

Training future experts in “biodiversity and ecosystem services”: a progress report

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Abstract Biodiversity is essential for multiple aspects of human life and well-being, but many current assessments of the functioning of biodiversity and ecosystems, understanding of risks posed by environmental change and the best practice of their management of ecosystems are lacking a unified scientific and conceptual basis. Methods such as scenario analysis, and terms such as ecosystem services, are widely used, but their meaning is understood in many different ways depending on context, user needs and experience of researchers. In order to advance the conceptual basis for ecosystem analysis and management in a rapidly changing world, as well as the ability of young scientists to reflect upon these concepts, we have organised

five 2-week-long summer schools in Peyresq, a remote village in the Southern French Alps. In total 173 participants have worked intensively with 69 experienced researchers and a team of conveners and tutors in order to discuss a broad range of views on topics on ecosystem analysis and functioning. Topics ranged from conditions of and threats to various ecosystems due to environmental change, models and scenarios for assessment, stakeholder perceptions and needs for information, to the social and economic contexts for biodiversity. We report our experience from these schools, present the training concept which has emerged from them and suggest lines of further development.

Keywords Biodiversity · Ecosystem assessment · Environmental change · Summer school

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Introduction

The functioning of the world's ecosystems is important for human life and well-being and many components of biodiversity play a major role in the provisioning of material or non-material ecosystem services to people (Reid et al. 2005). Research projects world-wide are struggling, however, to find appropriate metrics for the functional relationships between the main features of ecosystem and the values assigned to them by people (e.g. Balmford and Bond 2005). The problem is of undisputed practical as well as scientific urgency.

It has now become widely accepted to use the concept of “ecosystem services” as a basis for improved and target-oriented ecosystem analysis and management at scales from local to global, but there is no widely accepted assessment methodology for them. The Millennium

Ecosystem Assessment (MA 2003), for example, established definitions and relationships, discussed the importance of scale and drivers and reviewed different assessment approaches. Although this improved the comprehensiveness of the final assessment, a consistent implementation was nevertheless difficult because of the multitude of approaches already available in the literature, on which the assessment had to build. Also, changing biodiversity is postulated to be potentially critical for the provisioning of ecosystem services, but the evidence for the claim comes from widely differing lines of reasoning (e.g. Díaz et al. 2007).

A number of approaches to assess ecosystem functioning in a changing world build upon the “vulnerability paradigm”, popularized by the Intergovernmental Panel on Climate Change (IPCC). At the core of this paradigm is the notion that the scientific analysis of ecosystem processes (or other impacts) should focus on those phenomena that are of direct importance for people. If possible, the work should provide guidance for adaptation. An early example for a large European research project on ecosystem vulnerability in this context was the FP5 Integrated Project ATEAM¹ (Schróter et al. 2005a).

These conflicting views are not likely to be resolved in the short term with any unified and widely accepted theory. But while the concepts and underlying models are being developed, there is immediate need by (young) professionals to understand the debate, to identify ways of contributing meaningfully to it, and to develop best practices in order to resolve conflicts between the use of ecosystems and the longer-term sustainable development of them. To promote this collective reasoning and learning effort, we created a platform, with financial support of the European Union, first through a *Concerted Action* “Integrated Assessment of Vulnerable Ecosystems under Global Change” (AVEC), and later as a training component within the EU *Network of Excellence* “A Long-Term Biodiversity, Ecosystem and Awareness Research Network” (ALTER-Net). The most important activity in AVEC was the establishment of a two-week long summer school on “biodiversity and ecosystem services”, which was held in 2003 and 2005 in the tiny village of Peyresq, Alpes de Haute-Provence in Southern France (Fig. 1). The school was continued and developed further in 2006, 2007 and 2008 as the main training component in ALTER-Net.

The aim of this report is to provide a reference for the philosophy, structure and organizational concept of the five schools, to document some of the main experiences made, and to suggest elements for further training in the field of biodiversity and ecosystem services. For this, we briefly review the science basis for our specific curriculum,



Fig. 1 Peyresq, Alpes de Haute-Provence, France, location of the AVEC and ALTER-Net summer schools (photo: Björn Reu)

explain the actual organizational structure of the schools, and analyse some of the perceived achievements as well as shortcomings of them.

