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# PROFILE

# Researchers' Experiences, Positive and Negative, in Integrative Landscape Projects

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ABSTRACT / Integrative (interdisciplinary and transdisciplinary) landscape research projects are becoming increasingly common. As a result, researchers are spending a larger proportion of their professional careers doing integrative work, participating in shifting interdisciplinary teams, and cooperating directly with non-academic participants. Despite the growing importance of integrative research, few studies have investigated researchers' experiences in these projects. How do researchers perceive the outcomes of integrative projects, or career effects? Do they view the projects generally as successes or failures? This study analyses researchers' experiences in integrative landscape studies and investigates what factors shape these experiences. The data stems from 19 semi-structured qualitative interviews and a Web-based survey among 207 participants in integrative landscape research projects. It finds that researchers experience participation in integrative projects as positive, in particular discussions among participants, networking, teamwork, and gaining new insights and skills. Furthermore, most researchers perceive the projects as successful and as having a positive effect on their careers. Less positive aspects of integration relate to publications and merit points. Factors found to contribute to positive experiences include reaching a high degree of integration amongst the involved disciplines, common definitions of integrative research concepts, and projects that include a large share of fundamental research as well as projects with many project outcomes. Based on these findings, we advise future projects to plan for integration, facilitate discussions, and reach agreement on integrative concepts. We suggest that aspects of fundamental research be included in integrative projects. We also suggest that planning be done at an early stage for peer-reviewed publications, to ensure that participants gain merit points from their participation in integrative research efforts.

Integrative (= interdisciplinary and transdisciplinary) landscape projects have increased in number since the 1990s. More and more funding bodies with large national and international programmes support projects in which different disciplines cooperate to solve landscape-related problems (MRIT 1995, BMWV 1998, Brewer 1999, Höll and Nilsson 1999, BMBF 2000, RMNO 2001, NFR 2002, Bruce and others 2004, Jakobsen and others 2004). Funding bodies invest in integrative projects because they expect them to be more competent than single-discipline projects in solving pressing problems related to landscapes (Tress and others 2005a). Researchers are motivated to do interdisciplinary work by the perceived need to integrate knowledge from different disciplines in order to provide effective solutions for real-world problems. This is particularly evident when managing natural resources in human-dominated environments (Slocombe 1993, Armitage 1995, Frothingham and others 2002, Loveland and Merchant 2004, Redmann and others 2004) and for integrating social, economic, and ecological aspects for a sustainable development (Webb and Thiha 2002). This means transforming research ''from the realm of the general and abstract to the full complexity and specificity of concrete reality'' (Hansson 1999, p. 339). Further evidence of the increasing importance of integrative landscape studies is found in the fact that major international conferences have recently been dedicated to interdisciplinary and transdisciplinarity research, as reported by Brandt (2000), Klijn and Vos (2000), Moss (2000), Tress and others (2001), and Mander and others (2004). Fur-

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thermore, international journals have dedicated special issues to interdisciplinary and transdisciplinary research (e.g., *Ecosystems* in 1998, *Landscape and Urban Planning* in 2001, and *Futures* in 2004). Finally, Wu and Hobbs (2002) identify integrative research as a key priority for future landscape research.

Although this study pertains to the field of landscape research, we find parallel movements in a broad range of scientific fields including the health-sciences and bio-engineering (Metzger and Zare 1999, Gershon 2000a, Gershon 2000b). Recent observations and theories in the history and philosophy of science suggest that academia in all of its fields is in a fundamental transition from disciplinary to transdisciplinary structures, bringing change in research practices, knowledge institutions, and epistemology (Gibbons and others 1994, Weingart and Stehr 2000, Nowotny and others 2001). It is in this context that we analysed how researchers experience this change in their integrative landscape projects. Participating in these projects is no longer a one-time experience, but increasingly becomes the rule. Rather than working mainly in their own discipline, researchers are permanently engaged in shifting teams composed of colleagues from different disciplines. They also become more involved in direct cooperation with policymakers, other professionals in national, regional, or local governments, and with the public at large (Bellamy and Johnson 2000), represented as stakeholders in transdisciplinary projects (Serveiss and others 2004). These contacts certainly expose researchers to different attitudes towards research and might cause them to lose their familiar disciplinary ground, thus affecting the way they do research.

As the number of integrative projects increases and researchers' individual engagement in them becomes more permanent, the question arises of how participants in integrative projects experience their involvement in this type of research. What positive and negative impressions remain after a project is completed? Do researchers perceive the projects as successes or failures? Does participation in an integrative project have a positive or negative effect on researchers' careers? Despite the growing importance of integrative research, little is known about these aspects, and little data is available on the performance of these projects. Some studies that explicitly deal with integrative research are Hawkins (1997), Duffy and others (1997), Naiman (1999), Spanner (2001), Bruce and others (2004), Jakobsen and others (2004), and Jakobsen and McLaughlin (2004). These authors found poor organization, difficulties in leadership and personal chemistry, academic traditions and merit systems, power struggles, and publishing to be particular concerns. However, these studies are reflective in nature, or are reporting from a few case studies. None is based on the systematic collection of empirical data including a larger number of projects. Studies focusing on the experiences and perceptions of individuals in interdisciplinary teams are found only in the field of health care (Abramson and Mizrahi 1996, Cooke 1997, Cashman and others 2004).

This report has the objective to systematically analyse researchers' experiences in integrative landscape research projects. Specifically, it explores personal experiences related to relationships with other project participants, project management, merit points, and career effects. Furthermore, it looks at some of the factors that shape researchers' experiences. Factors that we considered as having potential influence are socio-demographic, financial, and research characteristics of the projects, as well as the researchers' roles in the project, their career status and previous experience with integrative research.

To avoid confusion regarding the central terms used in this study, we begin by providing some working definitions. By *landscape research projects*, we mean all studies carried out with the landscape as a basis for the investigation of mutual abiotic, biotic, and cultural processes or studies with strong relations to landscapes in general. These include, for example, studies on land use and land cover change, conservation of natural resources, landscape management, environmental and ecosystem management, landscape planning, biodiversity, ecosystems, landscape history, cultural landscapes, agricultural landscapes, suburban and urban landscapes, tourism and landscape, and landscape preferences. Given the breadth of our definition, it explicitly includes projects in the field of environmental management, which deal with one or more of the above-mentioned subjects.

