Integrating research and teaching by inter- and transdisciplinary case-studies: The case-study on mobility management along corridors.

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1 Introduction

Research and teaching on sustainability issues such as mobility management is always linked to handling ill-defined, highly complex problems. Hence, a paradigm shift towards a holistic problem solving approach involving systems thinking is needed. Here, inter- and transdisciplinarity are considered to be the main characteristics of effective sustainabilityoriented research and teaching. “Our objective must be to combine knowledge from different fields and traditions in such a way as to increase their power of expression and interpretation” (Kleiber 2001, 55). The next step to interdisciplinarity is transdisciplinarity, which involves not only interaction between scientists from different fields, but also intense interaction between academics and practitioners in order to promote a mutual learning process between them. It can be seen as a move from science on/about society towards science for/with society.

The purpose of this paper is to present and discuss selected results of an inter- and transdisciplinary case study on mobility management along corridors, conducted in the winter term 2010/11 at the University of Graz.

2 The case-study method

In the case study on mobility management, five researchers respectively university teachers from different scientific fields as well as ‘Environmental System Sciences’ students with different subject focus areas worked together with a municipality and a large scale enterprise south of Graz for one semester. The guiding question of the case study was how different actors along the corridor of the new suburban railway could intervene by measures of mobility management in order to positively influence the modal split. Here, emphasis was put on the commuter traffic of the employees of the enterprise and the traffic of the inhabitants of the municipality. Thus, within the case-study we formed three thematic working groups. The first group prepared an intervention within the company, the second analyzed mobility preferences and behavior of the employees, the third investigated the regional peculiarities of the municipality and the mobility behavior of the residents. Each group was tutored by two university teachers who also supported practical case work.

In the beginning of the semester, a target system and several milestones were set up between the students and teachers. Each milestone consisted of a defined working result and a fixed date. To encourage a self-regulated learning process it was left up to the students to organize their work, e.g. to distribute workloads amongst themselves, to schedule activities, to establish communication rules within the group, and to monitor the effectiveness of learning methods and strategies within self-oriented feedback loops. As central communication and information tool, a Moodle-learning-platform was set up where important background information was provided, discussions within forums could take place, and milestone and final reports could be uploaded.

Since intense interaction with stakeholders is essential in the concept of transdisciplinary case studies (Posch & Steiner 2006), each working group directly communicated with regional actors, such as the mayor and local authorities of the municipality as well as managers and representatives of the investigated company. In this way students, teachers and practitioners worked together to identify possible measures to achieve a more sustainable mobility system.

The findings of the case study are supposed not only to contribute to more sustainable travel behaviour of the employees of the company and the residents of the municipality investigated, but also to provide further evidence on the importance of inter- and transdisciplinary approaches for working on complex real world problems.

3 Results in regard to travel mode choices

3.1 Survey on mobility behaviour of employees

One main work package within the case-study was to empirically investigate the mobility behavior of the employees. For this, an online-questionnaire was developed, pretested and sent out via email to all employees of the company under investigation. 276 employees filled in and returned the questionnaire which is about 30 % of the total number of employees of the respective company. 77 % of the respondents were male, 23 % female, and only 4 % were shift worker.

The answers regarding to actually used means of transportation on the specific day of the survey (which was in December 2010) meet the general expectations: 82 % of the respondents had used a car for their way to work and back home, 73 % of them as driver and 9 % as passenger. In comparison, only 9 % stated that they had used public means of transport for their commuter traffic on this specific day. This result corresponds with the results of a similar survey in 2009 within the same company. Then, even 438 persons out of 475 respondents (92 %) declared to use a car for their commuter traffic.

Further, the criteria on which the travel mode choices are taken were of high interest. Response to the question “How important are the following criteria for your travel mode choice?” was graded according to a four step ordinal scale (1=very important, 2=important, 3=unimportant, 4=very unimportant). The Friedman’s homogeneity test shows that the distribution of the ranks in regard to the relative importance of the criteria for the travel mode choices is statistically significant (n=259, $\chi 2$=599.36, p<0.001). The most important criterion is time saving; 74 % of respondents state that the time saving is a very important criterion for their travel mode choice; the median is 1.20. The Wilcoxon’s test, which is a non-parametric test for assessing whether two related samples differ significantly in their central tendency, shows that this result is statistically highly significant in comparison to the criterion of cost savings (n=259, z=-7.613, p<0.001), and that of convenience (n=259, z=-9.228, p<0,001). It is worth mentioning that convenience and health impact were rated as almost equal important, both with a median of 1.70. There is no significant difference between these two criteria (n=259, z=-0.716, p=0.474). However, the criterion of environmental protection is again regarded as significantly less important. The by far least important aspect is image: 86 % of the respondents state that the image of the means of transport is very unimportant or unimportant for their travel mode choice.

