

**Title of the project**

Umweltpsychologie (Environmental Psychology)

**Project period**

2001 – 2010

**Institution**

Center for Environmental Systems Research

**Project co-ordination**

Prof. Dr. Andreas Ernst

**Project team**

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**Brief description:****Keywords**

Water use, agent-based social simulation, scenarios, integrative research, decision support system

**Targets**

The environmental psychology part of the project has implemented a multi-agent model that simulates all households in terms of their water use decisions. A coming task is to develop and test psychological-social indicators of satisfaction and risk perception as well as orientation values of water related social sustainability.

**Data**

Own empirical studies yielded a substantial data basis regarding habitual water use, risk perception, attitudes toward nature and adoption of water saving innovations.

**Modeling**

The process-oriented multi-agent model *DeepHousehold* contains five types of agents (here: *actors*) based on 5 lifestyles (Sinus-Milieus<sup>®</sup>), and simulates the water use as well as the water related satisfaction of private households based on 10 water-usages. Each actor type (milieu) has its own preferences, i.e. the actors perceive the variables upon which they base their decisions as varying in importance: It may be very important to one actor to behave in an environmentally friendly way, whereas another actor might base his decision mostly upon financial aspects.

Based on different scenarios including diverse climatic and social constraints, a dynamic emerges which fits actual social processes. Another feature is the explicit spatial resolution of the model:

The actor types in the model are distributed according to their real distribution. This is done by using data from Microm<sup>®</sup> who use themselves the Sinus-Milieus<sup>®</sup>.

The diffusion of water saving innovations is already implemented in *DeepHousehold*. Presently, a theoretical concept of risk perception regarding climate change and drinking water is being developed and implemented. The acceptance and reactance of interventions and their possible behavioral effectiveness regarding habit formation is to be captured similarly.

These advancements of the model enable to run socio-scientific scenarios under conditions of global climate change, in order to estimate potential conflicts and risks for acceptance.

## **Processing**

It is intended to upgrade the *DeepHousehold* model with respect to the following factors:

- Further development of psychological-social indicators for satisfaction and risk perception. These indicators are then to be used for decision support.
- Building scenarios to analyze the psychological-social indicators.
- Further validation and quality management of the model and its interactions with DANUBIA
- Integrative work to suit the realization of the decision support to the stakeholders.
- Provision of the scientific expertise of the project

## **Recent Publications**

### Publications

Ernst, A. (in press). Ökologisch-soziale Dilemmata. In E.D. Lantermann & V. Linneweber (Hrsg.), *Enzyklopädie der Psychologie*, Serie IX, Umweltpsychologie, Bd. 1. Göttingen: Hogrefe.

Ernst, A. & Kuhn, S. (in press). Trinkwasser - Grundlagen und psychologische Aspekte seiner Nutzung In V. Linneweber & E.D. Lantermann (Hrsg.), *Enzyklopädie der Psychologie*, Serie IX, Umweltpsychologie, Bd. 2. Göttingen: Hogrefe.

Ernst, A., Schulz, C., Schwarz, N. & Janisch, S. (in press). Modelling of water use decisions in a large, spatially explicit, coupled simulation system To appear in: B. Edmonds, C.H. Iglesias, & K.G. Troitzsch (eds.), *Social Simulation: Technologies, Advances and New Discoveries*.

Schwarz, N. & Ernst, A. (2006). Using empirical data to build an agent-based model of innovation diffusion. In: *Proceedings of the workshop on agent-based models of market dynamics and consumer behaviour*, Surrey, GB, January 17/18, 2006.

Ernst, A., Kuhn, S., Schulz, C., Schwarz, N. & Seidl, R. (2006). Wasserverbrauch privater Haushalte und des öffentlichen Dienstleistungssektors. In: GLOWA-Danube-Projekt (Hrsg.), *Global Change Atlas. Einzugsgebiet obere Donau*. München: Ludwigs-Maximilians-Universität.

Ernst, A., Schulz, C., Schwarz, N. & Janisch, S. (2005). Shallow and deep modelling of water use

in a large, spatially explicit, coupled simulation system In: Troitzsch, K. et al (eds.) *Proceedings of the 3rd Conference of the European Social Simulation Association (ESSA)*, Koblenz, Germany, Sept. 2005., Germany

### Talks

Ernst, A. (2007.02). *Zwischen Risikowahrnehmung und Komplexität: Über die Schwierigkeiten und Möglichkeiten kompetenten Handelns im Umweltbereich*. Tagung Operationalisierung und Messung von Kompetenzen der Bildung für nachhaltige Entwicklung, Berlin.

Ernst, A. (2006.12). *Die integrierte Modellierung von Wassernutzung – eine verhaltenswissenschaftliche Perspektive*. Graduiertenkolleg Interdisziplinäre Umweltgeschichte, Universität Göttingen, Workshop: Vom Wasser. Umweltgeschichtliche Perspektiven auf Konflikte, Risiken und Nutzungsformen.

Ernst, A. (2006.10). *Actor based modeling as an integrative tool*. Sino-German workshop on integrated ecosystem assessment and comprehensive watershed management of Poyang Lake Basin, Nanchang, China.

Kuhn, S. (2006.09). *Determinanten von gewohnheitsgeprägtem Umweltverhalten am Beispiel der Wassernutzung*. 45. Kongress der Deutschen Gesellschaft für Psychologie Nürnberg

Seidl, R. & Ernst, A. (2006.09). *Subjektive Mentale Modelle von Umweltrisiken. Antizipation und Bewertung schleichender Risiken am Beispiel Globaler Klimawandel*. 45. Kongress der DGPs, Nürnberg

Schwarz, N. & Ernst, A. (2006.09). *Die Akzeptanz von Wassernutzungs-Innovationen in privaten Haushalten. Theorie und Empirie*. 45. Kongress der Deutschen Gesellschaft für Psychologie Nürnberg

Schulz, C., Schwarz, N., Ernst, A. (2006.09). *Ein agentenbasiertes Modell zur Abschätzung des Wassernutzungsverhaltens privater Haushalte. Kopplung sozial- und naturwissenschaftlicher Modelle*. 45. Kongress der Deutschen Gesellschaft für Psychologie Nürnberg

### Poster

Ernst, A., Kuhn, S., Schulz, C., Schwarz, N. & Seidl, R. (2005.05). *Domestic drinking water use: The household model*. Poster presented at the GLOWA-Statuskonferenz, Köln.

Seidl, R. (2006.11). *Anticipation of and emotional reaction to slowly evolving environmental risks*. Poster presented at the Workshop: Intuition and Affect in Risk Perception and Decision Making, Bergen, Norway.

Seidl, R. (2006.02). *Individual anticipation of slowly evolving environmental risks*. Poster presented at the University of Kassel.

Janisch, S., Barthel, R., Schulz, C., Trifkovic, A., Schwarz, N. & Nickel, D. (2006.04). *A Framework for the Simulation of Human Response to Global Change*. European Geosciences Union General Assembly 2006, Wien, Österreich.