The science basis for the summer school curriculum

The scientific core of the evolving summer school programme was built on the experience with a number of European collaborative research projects, notably ACCELERATES, ALARM, ALTER-Net, ATEAM/AVEC, BioAssess, CarboEurope-IP, ENSEMBLES, NeWater, VISTA and others (see Footnote 1). One common theme for these projects (or for sub-projects in them) is the growing concern that ecosystems are being negatively affected by changing climate as well as by other forcings, such as land-use intensification and/or land abandonment. In these projects (which together represent a budget of well over 50 M€), an array of different methods has been developed for the assessment of present and future functioning of terrestrial ecosystems under the forcings occurring from changes in the deposition of polluting substances, climate change, and land-use change. Although the project-specific details vary widely, most of them have applied comparable methods to resolve concrete management issues at various scales (e.g. Metzger et al. 2008).

A balanced combination of the following elements has been found suitable in many recent ecosystem-oriented assessments:

- stakeholder-driven identification of assessment needs,
- implementation of a spatially explicit assessment framework,
- development of multiple scenarios for major future forcings of ecosystem functioning,
- adaptation and use of existing and well-tested numerical simulation models for the quantification of changes in ecosystem functioning,

¹ For coordinates of involved EU-Projects, see Appendix 2

- adaptation and use of a suitable indicator framework for ecosystem services,
- review of the entire process in cooperation with stakeholders.

This specific set of activities does not describe a particular well-developed paradigm—indeed, other logical structures have been proposed for related purposes, e.g. the comparable “eight step approach” developed by Schröter et al. (2005b). Nonetheless, they reflect a growing consensus in the science-oriented environmental assessment community and they are widely considered as a suitable compromise between the research and assessment effort on the one hand and the needs of stakeholders on the other.

The concept of *stakeholder-driven identification of assessment needs* is a significant departure from earlier environmental assessment procedures where it had been considered crucial that only scientists were able to identify the nature of environmental issues in need of assessment. But while the need to involve stakeholders now is widely accepted, there are still substantial uncertainties about the best practice for the interaction, concerning the selection of stakeholders, the timing of the interaction during the assessment, intensity of the exchange, the nature of information given to stakeholders, the preparedness of scientists to modify the assessment based on the exchange etc. (de la Vega-Leinert et al. 2008). Stakeholders for ecosystem-related vulnerability assessments can belong to a wide range of different groups of people, such as political decision-makers at any level between the local and the global, private entrepreneurs in a range of different sectors, non-governmental organizations and individuals with non-material personal interests in the services provided by ecosystems. While the stakeholder dialogue can never cater for all of these (often conflicting) interests in a fully balanced way, it remains an important goal to provide a well-designed plan for the stakeholder dialogue in any environmental impact assessment.

The implementation of a *spatially explicit assessment framework* for ecosystem-related impact studies (e.g. in the form of risk maps) responds to most user needs and is therefore fairly widely accepted—it, however, represents a significant challenge for many projects, for several reasons. First, spatial explicitness involves a notion of spatial scale and resolution. While there appears to be a wide-spread tendency among stakeholders to demand the highest possible resolution for the assessment, this is frequently neither feasible nor actually justified by the assessment purpose. It is therefore an important part of the planning process to define feasible and appropriate spatial resolution for the assessment, which can be based on regular grids with fixed cell size, a set of geo-referenced points (or small “sites”) in a larger area, irregularly shaped polygons

reflecting natural or administrative boundaries, or other elements. A further challenge comes from the dynamic features in most ecosystems (e.g. the rotation of agricultural crops, or the response of semi-natural communities to ‘natural’ climatic variability)—these require some level of representation both in the baseline description of the ecosystem and in the assessment itself. Increasing the resolution of temporal dynamics frequently meets its limits due to the shortage of data.

Scenarios are widely accepted conceptual tools for the assessment of possible implications of current trends. Developing *multiple, alternative scenarios* for major future forcings of ecosystem functioning is a suitable method to explore the range of “possible futures” and therefore highly suitable for the guidance of decision-makers (Cramer et al. 2000). In the past, many impact assessments selected only one scenario, usually of the more extreme kind, with some vague notion of “uncertainty analysis” (even if such an analysis was not carried out in a rigorous way). Therefore, a comprehensive assessment needs to apply a number of scenarios that sample a significant proportion of the range of future conditions and also indicate the outcome of possible alternative policies within this space.