In order to explain the low degree of utilization of public transportation for commuter traffic, the employees were asked to assess public transport for their way to work in regard of the criteria above. Response to the question was graded according to a four step ordinal scale (1=very positive, 2=positive, 3=negative, 4=very negative). The Friedman’s homogeneity test shows that the distribution of the ranks in regard to the relative assessment of public transport in regard to the criteria is statistically significant (n=255, $\chi 2$=262.89, p<0,001). The analysis of the three most important criteria shows that public transportation is assessed worst regarding the most important criteria of time saving: 60 % of the respondents assess public transport as very negative in regard to time saving, the median is 3.62. Also the assessments in regard to cost savings (median=2.81) and convenience (median=2.82) show a negative picture for public transportation, even though not as dramatic as in regard to time saving.

3.2 Calculation of travel time and costs

A further main task within the case-study was the calculation of the actual travel time and costs for the employees’ way to work and back home. For this, the company provided a list of the residences of the employees. After excluding shift workers from the list, the three student groups calculated and compared the actual travel times for 447 employees for driving a car or using public transport for their way to work. For this, the students used the online

information of the public transport provider in the province of Styria (www.busbahnbim.at) and the online route planner www.map24.at. For the ways from and to the bus stops, rail way stations, or parking areas of cars, as well as for congestion in urban areas, average assumptions were taken.

The calculation and comparison of travel times show that 16 % of the employees could even save up to 5 minutes travel time when using public transport compared to driving a car. For 18 % a switch to means of public transport would lead up to only 5 minutes and for further 24 % to up to 10 minutes longer travel time compared to driving a car. Only for 42 % of the sample, the travel time would increase more than 10 minutes.

Moreover, four main residential areas (Graz, Leibnitz, Gleisdorf, Gratkorn) were exemplarily chosen in order to calculate the specific costs for the journey to and from work. Actually, in all four cases the use of public transportation is by far less expensive than driving a car to and from work. Non surprising, also the calculated CO_2-emissions are always lower in case of public transportation.

3.3 Intervention within the company

One student group concentrated on possibilities for interventions within the company in order to convince employees to switch to public transportation. For this, the group designed and pinned a poster with an eye-catcher-slogan at different locations within the company. On this poster, also the advantages of public transport in regard to costs, time savings, and CO_2-emissions were communicated. Further, the opening date of the new sub-urban rail way was announced.

The employees had the possibility to write their names in a list in order to get a detailed infopackage including ticket for testing the public transportation. Although we were able to give away up to 100 tickets free of charge, only 52 employees were willing to test the public transportation. Few weeks later, the students made telephone interviews with the employees who got a test ticket. Actually, only 33 persons could be reached per telephone, of them only 19 had already used the ticket at that time. Although the sample size certainly does not allow for general conclusions, it can at least be stated that 10 of the 14 persons who tested public transportation indicated that they were willing to use public transportation also in future for their journey to and from work.

4 Discussion and conclusions

The central results of the presented case-study work in regard to the travel mode choices of employees can be summed up as following:

– Most important criteria for travel mode choices are travel time saving, followed by cost

savings.

- Means of public transportation are perceived as disadvantageous in regard to these criteria.
- Consequently, a large majority uses the private car for their journey to and from work.
- Detailed analyses showed that in fact for many employees a switch to public transportation would not cause significantly longer travel time. Costs of public transportation are in most cases lower than cost of car traffic.
- Even by providing free of charge ticket, it is not easy to convince employees to test means of public transportation, especially if the company provides enough parking space at no costs for employees.
- But many of those who tested public transportation state that they will continue to take means of public transportation.

Thus, it can be seen that travel mode choices are in many cases influenced by irrational biases and miss-perceptions. Consequently, the interplay between academics (students and university teachers) and practitioners has a high potential to enhance the quality of travel mode choices and in this way to contribute to a more sustainable mobility behavior in general. But the concept leads to benefits for all participants. The company might gain new insights through interaction with students and researchers in order to find appropriate measures for mobility management. Actually, in the presented case the company subsequently developed a whole set of mobility management measures in order to support public transportation and bicycling. The students' problem solving abilities and understanding of decision making processes are improved. This enables them to recognize what kind of intervention might contribute to an improvement of the mobility behavior. Researchers who act as instructors and tutors of students can also undertake research, not only focused on the specific problems as travel mode choices but also on the development of methods for knowledge integration.

References

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