We use the term *integrative projects* when referring to both interdisciplinary and transdisciplinary studies. We define *interdisciplinary projects* as studies that involve several unrelated academic disciplines in a way that forces them to cross subject boundaries to create new knowledge and reach a common research goal. By ''unrelated,'' we mean they have contrasting research paradigms. We might consider the differences between qualitative and quantitative approaches or between analytical and interpretative approaches that bring together disciplines from the humanities and the natural sciences. To us, true interdisciplinarity occurs when joint theories evolve between disciplines. We define *transdisciplinary projects* as studies that involve academic researchers from different unrelated disciplines as well

as non-academic participants, such as land managers, user groups, and the general public, to create new knowledge and theory and research a common question. Transdisciplinarity thus combines interdisciplinarity with a participatory approach. For a detailed discussion of integrative concepts and different use of terminology we refer to Jantsch (1970), Klein (1990), Weingart and Stehr (2000), Latucca (2001), Winder (2003), Balsiger (2004), COSEPUP (2004), and Tress and others (2005a, 2005b).

It is our intention to provide findings that researchers as well as funding bodies can use to further improve the quality and performance of integrative projects and make them a beneficial experience for all participants. To this end, this article looks into how participating researchers experience integrative projects. Participants' experiences reveal perceived strengths and weaknesses of the projects and thus provide a sharpened view of what the scientific community, as well as funding bodies, can and cannot expect from integrative research.

## Methods

The data for this study are derived from personal interviews and an anonymous Web survey of landscape researchers involved in integrative research projects. The interviews were conducted first. These provided in-depth insights into the experiences of researchers in integrative projects and identified a variety of experiences that might occur. Based on this information, we set up our Web survey to gather quantifiable data on researchers' experiences in integrative landscape projects.

### Interviews

To learn about ongoing projects, we collected written information (project descriptions, reports, and research programmes) on integrative landscape studies from large national research programmes in Europe. We then selected and contacted five projects within five national programmes, each from a different country. According to the project descriptions and the interviewees, the selected projects were all either interdisciplinary or transdisciplinary. The five selected projects dealt with; (1) management strategies for grazing; (2) the improvement of ecological and aesthetic qualities of agricultural landscapes; (3) integrated socio-economic and environmental modeling; (4) revitalization of a former mining-landscape; and (5) a regional study of an area dominated by glass house gardening.

We conducted 19 standardized open-ended interviews as described by Patton (2002) with selected participants from the five integrative landscape projects. Interviewees were selected to represent a variety of themes in landscape projects, to represent different research programmes, and to include researchers, project leaders, and PhD students.

The interviews were structured around seven thematic areas: understanding of and professional experience with integrative studies, project organization, integration of disciplines in the project, project outputs, participants' expectations towards the projects, participants' evaluation of the projects, and personal experiences in the project. These were areas we had identified from the literature review. Questions were open-ended and interviewees were encouraged to add whatever information seemed relevant to them. Interviews were conducted between September and December 2002. They lasted between one and three hours and were taped and fully transcribed. Transcripts were given an identifier, referring to the research project and the interviewed person within the project (e.g., A1 refers to interviewee 1 of project A). Depending on project size, between two and five representatives per project were interviewed (project A: A1, A2; project B: B1, B2, B3; project C: C1, C2, C3, C4, C5; project D: D1, D2, D3, D4; project E: E1, E2, E3, E4, E5). As participants were guaranteed anonymity, only identifiers appear in the text.

We performed a manual content analysis and cross-over analysis of the transcripts to identify predominant phrases and concepts and to derive information from the experiences mentioned (Patton 2002). We used the aspects identified as important by the interviewees for setting up the closed-ended questions of the Web survey.

### Web Survey

The aim of the Web-based survey was to directly address landscape researchers involved in integrative landscape projects on a broad thematic and international level. We chose a Web-based survey because it provided the best opportunity to reach project participants from different countries. Though Hayslett and Wildemuth (2004) found higher return rates for paper-based surveys, this was not an alternative for us due to our lack of contact information for potential respondents. Moreover, Schonlau and others (2002) found Web surveys to provide a higher quality of data in terms of completeness of the responses received compared to paper-based surveys.

Web surveys may be subject to coverage error among the general public, because Internet access is unequal among the population (Couper 2000). However, our target group was researchers recently involved in inte-

grative landscape projects, and we can assume that the Internet was available to all potential respondents. This excluded the chance of distortion in our sample due to coverage error. We tested a prototype of the Web survey with research colleagues and made changes to improve the textual and visual clarity and for ease of use of mouse buttons and scroll bars. Couper and others (2001) describe how the design of a Web survey can influence response patterns.

Our target group thus comprised all researchers who had participated in an integrative landscape project completed by the time of the survey. The survey was posted on the website of the INTELS project from June 2003 to June 2004. Invitations to participate in the survey were sent to 17 international mailing lists covering different areas of landscape studies. Each mailing list was contacted twice in the survey period. Additionally, we sent the invitation directly to 30 integrative landscape projects known to us and to about 1000 delegates at international landscape conferences held between June 2003 and June 2004. We can assume that only a minor part of the delegates contacted by e-mail actually is involved in integrative landscape projects, and thus within our target group. The invitations were sent once via e-mail. According to Hayslett and Wildemuth (2004), invitations for Web surveys by e-mail are more effective than paper notices. The text of the e-mail explained the objectives of the study and defined the target group. Recipients of the e-mails were asked to forward the message to colleagues who they knew were involved in integrative landscape projects. This process, which can be described as a mix of a convenience sample and probability sampling (Dillman 2000, Schonlau and others 2002), enabled us to address the hard-to-reach and identify population of landscape researchers involved in integrative projects. However, since we do not know the number of the total population of integrative landscape projects nor participants involved, we cannot provide a statement whether our survey is representative for the entire population. Consequently, we characterise our survey as an exploratory study.

A total of 207 researchers of interdisciplinary and transdisciplinary landscape projects from 28 countries took part in the survey. Response rates cannot be defined for Web surveys applying a convenience sampling approach because the group size of the population is unknown. However, for all types of Web-based surveys, estimated response rates vary between 7% and 44% (Schonlau and others 2002).

