

## Habitual behaviour and ecological consumption

# Exploring routines of leisure time mobility

In Germany about 20 percent of CO<sub>2</sub>-emissions are caused by traffic. A considerable amount of this effect on the environment has to be assigned to mobility behaviour in the field of leisure time activities. What are the conditions to achieve a change in this field?

By Frank Beckenbach, Ramón Briegel, Wilfried Konrad, Gerd Scholl and Stefan Zundel

For more than 300 billion kilometer per person a car is the preferred transport option (Konrad/Scholl 2009). Since this behaviour is often routinely or habitual, changes of traffic means seem much more difficult to obtain than in cases where deliberate decisions are carried out. The main topic of the research project Dynamikon, presented in the following article, is the conditions of change in a social system dominated by habitual behavior (1).

### Introduction

In the literature we find strong hints that decisions about means of traffic are often based on routines (for example Lanzendorf 2003 or Gärling/Axhausen 2003). Hence, attempts to change the modal split especially to substitute car-use by the usage of public means of traffic have to surmount a barrier of deeply entrenched habits. Hence, the factors that are responsible for establishing such routines, and also the factors for breaking such routines, are of special interest.

Our conceptual set up synthesizes approaches from behavioural psychology and economics: the framework of Ijek Ajzen (theory of planned behavior), Maslow's theory of needs (pyramid of needs) and the basic tenets of Carnegie school (Simon/March) of how information is picked up and transformed in a bounded rational fashion. In the second section of this article we present a rough overview about the most important features of our concept (2).

The DYNAMIKON Project was designed to generate empirical evidence that validates the relevance and conceptualisation of the theories it is based on. Furthermore it aims to obtain data that may validate the architecture of the multi-agent-modelling and to identify target groups particularly prone to switch to more sustainable mobility behaviours. DYNAMIKON encompassed three major activities as regards empirical investigation:

- Explorative face-to-face interviews that were conducted with 11 respondents from Berlin.
- A representative telephone survey that was done among 1,000 randomly chosen people living in the region of Kassel: city, suburban, rural area. (Konrad/Scholl 2009a)
- Qualitative interviews, with almost 30 people from the same region (3).

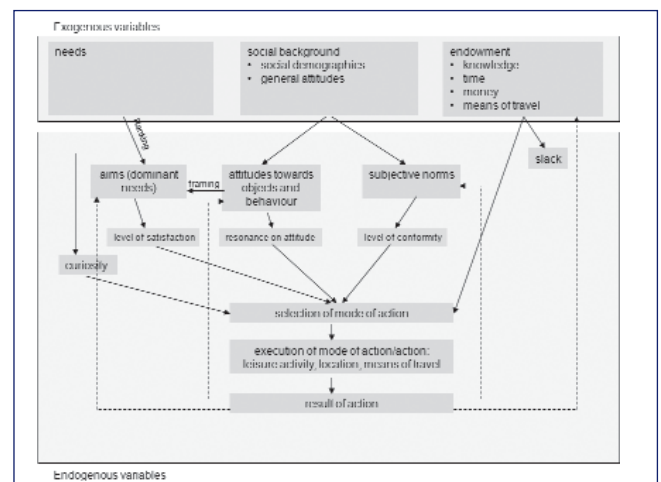
The third section of this article presents selected results of our empirical investigations.

Conceptual ideas and empirical findings are finally incorporated in a simulation model. In this simulation model the activity of each actor as well as their interaction is explicitly dealt with in a time-dependent manner (agent-based model). These processes create a time path of activities in terms of leisure activities. Based on this it can be investigated to what degree and how this time path of the overall activities changes if the boundary conditions for the actors are altered (scenario analysis). Some selected scenarios generated by the agent-based simulation model will be presented in the fourth section.