Most ecosystem impact studies recognise the possible non-linearity between forcing and impacts, as well as the need for extrapolation outside the range of observations. Therefore, *numerical simulation models*, capturing the main processes in the ecosystem are developed and applied for the ecosystem assessment (e.g. LPJmL: Sitch et al. 2003; Bondeau et al. 2007). Crucially, these models must be documented in the scientific peer-reviewed literature, and tested against observations for a range of conditions at scales appropriate for the assessment.

Once the ecosystem services in question have been identified through the stakeholder dialogue, and appropriate models and scenarios been developed, a suitable *indicator framework for these ecosystem services* must be developed. This is necessary because most ecosystem models do not directly provide quantitative estimates for ecosystem service provision. Again, a variety of approaches for this development exists (reviewed in Schröter 2008), and the selection among them is a key step in each assessment.

Once the spatially explicit results of scenario-driven model application exist, and are interpreted through the indicator framework, a *review of the entire process in cooperation with stakeholders* is necessary. While it is obviously important that results are communicated to the anticipated users, it is also necessary that questions are asked about the soundness of the procedure and the robustness of any findings, as well as about their correspondence with stakeholders’ needs and expectations.

Frequently, this phase reveals critical shortcomings of the process, particularly with respect to the guidance many stakeholders require with respect to possible adaptation. This illustrates that significantly more research is needed in order to stabilise the methods for the entire process.

The summer school programme

Overall structure

While the assessment steps described above were used as a rough guideline for the summer school curriculum, we were particularly concerned to avoid presenting any fixed theoretical framework to the students. Rather, we attempted to provoke critical debate around the overall procedure as well as around its individual components. This was achieved by inviting world-leading scientists from very different parts of the integrated assessment community. Through their introductions, lecturers provided a broad overview of methods. There was ample time to discuss their presentations, both formally in plenary, as well as informally during casual meals, evening gatherings and other encounters. Most afternoons were spent in working groups where the content of the morning lectures was discussed and wherever possible applied to case studies. In the end, we believe that it was through this particular combination of structured lecturing, independent working group activities and informal debate that our thinking about integrated assessment methods has matured (see e.g. Patt et al. 2008; Schröter 2008).

The schools were open for young scientists (usually in the middle of their graduate training) from Europe, with a few additional candidates from developing countries permitted upon pre-selection by START (Global Change System for Analysis, Research and Training, <http://www.start.org>) and IAI (Inter-American Institute for Global Change Research, <http://www.iai.int/>). During the later years, some candidates also participated as part of a bilateral agreement with the Australian government. For each school after 2003, more than three times as many candidates applied than could be granted access—selection to a final number of approx. 32 was carried out in a way that balanced the fields of expertise, country of origin, and gender, as well as giving some extra priority to junior scientists in ALTER-Net institutes.

The 2 weeks offered a very busy programme, but all students were highly committed to participate. The exceptional setting of the scenic village of Peyresq (with poor internet and phone access) also stimulated interactions between students and lecturers. The typical day contained 3 h of topical science lecturing and discussion in the morning, working group work in the afternoon, and a

stimulating “aperitif talk” before dinner. The science lectures addressed topics relevant to the theme of the course and provided details and limitations of the various approaches. The aperitif talk aimed to present related but much more controversial topics in a stimulating manner to broaden the perspective of the students. Exceptions from this programme arose because of the poster sessions where all participants presented their work (usually from their graduate programme, Fig. 2), during plenary sessions for discussion of working group interactions and results, for the full-day excursion and for a single day of rest. Occasionally, lecturers would spontaneously offer additional elements of training, e.g. in the development of research proposals targeting the EU funding schemes.