Our online survey began with a filtering question that asked respondents whether they had participated in an interdisciplinary or transdisciplinary project. Short definitions of both approaches were provided to avoid confusion on terms at this stage of the survey. Definitions presented are equivalent to the ones stated in the Introduction. Upon answering no, respondents were excluded from completing the survey further. Participants were also forced to answer each question in the survey; otherwise they could not proceed to the next section. This reduced to a minimum non-response errors such as lack of data due to missing values. Most of the survey questions were closed-ended and could be answered on a five-point scale (from 1 = negative to 5 = positive). Nominal (e.g., gender) and ordinal scales (e.g., project budget) were also used where necessary.

### Surveying Researchers' Experiences and Data Analyses

Respondents were asked to answer all questions in the survey with reference to their most recently completed integrative landscape project. To identify the respondents' experiences, we asked three questions (Q1, Q2, and Q3 below). For the first question, we provided 11 answer items and multiple answers could be given. Questions 2 and 3 allowed one answer item each. Researchers' experiences were thus surveyed using a total of 13 answer items.

Q1: ''*Which of the following did you perceive as positive or negative experiences in your project?*''

The 11 answer categories for this question were as follows: discussion, networking, teamwork, expectations, new insights, relationship among project participants, new skills, publications, merit points, project management, atmosphere. We did not provide a further definition of these answer categories in favour of a simple and effective questionnaire design. Additionally a category ''others'' (open field for additions) was offered. Fourteen respondents stated additional items, of which four could be assigned to the given categories and the remaining items were excluded from further analysis.

Q2: ''*Do you personally perceive the project as a failure or a success?*''

Q3: ''*Did the project have a positive or a negative effect on your career?*''

These questions could be answered on five-point scales. For Q1 and Q3, 1 = negative and 5 = positive. For Q2, 1 = failure and 5 = success.

These three questions with the 13 answer items served as our dependent variables in further statistical analyses, because we wanted to find out which factors influenced researchers' experiences.

Table 1. Independent variables used in the analyses

| No. | Categories and independent variables |
|---|---|
| | *Socio-demographic* |
| 1 | Age (<30, 30–50, >50) |
| 2 | Gender (female/male) |
| 3 | Highest level of education (high school, bachelor, master, PhD, engineering degree, other) |
| | *Financial framework* |
| 4 | Project size (1–5 participants, 6–20 participants, >20 participants) |
| 5 | Project budge (<100,000 EUR/USD, 100,000–500,000 EUR/USD, 500,000–1 millionEUR/USD, >1 million EUR/USD) |
| 6 | Project duration (<1 year, 1–3 years, 4–5 years, >5 years) |
| | *Professional experience* |
| 7 | Number of integrative projects in which respondent has participated (1, 2–5, 6, and more) |
| 8 | Role in project (participant, leader) |
| 9 | Career position at project start (PhD student, researcher, professor) |
| | *Research characteristics* |
| 10 | Type of project (interdisciplinary/transdisciplinary) |
| 11 | Degree of integration of disciplines that was reached in the project (scale from 1 = low to 5 = high) |
| 12 | Common agreement on concept of interdisciplinarity/transdisciplinarity (yes/no) |
| 13 | Share of fundamental research in project (scale from 1 = low to 5 = high) |
| 14 | Share of applied research in project (scale from 1 = low to 5 = high) |
| 15 | Share of consultancy /advice in project (scale from 1 = low to 5 = high) |
| 16 | Scientific outcomes of project (e.g., international peer-reviewed publications) (scale from 1 = low to 5 = high) |
| 17 | Product outcomes of project (e.g., methods, tools, guidelines, advice, outputs requested by funding body) (scale from 1 = low to 5 = high) |
| 18 | Outcomes for education and training (e.g., number of completed PhDs and master's degrees, student exchange, courses deriving from the project) (scale from 1 = low to 5 = high) |

We used four categories of independent variables: socio-demographic characteristics of the researchers, the financial framework of the project, the professional experience of the researchers, and the research characteristics of the project (see Table 1). The first three categories were represented by three variables each and the last category, research project characteristics, was represented by nine variables. Variables 13 to 15 survey the share of fundamental research, applied research, and consultancy/advice of projects. In this context, we define fundamental research as basic research carried out mainly to solve a scientific problem and to contribute to progress in science, while applied research aims mainly at the solution of a practical/real-word problem. Consultancy to us is the application of knowledge.

The analyses of the data from the Web-survey (N = 207) were carried out in a four-step process:

1. We used descriptive statistics to calculate the frequencies and means of the individual experiences.
2. We computed a new variable (named ''overall experience''), which is the mean of the sum of all 13 items (Q1, Q2, and Q3) that surveyed researchers' experiences. This variable reflects the overall experience of researchers in the integrative landscape research project.
3. We analysed correlations to reveal which independent variables did influence the overall experience of researchers. We used the independent samples t-test (2 groups) and the one-way ANOVA (>2 groups) for nominal independent variables. Both tests compare means for groups of cases. Significance in this case expresses that the means of two groups are significantly different (Bühl and Zöfelt 2002, Miller and others 2002). This is why no correlation values are given for the variables tested with the independent samples t-test in the correlation matrix tables (discussed later as Table 6). For correlation with ordinal and metric (5-point scale) variables we used, respectively, Spearman's correlation coefficient and Pearson's correlation coefficient.
4. We additionally compared means of the statistically significant variables in relation to the overall experience (see Tables 7–13) to clearly show the direction of influence of these variables.