### Conceptional approach

The theory of planned behaviour (TPB) was founded by Ajzen and Fishbein and was enriched and detailed mainly by Ajzen over the past years (Fishbein/Ajzen 1975, Ajzen 1988, Ajzen 2005). We adopted their basic idea, that action is influenced by three main driving factors: attitudes towards behaviour,

Figure 1: Overview of the conceptual model



Source: author

subjective norms and perceived behavioural control, which Ajzen takes to address subjective beliefs about an agent's ability to act like he or she wants. Furthermore we assume that attitudes towards behaviour are strongly influenced by needs and the degree of their satisfaction. We borrowed ideas from Maslow, who stated that there are classes of basic needs, ordered in a hierarchical manner (Maslow 1954, Alderfer 1972, Maslow 2005). Contrary to traditional economic textbook thinking we agree with the concept of bounded rationality of Simon, which he uses to especially address limits of knowledge and of knowledge processing of agents (Simon 1955, Simon 1957, Kahnemann 2002 for an overview of modern concepts of bounded rationality). Figure 1 shows an overview of our conceptual model.

One important feature of the model is the explanandum. We like to explain not only a specific action, that is choosing a mode of travel, travelling by feet, using a bicycle, using means of public transportation or taking a car, but also the mode of action in which such a selection takes place: routines, deliberate choices or adoption.

According to empirical results of mobility research, agents often act in a routine mode (Gärling/Axhausen 2003). Routines are simple heuristics that connect particular characteristics of situations with particular actions. A decision may be interpreted in the sense that feature x of a situation, for example a short distance, stimulates an action a, for example walking. The genesis of a routine like this is probably the result of a former weighting of different actions and their consequences. Once established, a routine does not need the cognitive effort of evaluating possible outcomes any more.

We assume that agents normally choose their mode of action with the smallest possible cognitive effort (Beckenbach 2004). Therefore, routines can be seen as the default mode of action. Routines are discarded when the result of the routine is not in accordance with the aims and attitudes of the agent performing the routine. Subsequently, a switch to another mode of action will follow; that is actions are chosen deliberately by evaluating their consequences. In contrast to traditional economic thinking, we assume that the agents in our model act according to their bounded subjective knowledge, instead of objective unbounded knowledge. Therefore an agent's knowledge is restricted and sometimes even wrong. Furthermore, the agents in our model have a limited memory, causing them to forget certain issues after a while and allowing them to learn something new. Our model's third mode of action represents a special case of learning, which we have labelled imitation or adoption that is the observation and adaptation of new opportunities of action. An agent is able to study other agents and imitate actions that appear successful to him. In general, the third mode of action will be chosen when all the other modes do not bring satisfactory results according to the actor's needs.

Obviously our model contains feedback-loops (broken lines in fig. 1), which normally reinforce routines, but sometimes, new experiences can break and change routines. From a systematic point of view we distinguish three cases:

- When an agent lacks a certain level of satisfaction, he or she very often has to correct either his/her aims or his/her actions. For example: if an agent experiences an outbreak of violence in public transportation, his need for safety will not be met any longer and an incentive to change the means of transport will be activated.
- If the action is frequently not in accordance with the agent's attitudes, the agent either has to change his attitude or the agent has to act more in line with the given attitudes at that moment. For example: if someone believes that driving a car is the most convenient way to come from A to B and is forced to use public transport due to high fuel prizes, he will have an incentive to change his attitude towards driving a car.
- If the action does not correspond to the subjective norms of the actor, there will either occur an incentive to choose another action or the social cohesion of the peer group is affected. For example: In a group of friends everyone normally uses a car and has a positive attitude towards using a car, but one member of the group is the only one who has to use public transportation because he cannot afford a car, a feeling of dissonance will probably grow in the long run.

## Empirical findings

The first series of interviews revealed that the routine strength linked with certain major means of transport is fairly high with some respondents, and pretty low with others. Weak routines lead to the use of a wide spectrum of different means of travelling, and individuals show multiple routines in the choice of their means of transportation, that is the evoked set involves more than one alternative. Transport choices are preponderantly made in an automatic fashion. Situational factors, like weather conditions or the individual health state determine the choice of alternative means of transportation in case of multiple routines. Breaks of mobility routines, if they occur at all, are often closely related to biographical events, for example relocation or acquisition of a driving licence.