The science presentations

The programme of science presentations started with a set of state-of-the-art reports on conditions and threats for biodiversity in Europe. The policy perspective was present in these presentations, but this was not the only aspect. We also heard reports of several different complete assessments, from different geographic and contextual settings. A regular key component were very substantial introductions to the development and use of scenarios, with reference to the Millennium Ecosystem Assessment. As a rule, these introductions triggered substantial discussion about the ecosystem service concept. Then, different forcings from climate change and land-use change were contrasted to each other. Examples for the application of ecosystem models and indicator sets were demonstrated—more as a proof of concept than as a completed toolbox. Social science components of relevance to the assessment, such as the consideration of gender bias, life-style or communication and perception issues were detailed. Additional methods from socio-ecology (socio-economic metabolism)



Fig. 2 Participants during a poster session in Peyresq (photo Jean: Vancompernelle)

environmental economics and aspects of long-term natural and human history were presented as well.

The working group programme

In order to train the deliberative process involved in environmental assessment, the participants of the summer school were asked to perform their own assessments in groups of 5–8 people, supervised by a tutor. They worked on this task throughout the 2 weeks of the school, and even afterwards by finalising their reports. The general purpose of these assessments was to inform stakeholders about future changes, associated risks, and potential adaptation strategies to sustain their economic success or well-being. We wanted this to be as close as possible to the “real world experience” that they might face further along in their careers, complete with time pressure, lacking data, missing other resources and difficulties of communication within the team as well as to the outside. The work was therefore carried out in multi-disciplinary groups (participants, tutors and lecturers from various disciplines), in an atmosphere of playfulness that would allow creative thinking, but was serious enough to stay on track with the task.

The basic task set was to perform an environmental assessment for a given region in such a way as to provide useful, science-based information to stakeholders that will help them adapt to expected future changes. The groups concentrated on specific case study areas. In the first two summer schools, we asked participants to assess vulnerability in general terms. In the three following schools we asked participants to focus upon specific sectors (e.g. water, agriculture or tourism). The material, data and tools that the participants were given to accomplish this task was diverse and included scenario reports from a variety of sources (in particular from the IPCC and the Millennium Ecosystem Assessment), maps of relevant ecosystem features for the case study areas (often diverse and incomplete), projections of climate, land use, and deposition of atmospheric pollutants, as well as literature on the current state of the region. Furthermore students were encouraged to do role-play exercises, embodying researchers and stakeholders. If necessary, students were asked to even produce “intuitional data” so that the assessment could be brought to a conclusion. In the later schools, tutors regularly took the role of a specific stakeholder, e.g. a hotel owner, a municipal planner, enacting this based on their experience and research prior to the school. One of the working groups then focused on the integration of results from the others, to ensure common scientific language, data exchange and a more comprehensive synthesis for the region under study.

The working group programme evolved further each year, based on previous experience. In 2007, we had

advanced our concept enough to offer participants a “fake” integrated research project, similar to EU Integrated Projects within which they performed their analysis. They were provided with an EU-project-style Annex 1, summarising the work plan of an imagined integrated assessment project of which they were part. Tutors and conveners of the school acted as “contractors”, “scientific advisors”, “stakeholders” and “EU scientific officers”. This helped participants to formulate concepts and research questions, and to prepare their assessment in ways that would be useful to the stakeholders and commissioners of the study. In other words, we provided a mechanism designed to continually test the applicability of the participants work for the applied task at hand.

The field trip

While the case studies worked on by the participants not always related to the region near Peyresq, we nevertheless found it appropriate to present several cases of ecosystem management challenges from the Provence during a field trip. This tour involved three major sites of interest which were visited under the guidance of local experts:

- The *Plateau de Valensole*, a former wheat-growing area that has been turned into extensive lavender plantations during the mid 20th century. The area is now under considerable pressure of change, due to a variety of forcings: changes in the market potential for its agricultural products (due to competition from other world regions and also synthetic products), changes in local community structure (due to the agricultural changes, but also due to the arrival of high speed train connection to Paris in 2001, which inflated prices for secondary residences), and possibly changes in climate, increasing drought stress on all ecosystems. Current trends point to some increased diversity in some locations, e.g. through the plantation of stone oak groves, inoculated with soil from truffle forests, while some interests also want to safeguard the particular monotonous lavender fields attracting tourists from far away (Fig. 3).
- The village *Les Salles sur Verdon*, which was flooded due to the construction of the Lac de Ste. Croix in 1973. The new lake, which is part of a massive water supply scheme for the region Provence-Alpes-Côte d’Azur (PACA) further south, not only flooded the old Provençal village (which was rebuilt near the lake), and its surrounding agricultural landscape—it also provided the basis for a powerful tourist industry. The biodiversity loss due to the lake construction is clearly visible—the main issue of development is to assess the sustainability of community development involving



Fig. 3 Participants and guides discussing land-use change and ecosystem services on the Plateau de Valensole (photo: Rik Leemans)

different aspects of tourism based on ecosystem services.

