirically the research drew on evidence from Germany, China, Australia and the USA, as well as innovation activities from transnational companies.

Identification of the problem you address:

Radical system change in the urban water management sector leading to a substantially higher performance in terms of sustainability

Key question asked about the problem:

Preconditions for industry formation to address the key innovation challenges of this technology: cost-effectiveness, reliability and acceptance.

The methods by which you answered that question:

Conceptually: Innovation System Analysis; Methodologically: mixed methods approach with a strong reliance on expert interviews in industry, professional associations and academia. But also, co-authorship and patent analysis (social network analysis) and analysis of secondary sources.

Principle literature upon which the research drew:

Innovation Studies as a confluence between evolutionary economics, science and technology studies, industrial dynamics and the innovation management literature.

Empirical data acquisition description:

In each country 20-50 expert interviews (for a full scale analysis). Co-authorship analysis with about 1000 publications on membrane bioreactor technology.

Geographical region studied:

Germany, China, Australia (full scale analysis), USA (overview analysis), transnational companies (analysis more strongly focused on secondary sources)

Recommendations that might be relevant for your problem:

A major implication of this research is that it seems unlikely that onsite systems will take off unless the system deficits are addressed explicitly. This calls for an active role of academic research and a tight interaction with practice through pilot and demonstration projects. Therefore the problem represents an ideal type case for a sustainability science approach.

A description of the final product(s) you have/are aiming to produce:

Binz, C. and Truffer, B. International Innovation Systems in multi-scalar space: Analyzing the emergent water recycling industry with social network analysis Submitted to *Geographica Helvetica*.

Coenen, L., Truffer, B. (guest editors) Places and spaces of sustainability transitions: geographical contributions to an emerging research and policy field'. Forthcoming Special Issue in *European Planning Studies*. (Publication date: end of 2011)

*Dewald, U. Truffer, B. (accepted) Emerging innovation systems – diffusion of photovoltaic applications in Germany. Accepted for *European Planning Studies*. (Publication date: end of 2011)

Truffer, B., Binz, C., Gebauer H. and Störmer E. (accepted). Success conditions for on-site technologies: a system innovation perspective. In: T. Larsen, K. Udert and J. Lienert (eds.) *Wastewater Management: Source Separation and Decentralisation*. IWA Publishing. (Publication date: end of 2011)

Truffer, B., Binz, C., Gebauer, H., Li, L., and Lu, Y. Assessing an emergent global industry for onsite water treatment systems. Paper to be submitted to *Technological Forecasting and Social Change*. (To be submitted by the end of 2011)

Truffer, B., Coenen, L. (forthcoming) Environmental Innovation and Sustainability Transitions in Regional Studies. *Regional Studies Annual Lecture 2011*. Forthcoming in *Regional Studies*. (Publication date: January 2012)

** Van den Bergh, J., Truffer, B. and Kallis, G. 2011. Environmental innovation and societal transitions: Introduction and overview. *Environmental Innovation and Societal Transitions*. Vol. 1 (1). In print. (Publication date: June 2011).

Description of major other intellectual or professional advancement activity(ies) over the past academic year:

- Nomination as an adjunct professor at the institute of Geography at the University of Bern
- Invitation to hold the Regional Studies Annual Lecture 2011 of the international Regional Studies Association

Citations for reports, papers, publications and presentations that built on your fellowship research:

See above

Principal collaborators outside Harvard:

Prof. Yonglong Lu, Chinese Academy of Sciences (RCEES) Beijing

Prof. Anton Eberhard, University of Cape Town, South Africa

Prof. Rebekah Brown, Monash University, Melbourne

Prof. Lars Coenen, Circle, Lund University, Sweden

Prof. Rob Raven, Eindhoven Technical University, the Netherlands

Prof. David Sedlak, UC Berkeley (CA)

Prof. Jim Murphy and Halina Brown, Clark University, Worcester (MA)

Several at the Swiss Federal Institute of Aquatic Science and Technology, Switzerland