## Results

We first present the experiences of researchers as identified in the interviews. Then we look at the researchers' assessment of their experiences as reported in the Web survey. Finally, we present the

Table 2. Positive experiences of selected interviewees

| No. | Question: ''What were the positive experiences in the project?'' | Interviewee |
|---|---|---|
| 1 | ''The amount of energy you get from other people. The inter-human part of it. And it gave me status. This project [gave] me the opportunity to battle and I learned [from] it.'' | (B2) |
| 2 | ''I gained respect during the project. At the beginning I was not more than the assistant, towards the end I was taken seriously. I also learned a lot of practical things. Well I hope that I can complete the dissertation in some time ... I learned to lead workshops, also I gained management experience.'' | (C1) |
| 3 | ''The most positive experience is what you learn when working transdisciplinary. You learn a lot from the others, whether they are scientists or practitioners. Of course, you learn more from someone who is not so close to your own field of research.'' | (C2) |
| 4 | ''Cooperation within the team and to see everything from many different perspectives. I have also learned... methods and new approaches.'' | (C3) |
| 5 | ''The motivation of all participants, everyone fully supported the project. In the end we had no money anymore, but we completed the project anyway.'' | (D1) |

Table 3. Negative experiences of selected interviewees

| No. | Question: ''What were the negative experiences in the project?'' | Interviewee |
|---|---|---|
| 1 | ''It is not a project as we learned in project management. It is going in circles. You can only define an aim on the horizon and when you climb the first mountain, you can see further.'' | (B1) |
| 2 | ''It was a tough job, it took enormous energy. The administration of the project was chaos.'' | (B2) |
| 3 | ''You think you agree on things and you know what to do the next half year, but there are still people who see this totally different. In spite of the fact that you have discussed it again and again and again and again. It just does not stop.'' | (C1) |
| 4 | ''The need for discussions and communication in such a project is much higher than you can ever put in your budget. There are also limits in terms of efficiency.'' | (D1) |
| 5 | ''There was too short time to produce publications.'' | (E1) |
| 6 | ''I could not fulfil the scientific expectations placed on me by the institute solely from this project. ...For your scientific reputation you do not get much out of such [transdisciplinary] projects.'' | (C5) |

factors found to influence researchers' experiences in integrative landscape projects.

### Researchers' Experiences as Expressed in Interviews

All interviewees gave one or more examples of positive experiences in their integrative research project. Aspects mentioned by several interviewees as positive were the interpersonal relationships and working in a team of researchers (A1, B2, C1, C2, C3, C4, C5, D1, D2, D3, D4, E2, E5), learning and gaining insights about new fields (A2, C1, C2, D2, D3, E1), and acquisition of skills (C1, C3, C4, E4). Two interviewees said that overcoming the difficulties in the project had made them more confident (see Table 2 for a selection of quotes from the interviews).

Regarding negative experiences, interviewees mentioned poor project management and struggles in project organization (A2, B1, B2, C1). Many pointed out that they had long and difficult discussions during project meetings, and they felt this was ineffective (C1, C2, C4, D1, D3, E1). At the same time, however, they were convinced that the discussions were a necessary part of the project process (see Table 3 for selected statements). Interviewees also mentioned a general dissatisfaction with publications (A2, C2, C5, E1) and scientific merits (C5, E2, E5) accrued from the projects. By merit points, we mean a system rewarding researchers for valuable achievements. Academic merit systems are generally structured to recognize and reward the meritorious performance of researchers in a specific area or activity. Most such merit systems give (monetary) reward for publications, gaining research grants, academic honours, and for services to the institute (Forsyth 1999, Reichert and others 2002). Promotion and tenure of researchers can be dependent on earning a certain number of merit points.

Table 4. Career effects as experienced by selected interviewees

| No. | Question: ''Career-wise, what was your personal benefit from the project?'' | Interviewee |
|---|---|---|
| 1 | ''I got some contacts that I still keep and that I use to set up new projects.'' | (A2) |
| 2 | ''If you aim at an academic career, for instance, as a professor, a transdisciplinary project might not be very helpful; it might even be counterproductive. If you do it because you are interested in this kind of research, and not in your career or in money, then it is a benefit. You get access to entirely different networks than before.'' | (C2) |
| 3 | ''If I were to depend on this project for my career, [it] would be very poor. The scientific output was small. It is difficult to combine friendship and a good atmosphere with high personal ambitions. As long as the evaluation criteria remain as they are now, such a project is not good for your career.'' | (C5) |
| 4 | ''I gained many experiences that were very helpful for other projects. Further, it had no career influence, but I did not hope for it either. For job applications I think it really would have a positive effect, it is no barrier that's for sure. | (D3) |
| 5 | ''It was very important because I took my PhD [during the project] and I got the permanent position in a field I would not have expected. That was only due to the project. Otherwise I would not have gotten the position.'' | (E1) |

Table 5. Researchers' assessment of experiences

| No. | Question/item | Min. | Max. | Std. dev. | Variance | Mean |
|---|---|---|---|---|---|---|
| | ''Which of the following did you perceive as positive or negative experiences in your project?'' (scale from 1 = negative to 5 = positive) N = 206 | | | | | |
| 1 | Discussions | 2 | 5 | 0.734 | 0.539 | 4.34 |
| 2 | New insights | 1 | 5 | 0.820 | 0.673 | 4.07 |
| 3 | Networking | 1 | 5 | 0.971 | 0.944 | 3.87 |
| 2 | Teamwork | 1 | 5 | 1.036 | 1.074 | 3.86 |
| 5 | New skills | 1 | 5 | 0.891 | 0.794 | 3.80 |
| 6 | Relationships among project participants | 1 | 5 | 0.940 | 0.884 | 3.78 |
| 7 | Atmosphere | 1 | 5 | 0.963 | 0.928 | 3.63 |
| 8 | Publications | 1 | 5 | 1.152 | 1.328 | 3.19 |
| 9 | Expectations | 1 | 5 | 0.936 | 0.876 | 3.15 |
| 10 | Project management | 1 | 5 | 1.089 | 1.187 | 3.09 |
| 11 | Merit points | 1 | 5 | 0.854 | 0.730 | 2.67 |
| 12 | ''Do yon perceive the project as a success or a failure?'' (scale from 1 = failure to 5 = success) | 1 | 5 | 0.943 | 0.889 | 4.06 |
| 13 | ''Had the project a positive or negative effect on your career?'' (scale from 1 = negative to 5 = positive) | 1 | 5 | 0.847 | 0.717 | 3.99 |
| Overall experience (summarizing 1–13) | | 2.23 | 4.85 | 0.510 | 0.260 | 3.65 |

Interviewees' perceptions of the career effects of integrative projects varied. Some researchers had a clear impression, or evidence, that the integrative project had benefited their careers (A1, B2, C 1, C4, E1). Others, however, stated concerns as far as their scientific career advancement was concerned (Table 4).