- The *Gorges du Verdon* as a major tourist attraction of the area and part of the Parc naturel régional du Verdon. The scenic wilderness of the gorge (Fig. 4) contrasts with areas of (mostly extensive) agriculture and forestry, both of which are managed by a consortium involving 45 local communities. The main biodiversity issue is to protect the remaining rural landscape pockets from encroachment by forest, despite the tendency of farm abandonment—while maintaining a stable base for employment in the area. As parc naturel, the region is not under a rigorous protection status, but the communities strive to develop a sustainable profile for the different land-use interests including tourism and agriculture.



Fig. 4 During the field trip, participants discussed management issues and biodiversity in the Parc naturel régional du Verdon, including the role of agricultural land use as part of its maintenance besides tourism (photo: Kim Cahill)

Conclusion and outlook

A structured evaluation of the school by all participants was carried out in order to assess the specific merits or weaknesses of certain components. A regular comment has been that the exceptional quality of the invited lecturers, combined with the relatively secluded location and the ease of informal encounter, provide a rather unique opportunity to learn. In addition, conveners, tutors and lecturers frequently express a strong interest to return (without payment) in order to benefit from the discussions. These two comments, and many other spontaneous remarks from most involved people, make us believe that the initially stated goals, particularly that of knowledge gathering on biodiversity and ecosystem services, has been achieved to a very large degree. There is now a growing network of “Peyresq-trained” ecosystem experts around Europe and beyond (supported by a moderate “alumni scheme” under development) and we begin to find anecdotal evidence for the spread of certain ideas through this platform. An example of this is the growing use of the ecosystem service concept throughout many new projects, where frequently alumni from our summer schools participate.

Critical remarks fell into several categories. Some participants and lecturers remarked that very little training was offered on the biological foundation of biodiversity—and some of these commented that social sciences had little relevance for the ‘true problems’ in ecosystems. We found this debate very important, while maintaining that plenty of other opportunities exist to be trained in these specific aspects of the biological sciences. There also are fewer courses where the interdisciplinary aspects of biodiversity management are addressed. Some asked for more spare time in the midst of an extremely dense and challenging programme. Others noted some difficulties in identifying their own personal contribution in what appeared to them an area of much deliberation and little certainty.

Future training events will need to reconsider all elements in our programme. An aspect in constant need of attention is the best structure and content for the working group activities which could be defined more rigorously and based on more ‘hard data’ or on the possibility of performing actual calculations with models and geographical data bases. Another concern is about the relationship between Europe-focused topics and those concerning development issues in non-European countries: while we have given the impression that both are only sides of the same coin, we acknowledge that a different and very useful training concept could be developed for assessments in developing countries.

A full evaluation of the merits of the Peyresq schools will only be possible, in our view, when several years of

further development of the involved concepts will either show traces of the brilliant talks, fierce debates and long nights of group work or not. For us, after five years of work involving 200+ individuals, it is rather clear that formal assessments of biodiversity-related ecosystem services are still in its infancy, and that there is high urgency to prevent further erosion of the biosphere’s potential to sustain humanity on the planet. The Peyresq-trained community now understands these issues and could become a skilled resource of contributors for the planned follow-up of the Millennium Ecosystem Assessment and its expanded network of its local and regional assessments.