The observations made during the explorative interviews concerning decision-making routines and the relevance of life events for routine breaks were generally proven and furthermore differentiated by the findings of the telephone survey. In all considered spatial areas, the majority of respondents characterize their travel choices for leisure time activities as routine processes. For instance, 77 percent of all respondents agree with the statement "If I plan going out for a leisure time activity, I have already set the means of transport I use".

The habitual decisions concerning travelling choices do not only depend upon the considered activity, but also on whether the activity is done alone or with family or friends. 79 percent of respondents agreed to the statement: "Which means of transport I use for a certain activity depends on whether I go on my own or with my family or with my friends". This shows a level similarly high to the previous one, no matter if the respondent lives in the city, in the suburbs, or in a rural area. ➔

In the context of leisure time mobility behaviour, deliberate choice is rarely seen and it requires strong external triggers to be activated, as was revealed by the questions dealing with past changes to the favorite means of transportation. Only small groups of respondents displayed such an experience, caused mainly by certain life events or by alterations in transport supplies and prices:

- One third of the respondents from Kassel city had changed their means of transportation, mostly because they moved or started a family. In the suburbs and the rural area only one fifth of the respondents changed means of transportation for the same reason.
- A change in prices was more often the cause for shifts in modal splits in Kassel (30 percent) and in the rural area (28 percent) than it was in the commuter's belt (24 percent). The most important changes mentioned, were increases of the costs of public transport and of private vehicles. In Kassel city, the latter was mentioned less often than the former. In the rural area, it was the other way round. People from the suburbs mentioned both kinds of cost stimuli equally often.
- Only 15 percent of the respondents ascribe a shift in modal split to a change in transport supplies. Most often these changes were novelties in public transport.

From this brief overview we can conclude that habitual behaviour is strongly relevant in leisure time mobility, that strong external stimuli are necessary to break existing routines and that they provide a range of opportunities for behavioural change.

However, the strength of behavioural routines varies among the population. Five clusters have been identified showing different characteristics in terms of socio-demographics, attitudes, endowments and habitual strengths (see Table 1).

Interventions aiming at a more intense use of public transportation in leisure time should, on the one hand, address the "pragmatic multi-modals" and the "elder public transport users". They should respond to their specific motivations, such as pragmatism or security, and, thereby, try to expand their use of public transport. On the other hand, new customer segments, such as the "environmentally sensitive car users", should be developed by creating offers that respond to their mix of altruistic motivational drivers: environmental protection and individualistic motivational drivers: convenience, fun.

These empirical findings are related to a more or less small time span. Broadening this perspective to include a larger sequence of time steps being linked to each other in a dynamical perspective is the *raison d'être* of the simulation model.

Table 1: Overview of leisure time mobility clusters

	pragmatic multi-modals	practical motorists	convinced motorists	environmentally sensitive car users	elder public transport users
	27.9 %	24.5 %	18.0 %	16.9 %	12.7 %
<b>most prominent demographics</b>	young; with children; city	high educational level; high income; suburban/ rural area	male; rural area	male; high income; suburban area	old; low educational level; low income; city
<b>most prominent attitudes</b>	pragmatic towards means of transport; middle-range environmental orientation	strong functional relation to cars; little environmental orientation	strong symbolic relation to car; no environmental orientation	strong relation to car; strong environmental orientation; mobility as fun need for security and safety	control and routines important; no environmental orientation; mobility no fun
<b>endowment</b>	little car ownership; high level of season tickets ownership; good level of public transport provision	high level of car ownership; low level of season tickets ownership; middle range level of PT provision	high level of car ownership; low level of season tickets ownership; middle range level of PT provision	high level of car ownership; low level of season tickets ownership; low level of public transport provision	little car ownership; high level of season tickets ownership; good level of public transport provision
<b>leisure time travel modes</b>	equal use of car and public transport	mainly car use	mainly car use	mainly car use	equal use of car and public transport
<b>action modes</b>	lower level of routine; higher level of deliberation	average routines; low level of deliberation	higher level of routine; mid level of deliberation	high level of routine; mid level of deliberation	higher level of routine; mid level of deliberation