On the question of whether the project was a success or failure, one interviewee did not give an answer (A1). Another responded, ''In terms of career: a failure! In terms of having fun and personal satisfaction: a success!'' (C5). Almost all of the other interviewees said they perceived the project as a success (B1, B2, B3, C1, C2, C3, C4, D1, D2, D3, D4, E1, E2, E3, E5).

### Researchers' Experiences as Expressed in the Web Survey

The Web survey asked researchers to rate their experiences in integrative landscape projects, specifically in 11 areas: discussions, networking, teamwork,

Table 6. Factors that influence researchers' overall experience

| No. | Tested variables | N | Correlation | Significance |
|---|---|---|---|---|
| | *Socio-demographic* | | | |
| 1 | Age | 204 | 0.035 | 0.617 |
| 2 | Gender | 206 | — | 0.370 |
| 3 | Highest level of education | 207 | — | 0.428 |
| | *Financial framework* | | | |
| 4 | Project size | 206 | 0.073 | 0.297 |
| 5 | Project budget | 206 | −0.098 | 0.160 |
| 6 | Project duration | 206 | 0.021 | 0.759 |
| | *Professional experience* | | | |
| 7 | Number of integrative projects participated in | 206 | 0.016 | 0.822 |
| 8 | Role in project | 206 | — | 0.001*** |
| 9 | Career position | 207 | — | 0.746 |
| | *Research characteristics* | | | |
| 10 | Type of project | 206 | — | 0.051 |
| 11 | Degree of integration of disciplines that was reached in the project | 207 | 0.577 | 0.000*** |
| 12 | Common agreement on concept of interdisciplinarity/transdisciplinarity | 206 | — | 0.000*** |
| 13 | Share of fundamental research in project | 207 | 0.202 | 0.004** |
| 14 | Share of applied research in project | 207 | 0.028 | 0.687 |
| 15 | Share of consultancy/advice in project | 207 | 0.054 | 0.438 |
| 16 | Scientific outcomes of project | 207 | 0.390 | 0.000*** |
| 17 | Product outcomes of project | 207 | 0.420 | 0.000*** |
| 18 | Outcomes for education and training | 207 | 0.287 | 0.000*** |

Correlation was tested with independent samples t-test (2 groups) or one-way ANOVA (>2 groups) if no correlation values are given. Significance in this case indicates that the means of two groups are significantly different. The significance is indicated with ** for $P \leq 0.01$, *** for $P \leq 0.001$.

expectations, new insights, relationships among project participants, new skills, publications, merit points, project management, and atmosphere. It also asked whether they perceived the project as a failure or a success and what the project's career effects had been. Table 5 shows the mean scores for each item as assessed by the researchers surveyed. Their overall experience (calculated as the mean of the 13 items from Q1, Q2, and Q3) is positive, with a mean of 3.65. Means for the individual items vary between 2.67 and 4.34. Aspects rated highest are discussions, new insights, and the perceived project success. The aspects rated lowest are publications, expectations, project management, and merit points. Researchers perceived the integrative projects as having positive effects on their career.

## Factors That Influence Researchers' Experiences in Integrative Projects

To gain information about the factors that shape researchers' experiences, we investigated socio-demographic attributes, financial frameworks, professional experience, and the research characteristics of the projects. To reveal whether there was an influence, we correlated the potential influencing factors with researchers' overall experience (Table 6).

Table 7. Overall experience for project leaders and other participating researchers ($p \leq 0.001$, sign***)

| Overall experience | N | Std. Dev. | Mean |
|---|---|---|---|
| Project participant | 126 | 0.510 | **3.57** |
| Project leader | 80 | 0.480 | **3.80** |
| All participants | 206 | 0.510 | **3.65** |

We found no significant relationships for the *socio-demographic* factors (nos. 1–3) and the *financial framework* (nos. 4–6). Among variables related to *professional experience* (nos. 7–9), only ''role in project'' (project participant or project leader) has significant influence on researchers' experiences. Considering the *research characteristics* of projects (nos. 10–18), we found highly significant correlations for six of the nine factors investigated. These are the ''degree of integration of disciplines that was reached in the project,'' ''common agreement on concept of interdisciplinarity/transdisciplinarity,'' ''share of fundamental research in project,'' ''scientific outcomes,'' ''product outcomes,'' and ''outcomes for education and training.''

To clearly show the direction of the influence of the seven statistically significant variables, we compared the means of these variables in relation to the overall experience (Tables 7–13). Table 7 shows that project leaders have higher mean values and thus a more

Table 8. Overall experience in integrative research project, with and without common agreement on definition of interdisciplinarity/transdisciplinarity ($p \leq 0.001$, significance***)

| Overall experience | N | Std. dev. | Mean |
|---|---|---|---|
| No common definition of interdisciplinarity/transdisciplinarity reached | 101 | 0.510 | **3.48** |
| Common definition of interdisciplinarity/transdisciplinarity reached | 99 | 0.480 | **3.84** |
| All participants | 206 | 0.510 | **3.65** |

Table 9. Overall experience in integrative research project, according to the degree of integration reached in the project (1 low, 5 high) ($p \leq 0.001$, significance***)

| Overall experience | N | Std. dev. | Mean |
|---|---|---|---|
| 1 = Low degree of integration | 5 | 0.437 | **3.28** |
| 2 | 35 | 0.429 | **3.06** |
| 3 = Medium degree of integration | 33 | 0.469 | **3.59** |
| 4 | 88 | 0.377 | **3.76** |
| 5 = High degree of integration | 45 | 0.409 | **4.01** |
| Total | 206 | 0.510 | **3.65** |

positive overall experience than participating researchers. Researchers from projects with agreement on common definitions of integrative concepts have a more positive experience than those working without such common agreement (Table 8). Tables 9 through 13 summarize the results for the remaining variables. As illustrated by the tables, we can state that researchers have a more positive experience if:

- they reached a high degree of integration in their project
- the project was largely fundamental research
- the project resulted in significant scientific outputs (e.g., international peer-reviewed publications)
- the project had high output in terms of products (e.g., methods, tools, guidelines, advice, and specific outputs requested by funding body)
- the project was highly productive in terms of education and training (e.g., in numbers of completed PhD and master's degrees, student exchange, and courses deriving from the project)

## Discussion

We set out to analyse researchers' experiences in integrative landscape projects and to identify what factors shape these experiences. The results of our interviews plus the Web survey show that there are many facets to researchers' experiences and the factors that influence them. Discussions, new insights, networking, teamwork, and new skills are amongst the most positive aspects of researchers' experiences in integrative projects. In contrast, publications, expectations, project management, and merit points are some of the more negative aspects. ''Overall experience,'' which summarizes researchers' assessments of the 13 factors considered in the Web survey, received a rating of 3.65. This confirms that researchers experience their participation in integrative landscape projects as largely positive.