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Appendix 1

List of all participants in the AVEC/ALTER-Net Summer Schools (in brackets year(s) of participation, if no role is indicated, as participant—cities of residence according to our latest information in July 2008)

Aavik, Tsipe, Tartu, EE (2006)
 Ahern, Mike, London, UK (speaker 2003)
 Alcamo, Joseph, Kassel, DE (speaker 2005, 2007)
 Allombert, Sylvain, Poligny, FR (2006)
 Arets, Eric, Wageningen, NL (2006)
 Baadsvik, Karl, Trondheim NO (chair of board 2006–2008, speaker 2006)
 Baca, Andrej, Nitra, SK (2005)
 Baxter, Bob, Durham, UK (tutor 2003, 2005)

Bealey, William, Edinburgh, UK (2005, tutor 2006, 2007, 2008)
 Beier, Claus, Roskilde, DK (speaker 2005, 2006)
 Berkhoff, Karin, Frankfurt/Main, DE (2005)
 Bertzky, Monika, Greifswald, DE (2005)
 Bianchin, Sylvi, Freiberg, DE (2005)
 Biewald, Anne, Potsdam, DE (2003)
 Bindi, Marco, Firenze, IT (speaker 2005)
 Bodin, Per, Kalmar, SE (2003)
 Bohn, Kristin, Jena, DE (2008)
 Bomhard, Bastian, Gland, CH (2005)
 Bondeau, Alberte, Potsdam, DE (speaker 2005)
 Bormann, Helge, Oldenburg, DE (2003)
 Boucnikova, Eva, České Budějovice, CZ (2006)
 Boven, Liesbet, Leuven, BE (2005)
 Bredemeier, Michael, Göttingen, DE (speaker 2006, 2008)
 Brittain, Claire, Reading, UK (2006)
 Bugmann, Harald, Zürich, CH (speaker 2003, 2005, 2006, 2007)
 Cahill, Kimberly Nicholas, Stanford, US (2005)
 Callo-Concha, Daniel, Bonn, DE (2007)
 Carter, Timothy, Helsinki, FI (speaker all years)
 Cavalieri, Sandra, Berlin, DE (2007)
 Chen, Youmin, Jena, DE (2003)
 Cobben, Marleen, Wageningen, NL (2008)
 Colls, Alison, Norwich, UK (2003)
 Conti, Georgina, Córdoba, AR (2007)
 Coreau, Audrey, Montpellier, FR (2007)
 Cormont, Anouk, Wageningen, NL (2008)
 Cosor, Georgia, Bucharest, RO (2008)
 Costa, Luis, Potsdam, DE (2008)
 Costache, Andra, Târgoviște, RO (2003)
 Cramer, Wolfgang, Potsdam, DE (convener all years, board member 2006–2008)
 Czúcz, Bálint, Vácrátót, HU (2006)
 Datcu, Sabina, Bucharest, RO (2006)
 De Boeck, Hans, Wilrijk, BE (2006)
 De Chazal, Jacqueline, Louvain-la-Neuve, BE (speaker and tutor 2003)
 De Dato, Giovanbattista, Viterbo, IT (2003)
 De la Vega-Leinert, Anne, Berlin, DE (speaker and tutor 2003, 2005)
 Dendoncker, Nicolas, Edinburgh, UK (2005)
 Den Uyl, Roos, Utrecht, NL (2008)
 Denyer, Joanne, St. Ives, UK (2006)
 Didderen, Karin, Wageningen, NL (2007)
 Didion, Markus, Zürich, CH (2008)
 Dirnböck, Thomas, Wien, AT (2005)
 Domptail, Stephanie, Gießen, DE (2008)
 Dragne, Dana, Bucharest, RO (2003)
 Ekschmitt, Klemens, Gießen, DE (speaker 2003)
 Essl, Franz, Wien, AT (2007)
 Everaars, Jeroen, Leipzig, DE (2007)