Source: author

### Selected results of an agent-based simulation model

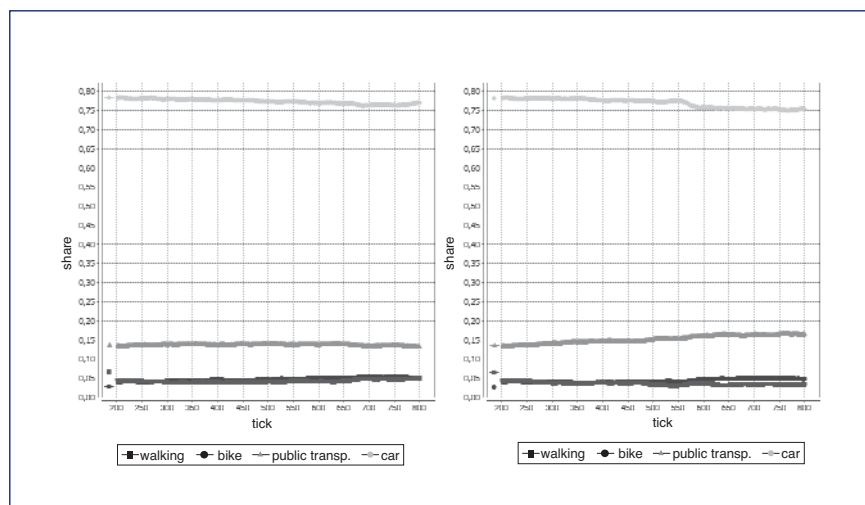
Modelling the cognitive architecture of human actors, as sketched above, and depicting the heterogeneity resulting from it necessitates to choose a multi-agent approach. As already mentioned above, activating and pursuing routines is considered as a specific mode of action different from deliberate choice as well as from adopting new upcoming ways to act. According to our conceptual design we apply the tools for analyzing bounded rationality to the different goal dimensions of behaviour incorporated in our framework (that is satisfaction of needs, attaining behavioural consonance, conforming and pursuing curiosity). Hence, for each of these goal dimensions a lower and an upper level of aspiration is distinguished. The routine mode of action is activated by an agent if the degree of goal attainment is considered as being perfectly satisfying in terms

Table 2: Assumptions of the monetary push &amp; pull scenario

Time-step	var. cost car	var. cost public transport
bis 249	20 ct/km	10 ct/km+100ct /trip
250...349	20 ct/km	5 ct/km+50 ct/trip
350...449	25 ct/km	5 ct/km+50 ct/trip
450...549	25 ct/km	0
ab 550	30 ct/km	0

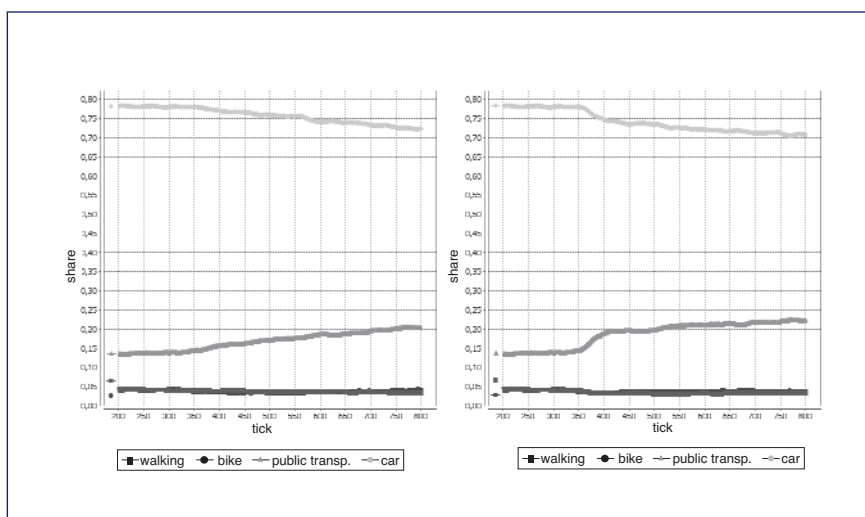
Source: author

Figure 2: Reference scenario (left); monetary push &amp; pull scenario (right)



Source: author

Figure 3: Simple innovation scenario (left); innovation &amp; marketing scenario (right)



Source: author

of all goal dimensions. If this condition is not given, the other modes of actions come into play. If the upper aspiration level is not met in any of the goal dimensions the agent will select deliberate choice; if the lower aspiration level is not met in any of the goal dimensions an adoption procedure toward new options will be pursued.