### Interviews, Web Survey and Researchers' Self-Assessment

The combination of the two data sources, — the interviews and the Web survey, — proved useful, as they were broadly complementary. Comparing the results from the interviews with those of the Web survey, we note that more negative experiences seemed to emerge from the interviews than from the survey. A possible explanation for this is that in the trusted atmosphere of a personal interview, researchers delve deeper into their experiences than they do when completing a questionnaire. An interviewer's questions might provide opportunity for a subject to reflect on and air negative experiences that occurred in the course of a project. The interview situation might thus make it easier for a researcher to admit negative aspects. For the Web-survey, participants could decide themselves whether they would follow our invitation or not. This self-selecting process might have attracted more researchers with positive experiences to fill in the questionnaire survey.

Both the interviews and the Web survey used only data from completed projects. They thus represent an ex post self-assessment by researchers. Again, an ex post self-assessment might be easier in an interview situation where the confrontation with past experiences is more intense. Anonymously completing a Web survey might lead subjects to overestimate themselves

Table 10. Overall experience in integrative research project, according to the share of fundamental research (1 low, 5 high) ($p \leq 0.01$, significance**)

| Overall experience | N | Std. dev. | Mean |
|---|---|---|---|
| 1 = Low share of fundamental research | 30 | 0.658 | **3.60** |
| 2 | 45 | 0.319 | **3.54** |
| 3 = Medium share of fundamental research | 51 | 0.582 | **3.66** |
| 4 | 47 | 0.452 | **3.54** |
| 5 = High share of fundamental research | 33 | 0.362 | **4.02** |
| Total | 206 | 0.510 | **3.65** |

and their projects, blending out the more negative aspects. In an evaluation of undergraduate students, McCourt Larres and others (2003) report subjects' overestimating themselves in self-assessments. Strachan and Wilcox (1996) compared self-assessment and peer-assessment of student group work and found self-assessment to be an effective tool leading to more accurate assessments of student performance. We cannot rule out that self-selection and overestimation affected the respondents' assessments of their personal experiences in the Web survey. We, therefore, take this possibility into account when interpreting our data. Again, it is worth noting that we are not using the data to assess the performance of integrative projects, but rather to reveal researchers' personal experience of such projects.

### Broadening the Knowledge Base Through Interpersonal Exchange

Of the items on the Web survey, researchers rated ''discussions'' as the most positive experiences. Discussions can be regarded as the main channel through which information is shared in integrative projects, as described by several interviewees. Researchers have very different starting points in the project and attitudes vary a lot between participants, depending on their disciplinary backgrounds. There is thus a great need for communication (Wear 1999, Brewer 1999, Turner 2000, Bruce and others 2004, Jakobsen and McLaughlin 2004). The interview results showed us that it is in discussions that common ground is identified and integration occurs. Although discussions might sometimes be frustrating—as expressed in some of the interviews—researchers perceive the tensions as fruitful. They acknowledge that without discussion, no integration could take place.

Similarly, ''teamwork'' can be regarded as a means of active information exchange, as expressed in examples from the interviews (C2, C3). Joint work, whether it be collecting field data, working in a laboratory, or reviewing literature, gives participants opportunities to get to know one another's disciplines and alternative ways of thinking and approaching a research question.

Table 11. Overall experience in integrative research project, according to the scientific outcomes of the project (1 low, 5 high) ($p \leq 0.001$, significance***)

| Overall experience | N | Std. dev. | Mean |
|---|---|---|---|
| 1 = Low scientific project outcome | 16 | 0.524 | **3.30** |
| 2 | 40 | 0.518 | **3.45** |
| 3 = Medium scientific project outcome | 60 | 0.455 | **3.57** |
| 4 | 62 | 0.420 | **3.82** |
| 5 = High scientific project outcome | 28 | 0.524 | **3.95** |
| Total | 206 | 0.510 | **3.65** |

Table 12. Overall experience in integrative research project, according to product outputs of the project (1 low, 5 high) ($p \leq 0.001$, significance***)

| Overall experience | N | Std. dev. | Mean |
|---|---|---|---|
| 1 = Low product outcome | 5 | 0.534 | **3.32** |
| 2 | 23 | 0.614 | **3.23** |
| 3 = Medium product outcome | 52 | 0.480 | **3.57** |
| 4 | 69 | 0.401 | **3.63** |
| 5 = High product outcome | 57 | 0.436 | **3.96** |
| Total | 206 | 0.510 | **3.65** |

The positive assessment researchers gave ''networking'' can be interpreted in a similar light. In integrative projects, ''networking'' is the activity that brings researchers into contact with people from other disciplines, but also, — and probably more important, — with those from outside academia. Two interviewees stated this explicitly as a valuable experience (C2, D3). Researchers are thus able to draw from different fields of public life and from other professional arenas, truly broadening the scope of their professional relationships.

The positive experiences with ''discussions,'' ''teamwork,'' and ''networking'' are closely related to the positive experiences recorded for ''new insights'' and ''new skills.'' The sharing of knowledge, and thus gaining new insights and skills, takes place in the active exchange between disciplines, as manifested in

Table 13. Overall experience in integrative research project, according to outcomes for education and training (1 low, 5 high) ($p \leq 0.001$, significance***)

| Overall experience | N | Std. dev. | Mean |
|---|---|---|---|
| 1 = Low outcome for education and training | 30 | 0.697 | **3.42** |
| 2 | 35 | 0.382 | **3.57** |
| 3 = Medium outcome for education and training | 53 | 0.476 | **3.60** |
| 4 | 55 | 0.429 | **3.73** |
| 5 = High outcome for education and training | 33 | 0.496 | **3.92** |
| Total | 206 | 0.510 | **3.65** |

discussions and teamwork. Both are media, which enable learning. As one interviewee said, you can learn the most from people outside your own disciplinary framework. For researchers, this satisfies intellectual demands, such as curiosity and inquisitiveness, and is, therefore, experienced as rewarding.