In each time step every agent perceives his or her situation and correspondingly selects a means of transport for pursuing his or her leisure activity. The path of relative shares of different means of transport is the result of the simulation model, that is the macroscopic feature to be explained is the over-all modal split of the agents.

The simulation comprises 500 agents. Their leisure activity, in terms of modal split, is depicted over a time span of six years

after the transition phase is over, that is the system shows any type of regularity. 100 ticks in the following graphs correspond to one year. Here we have confined ourselves to present singular runs.

The starting point is a reference scenario that assumes a secular increase of the cost for public transport (2 percent per year) and for car use (5 percent per year). This scenario is the baseline of all the following scenarios. Figure 2 (left side) shows that the modal split almost remains constant over time (4). For analysing the effects of costs more closely we assume that there is a time-dependent inverse change of cost for car use on one side and use of public transport on the other side. This monetary push and pull scenario is presented in figure 2 on the right side. Table 2 specifies the corresponding assumptions. In this scenario we can observe that introducing free fares for public transport is not sufficient for switching from car use to public transport. Only a combination of further cost increases for car use and free fares for public transportation generates a noticeable substitution in public transportation and using the bicycle instead of using the car.

Another possibility to increase the attractiveness of public transport for leisure activities is to innovate it in terms of improving its utility for the users (for example better safety regulations, or increased frequency). In a simple innovation scenario (figure 3,

left side) such an innovation is assumed to occur in time steps 300 and 350. Depending on the dynamics of diffusion, in terms of knowledge about the innovation, it now shows a more distinct substitution of using public transport facilities instead of private cars. This effect can be improved significantly if innovative measures are accompanied by a matching marketing campaign, taking place between time steps 350 und 399, which communicates the innovation to the agents. This innovation and marketing scenario is depicted in figure 3 on the right side.

The environmental effect of these scenarios can be illustrated by using the specific CO<sub>2</sub> emissions of the different means of transport. Figure 4 summarizes the overall reduction of CO<sub>2</sub> emissions for the scenarios considered so far depicting the reduced amount of emission if compared to the reference →

*„Overcoming habitual behaviour needs a strong impulse, which can be generated autonomously, typically by biographical changes.“*

scenario. Furthermore it shows that the enhancement of the reference scenario (R) by a combination of monetary incentives (P), innovative measures (I) and marketing campaigns (M) not only generates an addition of single reduction effects but, due to nonlinear relationships within the interaction of agents, even more than that (5).

From this scenario-analysis we can conclude that the system is generally rather inertial due to the prominent role of routines in leisure mobility. Hence, single measures are not sufficient for a significant change of the modal split. Rather, multiple impulses have to be combined in a confined time span: window of opportunity, and have to be ordered in an appropriate manner: path dependency.

## Conclusions

Overcoming habitual behaviour needs a strong impulse, stronger than the one leading to deliberate action. Such an impulse can be generated autonomously, typically by biographical changes. Then the main tasks are either identifying such windows of opportunity and the people who are in it, or to create such a window by strong and combined measures that have to

be ordered in a fitting way. The implementation of a new and more convenient train in combination with a change of prize relation between car and public traffic, accompanied by a marketing campaign promoting the new service could be one example. At this point it has to be mentioned that such time windows and policies do not necessarily move in an ecological direction. For example in the case of an eighteen year old boy, who gets a driving licence, combining biographical change and window of opportunity, and is now allowed to drive the family car. Here we clearly find a potential customer of the car industry.

Verplanken and Wood suppose that 40 to 50 percent of our daily actions are the result of routines (Verplanken/Wood 2006). Routines are ubiquitous, they can be found everywhere in our daily life. Moreover, they are indispensable for our daily life, because they structure and order our life and, as we mentioned above, they relieve our cognitive efforts. With routines we do not have to think about any daily decision. Against this backdrop breaking routines do not mean that one should act deliberately every time, but it means that we should create better and, in our case, more ecological routines than before.

Further research is still needed. Decisions on transportation for leisure time activities depend strongly on institutional and technical structures: for example on car ownership and transport relations between work and home on one side and on cultural embedded attitudes towards different kinds of transport on the other side.

Therefore these decisions have to be seen in a wider systemic context if we want to know the range of routine breaks. Routine breaking possibly only has a small range because of the manifold factors influencing them. Due to such links it is not very surprising that leisure time traffic represents a very conservative social system. This might not be true for all fields of consumption.

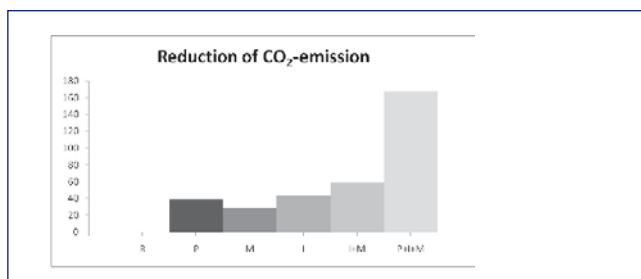
## Annotations

- (1) Dynamikon is an acronym for the German title of the research project, which addresses the dynamics of consumer behaviour. The authors are grateful to the German Ministry of Education and Research, by which the research project Dynamikon was funded.
- (2) For more details of our conceptional framework see (Zundel 2008).
- (3) The results of the in-depth interviews are not discussed here, but in (Konrad/Scholl 2009b).
- (4) Apart from a slight increase of walking activity and usage of bicycles.
- (5) This scenario of combined effects is enriched by assuming a change of speed in public transport (increase) and of cars (decrease).

## References

- Ajzen, I.: Attitudes, Personality and Behavior. Chicago 1988.
- Ajzen, I.: The theory of planned behaviour. In: Organizational Behavior and Human Decision Processes 50/1991, S.: 179-211.
- Ajzen, I.: Attitudes, personality and behavior. Maidenhead, New York 2005.
- Alderfer, C. P.: Existence, relatedness and growth. Human needs in organizational settings. New York, London 1972.
- Beckenbach, F.: Das Handlungskonzept in der Evolutorischen Mikroökonomik. In: Kerber, W.: Studien zur Evolutorischen Ökonomik. Berlin 2004, S.: 29 - 68.
- Fishbein, M. / Ajzen, I.: Belief, attitude, intention, and behavior: an introduction to theory and research. Reading 1975.