### Experiencing Integrative Projects as a Success

Researchers experience their integrative projects largely as a success. This might be because they are satisfied with the project process and outcomes. Our data do not allow further specification of what criteria researchers based this assessment on or of how far project goals were actually met. In the interviews, one researcher (C2) said that he really felt the project was a success, both internally and externally, because they had so many troubles throughout the process, and in spite of these difficulties the project reached a lot and produced a lot of spin-off activities and products.

Leaders evaluated their projects more positively than participating researchers (significance = 0.000***). This might be related to the fact that leaders in many cases are the ones who wrote the research proposal, and they therefore identify more with the project and its outcomes. At the same time, project leaders, due to their function, are largely responsible for the failure or success of a project. In this sense, it might be difficult for a research leader to admit that a project was unsuccessful, as they might regard such an outcome as a personal failure. In contrast, participants do not feel directly responsible for a project's success or failure and therefore can admit to failures more openly.

### Perceived Career Effect

Researchers responding to our survey perceived a positive career effect from integrative projects. This contrasts with Bruce and others (2004), who mention the poor career structures for academic interdisciplinary researchers as one of the factors discouraging integrative research. Metzger and Zare (1999) state that researchers who propose interdisciplinary research programmes have and do put their careers at risk. Also, Jakobsen and others (2004) found that participants in integrative landscape studies perceive ''insecurity regarding career implications'' as a barrier to participation in integrative projects. Jakobsen and others (2004) linked this to the idea that it can be difficult to find journals in which to publish interdisciplinary articles and thus to gain merit points for career advancement. However, in an investigation of 156 international peer-reviewed journals, we found no evidence of an editorial bias against publications from integrative projects (Fry and others 2004).

We also find evidence supporting a positive career effect of participation in integrative projects in the candidate qualifications mentioned in job advertisements. Furthermore, funding bodies broadly support integrative research, which is likely to lead to continued growth and thus increased career opportunities in integrative research fields.

We recognize, however, that our respondents represent individuals using very different measures of career development. For example, researchers who strive to gain academic merit may not perceive integrative projects as the best way to a successful career, whilst researchers considering a career outside of academia might view the broad experiences offered by integrative projects as an opportunity for career advancement.

Our data do not allow us to differentiate between researchers who aim at continuing an academic career and those pursuing a career outside academia. We do feel that increased contact with other professions and better insight into different professional arenas are likely to result in (temporary) engagement of researchers in non-academic professions. Here again, participation in integrative projects would be perceived as having a positive effect on career.

### Experiences with Merit Points and Publications

''Merit points'' is the only item that received a rating below 3 points and could thus be considered a negative experience. Together with ''publications,'' ''merit points'' represents what we call ''academic

currency.'' Research findings, resulting in peer-reviewed publications and hence merit points, are a precondition for achieving tenure and promotion in academia (Reis 1997, Court 1999). Furthermore, university funding increasingly depends on high ratings in government research assessments, which, — among other things, evaluate publication output. Some interviewees experience this merit system as negative (C2, C5, E1, E2). As ''publications'' is also among the less positive experiences, we discuss them together with merit points.

We interpret the low rating given to ''merit points'' and ''publications'' in integrative projects as a result of four factors. First, integrative projects, and certainly transdisciplinary projects, tend to be more applied in character than disciplinary ones. Tress and others (2005a) found that funding bodies primarily support integrative studies to solve pressing societal-environmental problems. Advancing science is a subordinate goal.

Second, it might be difficult to gain depth in integrative projects. Coming together from different disciplines, an interdisciplinary or transdisciplinary project team has to start from the smallest common understanding, rather than from the edge of the respective knowledge cultures. Daily and Ehrlich (1999) also conclude that it is more difficult to maintain high standards in interdisciplinary projects.

Third, as integrative landscape research is a relatively new area, there is a lack of integrative methods and theories (Turner and Carpenter 1999, Wu and Hobbs 2002; Musacchio and others 2005; Fry and others 2005). Instead of relying on approved methods, integrative teams must first develop a set of tools. It might, thus, be more difficult to produce cutting-edge results that are suitable for submission to high-ranking journals.

Finally, researchers might perceive the academic merit system as favouring disciplinary projects. This came to the fore in the interviews, where researchers said that integrative projects offered little scientific reward (see Table 3: interviewee C5; Table 4: interviewee C2, C5).

Researchers' less positive perception of ''merit points'' and ''publications'' seems to contrast with the perceived positive effect of integrative projects on career. Based on our results, we conclude that the perceived positive career effect is largely related to researchers' broadened personal knowledge base, new skills, and insights derived from integrative projects. Researchers learn a lot in these projects and experience this as beneficial for their careers. But the positive effects are not based on traditional academic merit. In fact, our findings may confirm a trend in which research institutions are increasingly demanding additional skills such as teamwork, project management, and presentation skills as important research qualifications (Fry and others 2005). In that sense, researchers from integrative projects may well be sought after in the job market.

### Success Factors for Positive Experiences in Integrative Projects

Researchers' experiences in integrative research projects are strongly influenced by the projects' research content, but not by other project characteristics. None of the socio-demographic factors (gender, age, and career level) had a significant effect on researchers' experiences. The same is true for the financial framework, where one might have expected different experiences from large versus small project groups and for short-term versus long-term projects. Our survey, however, is a study of the positive and negative experiences of researchers, and, as such, it may not reveal how the financial framework, e.g., project size, influenced the kind of problems a project faced in achieving integration or how it influenced the project goals.

Four project characteristics largely determine experiences in integrative projects: a high level of integration, a common definition of interdisciplinarity/transdisciplinarity, a large share of fundamental research in the project, and high project outcomes (scientific outcomes, product outcomes, and outcomes for education and training).

*Perceived High Level of Integration.* Projects that reach a high level of integration are experienced as more positive by researchers. This confirms that researchers regard the strive for integration as being at the core of integrative projects. Simply putting different disciplines together in a project, without working towards integration, is not experienced positively, as argued also by one interviewee (C1). We have argued elsewhere (Tress and others 2005a) that having a common strategy for integration is key to success in an integrative project, and this idea seems to be confirmed by the results of this study. Furthermore, we see a close link to the high appreciation of ''discussions'' in the projects. Fruitful discussions with open exchange of information are a precondition for achieving integration across disciplines. This links to our next point, because understanding one another in discussions is necessary in order to reach a common definition of integrative concepts.