Figure 4: Ecological results of different scenarios



Source: author



- Gärling, T. / Axhausen, K. W.: Introduction: Habitual travel choice.  
In: *Transportation* 30/2003, S.: 1-11.
- Kahnemann, D.: Maps of Bounded Rationality. Nobel Prize Lecture 2002.  
Internet: [http://nobelprize.org/nobel\\_prizes/economics/laureates/2002/kahnemann-lecture.pdf](http://nobelprize.org/nobel_prizes/economics/laureates/2002/kahnemann-lecture.pdf)
- Konrad, W. / Scholl, G.: Verhaltensroutinen in der Freizeitmobilität.  
Ergebnisse einer qualitativen und quantitativen Befragung. Schriftenreihe des IÖW 193/09, Berlin 2009a. Internet: [http://www.ioew.de/uploads/tx\\_ukioewdb/IOEW-SR\\_193\\_Freizeitmobilitaet\\_02.pdf](http://www.ioew.de/uploads/tx_ukioewdb/IOEW-SR_193_Freizeitmobilitaet_02.pdf) (last accessed 01.03.10)
- Konrad, W. / Scholl, G.: DYNAMIKON – Umbruchsdynamiken im Konsum und nachhaltige Innovationspfade: Eine Untersuchung am Beispiel der Freizeitmobilität. Auswertung der qualitativen Vertiefungsinterviews, Berlin/Heidelberg 2009b. Internet: [http://www.ioew.de/no\\_cache/publikation\\_single/DYNAMIKON/?tx\\_t3ukioew\\_pi1\[pointer\]=2&cHash=037e8076c17768323548162d6083db7e&sword\\_list\[0\]=dynamikon](http://www.ioew.de/no_cache/publikation_single/DYNAMIKON/?tx_t3ukioew_pi1[pointer]=2&cHash=037e8076c17768323548162d6083db7e&sword_list[0]=dynamikon) (last accessed 08.03.10)
- Lanzendorf, M.: „Thrill und Fun“ oder „immer die gleiche Leier“? Freizeitmobilität und Routinen. In: Hautzinger, H. (Hrsg.): *Freizeitmobilitätsforschung. Theoretische und methodische Ansätze*. Mannheim 2003, S.: 89-104.
- Maslow, A.: *Motivation and Personality*. New York 1954.
- Maslow, A.: *Motivation und Persönlichkeit*. Hamburg 2005.
- Verplanken, B. / Wood, W.: Interventions to Break and Create Consumer Habits. In: *Journal of Public Policy & Marketing* 25, 1/2006, S.: 90 - 103.
- Zundel, S.: Architektur eines Handlungsmodells zur Modellierung der Freizeitmobilität. Hochschule Lausitz. Senftenberg 2008. Internet: [http://www.ivwl.unikassel.de/beckenbach/PDFs/DYNAMIKON\\_Architektur%20eines%20Handlungsmodells.pdf](http://www.ivwl.unikassel.de/beckenbach/PDFs/DYNAMIKON_Architektur%20eines%20Handlungsmodells.pdf)

#### ■ AUTHORS + CONTACT

**Dr. Frank Beckenbach** is economist and professor at the University of Kassel, Department of Economics.

University of Kassel, Nora Platiel Str.4, 34109 Kassel, Germany.  
Phone: +49 0561 8043884, Email: [beckenbach@wirtschaft.uni-kassel.de](mailto:beckenbach@wirtschaft.uni-kassel.de),  
Internet: <http://www.ivwl.uni-kassel.de/beckenbach/>

**Dr. Ramón Briegel** is mathematician and research fellow at the Center for Environmental Systems Research at the University of Kassel.

University of Kassel, 34109 Kassel.  
Email: [ramon.briegel@gmx.de](mailto:ramon.briegel@gmx.de)

**Dr. Gerd Scholl** is economist and head of IÖW's research field "Ecological Consumption".

IÖW, Potsdamer Str. 105, 10785 Berlin. Phone: +49 30 88459420,  
Email: [gerd.scholl@ioew.de](mailto:gerd.scholl@ioew.de), Internet: <http://www.ioew.de>

**Dr. Wilfried Konrad** is researcher at DIALOGIK non-profit institute for communication and cooperation research.

DIALOGIK, Lerchenstr. 22, 70176 Stuttgart, Germany.  
Phone: +49 (0)711 3585 2165, Email: [konrad@dialogik-expert.de](mailto:konrad@dialogik-expert.de),  
Internet: <http://www.dialogik-expert.de>

**Dr. Stefan Zundel** is professor for environmental economics and energy economics at the University for applied Sciences Lausitz in Senftenberg.

Hochschule Lausitz, Großenhainer Straße 57, 01968 Senftenberg, Germany. Phone: +49 3573 85441,  
Email: [zundel@hs-lausitz.de](mailto:zundel@hs-lausitz.de)



Das Fachbuchjournal.  
Jetzt abonnieren:  
[www.fachbuchjournal.de](http://www.fachbuchjournal.de)



(c) 2010 Authors; licensee IÖW and oekom verlag. This is an article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivates License (<http://creativecommons.org/licenses/by-nc-nd/3.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.