*Common Definition of Interdisciplinarity/Transdisciplinarity.* The different use of terminology is regarded as a major barrier to integration (Fry 2001, Nicolini 2001,

Jakobsen and others 2004). Agreement on the use of terminology facilitates integration. This is especially valid for the basic concept of interdisciplinarity/transdisciplinarity. Only once common agreement has been reached on what interdisciplinarity means to a project group can it elaborate on how it might be operationalized in the project and how integration can be achieved. Without a common definition, there is little chance for success in integrative projects.

*Fundamental Research.* A larger share of fundamental research in a project leads to more positive experiences for researchers. Again, this finding must be viewed in light of the fact that funding bodies set up many integrative projects to help solve a practical problem. Accordingly, such projects frequently have a component of applied research and consultancy. It is, however, the fundamental research aspect that develops and sustains expertise of integrative research, because fundamental research enables reflection and development of integrative theory and production of new methods and tools.

*Project Outcomes and Evaluation.* The more productive a project is, the more positive the experience of researchers. This finding demonstrates that researchers' experiences are strongly related to the research process and its results, rather than on demographic factors or the financial framework. Furthermore, our results show that all types of project outcomes—scientific outcomes, product outcomes, and outcomes for education and training—have a positive influence on researchers' experiences. Here we see that researchers have a broad perception of what they consider valid outcomes of integrative projects. Scientific publications, product outcomes, or outcomes for education and training count as equally positive.

The emphasis on product outcomes is possibly related to the increasing pressure exerted by funding bodies to produce readily applicable results to solve societal and environmental problems. Researchers see such outcomes as fulfilling the expectations of funding bodies, and therefore experience a project that produces a large number of product outcomes as rewarding.

We can again link this to ''merit points'' and ''publications.'' Although researchers are obliged to produce a range of products, they feel that merit mostly relies on scientific outputs. This helps explain their negative experiences related to ''merit points'' and leads to the question of how integrative projects should be assessed. We suggest that a fair assessment of integrative projects would evaluate scientific outcomes as well as product outcomes and outcomes for education and training. Such an assessment would, for example, include an evaluation of the impact of the product outcomes in the ''real world,'' especially the problem-solving capacity of a project, as this is the main driving force for funding integrative projects.

Balsiger (2004) claims that the application of disciplinary evaluation criteria would not identify high-quality integrative research, as their aims are different. Integrative research does not primarily set out to produce knowledge but to produce solutions. This is in line with Hubert and Bonnemaire (2000) who argue for an evaluation of integrative research that includes not only academic criteria but also the practical impact of the project. Frederiksen and others (2003) suggest that the changing relationship between science and society will lead to altering our approaches to research and thus to research evaluation. These new evaluations may take, for example, social forces, politics, ethics, and economy into consideration.

Whatever form suitable assessment tools for integrative research may take, their development and application is an important means of quality control and benchmarking in integrative research. In this, we agree with Brewer (1999) who claims that only rigorous quality control can ensure the application of the high professional standards necessary to safeguard the success of integrative projects.

Product outcomes and outcomes for education and training can in the long run only be produced successfully if integrative projects also make sound contributions to scientific progress and the acquisition of new knowledge, including development of integrative methods and theories. To achieve this, integrative projects need to include a significant share of fundamental research. This again ensures the production of results suitable for high-ranking journal publications and the award of traditional merit points.

Finally, we agree with Feibelman (1993) that a research project should not be regarded as completed until its results are published. Publication of results of integrative projects is crucial for the advancement of the field itself. Publications are the way to feed project results and experiences back to the academic community and thus to contribute to academic advancement (Tress and others 2005c). We, thus, see inclusion of fundamental research, leading to publications and merit points, as one of the important pillars of integrative research and a key to its future success.

## Conclusion

This article analysed researchers' experiences in integrative projects as well as the factors that influence

these experiences in a positive or negative way. Our results are based on interviews and a Web-based survey of researchers who had participated in integrative landscape projects. We consider researchers' experiences an important aspect of integrative projects, and our findings provide a broad empirical knowledge base on these experiences. This should be complemented by systematic investigations of project performance. In particular, we suggest research on integrative project outcomes, to gather more information about project performance and their long-term impacts on science as well as problem solving. Ultimately, this should include development of a tool for assessment of integrative projects. Integrative projects are not undertaken for the sake of it, but in an attempt to improve our understanding of the relationship between people and nature and to manage natural resources in more effective and sustainable ways. Therefore, successful integrative studies that achieve bringing together knowledge from different disciplines, will also lead to a better management of the environment.

From our research findings, we can distil results down to five key aspects related to positive experiences in integrative projects.

*Plan for Integration.* Projects need to plan for integration. This aspect should be approached early on, ideally at the proposal-writing stage. The aims of integration should also be determined, as well as which fields should be integrated for which purpose and how this might be achieved.

*Allow Space for Discussions.* Particularly early on, but also throughout the project process, there needs to be room for discussions among participants. This requires them to get together at suitable meeting places and the allocation of sufficient time. Discussions should not be left to formal presentations or occasional and spontaneous gatherings, but rather be part of the plan to reach integration.

*Facilitate a Common Definition of Integrative Concepts.* Integrative research teams need to reach agreement on a common definition of integrative concepts. Time must be allocated to this process without too much pressure put on participants. However, the team should eventually agree on common definitions, which should be binding so that the focus can then shift to the implementation of the chosen concept.

*Balance Applied and Fundamental Research.* At the proposal-writing stage, teams should ensure a sound balance between applied aspects and fundamental research. The latter is the core of research work that will lead to results suitable for peer-reviewed publications and merit points. Likewise, project teams should strive to balance scientific outcomes, product outcomes, and outcomes for education and training.

*Plan for Publications.* Time is always short. It therefore helps to plan for publications from the early stages of a project and to discuss and allocate responsibilities and authorship. This includes discussions about which aspects of a project are most suitable for the various publication channels.

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