- Feehan, Jane, Luxembourg, LU (speaker 2007)
 Fischer, Anke, Aberdeen, UK (speaker 2006, 2008)
 Fischer-Kowalski, Marina, Wien, AT (speaker 2007, 2008)
 Fletcher, Penny, Harpenden, UK (2007)
 Frapa, Pierre, Entrevennes, FR (speaker 2003)
 Fritsch, Uta, Bolzano, IT (organizer and convener 2003, tutor 2005, 2006, 2007, convener 2008)
 Fronzek, Stefan, Helsinki, FI (2003)
 Fyllas, Nikolaos, Mytilini, EL (2005)
 Gallai, Nicola, Avignon, FR (2006)
 Garcia Llorente, Marina, Madrid, ES (2008)
 Gaube, Veronika, Wien, AT (2006)
 Geiger, Flavia, Wageningen, NL (2007)
 Gerbens-Leenes, Winnie, Groningen, NL (2003)
 Godbold, Jasmin, Aberdeen, UK (2007)
 Goidts, Esther, Louvain-la-Neuve, BE (2005)
 Goldin, Sarah Raphaél, Canberra, AU (2008)
 Gonzales, Carla, Caparica, PT (2007)
 Grabherr, Georg, Wien, AT (speaker 2008)
 Graef, Frieder, Müncheberg, DE (2003)
 Grossmann, Iris, Geesthacht, DE (2003)
 Habeck, Anja, Potsdam, DE (2003)
 Haberl, Helmut, Wien, AT (speaker 2006)
 Hahn, Katrine, København, DK (2006)
 Hájek, Jan, České Budějovice, CZ (2007)
 Hájková, Libuše, České Budějovice, CZ (2007)
 Hallstan, Simon, Uppsala, SE (2007)
 Hanspach, Jan, Halle, DE (2008)
 Heinrichs, Steffi, Göttingen, DE (2007)
 Hille, Marco, Hopsten, DE (2003)
 Hippler, Dorothee, Bern, CH (2003)
 Hirschnitz, Martin, Greifswald, DE (2007)
 Holcová, Veronika, České Budějovice, CZ (2007)
 Hudek, Csilla, Budapest, HU (2008)
 Imrichová, Zuzana, Aberdeen, UK (board member 2006, participant 2005, tutor 2006)
 Jačková, Kateřina, Praha, CZ (2008)
 Jaeger, Carlo, Potsdam, DE (speaker 2003)
 James, Marianne, Aberdeen, UK (2006)
 Jedrzejczak, Marcin, Firenze, IT (2003)
 Jones, Laurence, Bangor, UK (2003)
 Jung, Martin, Jena, DE (2005)
 Jurasinski, Gerald, Bayreuth, DE (2003)
 Juszczak, Radek, Poznan, PL (2003)
 Kahmen, Ansgar, Berkeley CA, US (2003)
 Kallache, Malaak, Paris, FR (2007)
 Keskitalo, Carina, Umeå, SE (speaker 2006)
 Kivimäki, Sanna, Edinburgh, UK (2008)
 Klok, Chris, Wageningen, NL (speaker 2007)
 Knohl, Alexander, Zürich, CH (2003)
 Knorn, Jan, Berlin, DE (2007)
 Koca, Deniz, Lund, SE (2003)
 Koch, Katja, Marburg, DE (2003)
 Koetz, Thomas, Barcelona, ES (2005)
 Körner, Christian, Basel, CH (speaker 2003, 2008)
 Kröel-Dulay, György, Vácrtót, HU (2005)
 Krukenberg, Brigitta, Potsdam, DE (organizer 2005, 2006, 2007, 2008)
 Kujawa, Krzysztof, Poznan, PL (2003)
 Kundzewicz, Zbigniew, Poznan, PL (speaker 2003)
 Küster, Eva, Halle, DE (2007)
 Kyparissis, Asterios, Mytilini, EL (2006)
 Langerwisch, Fanny, Potsdam, DE (2008)
 Lavorel, Sandra, Grenoble, FR (speaker 2006, 2007)
 Lazzarotto, Patrick, Zürich, CH (2005)
 Lee, Peter, Canberra, AU (2008)
 Leemans, Rik, Wageningen, NL (convener all years)
 Leitinger, Georg, Bolzano, IT (2005)
 Lellei-Kovács, Eszter, Vácrtót, HU (2007)
 Leuzinger, Sebastian, Basel, CH (2005)
 Liira, Jaan, Tartu, EE (2005)
 Linard, Catherine, Louvain-la-Neuve, BE (2006)
 Liswanti, Sudaryati Nining, Bogor, ID (2007)
 Loritz, Holger, Halle, DE (2006)
 Lotze-Campen, Hermann, Potsdam, DE (speaker 2008)
 Lucht, Petra, Berlin, DE (speaker 2006)
 Lucht, Wolfgang, Potsdam, DE (speaker 2005, 2006, 2007, 2008)
 Lundin, Lars, Uppsala, SE (board member 2006–2008, speaker 2005)
 Lütke-meier, Sabine, Potsdam, DE (organizer 2003, convener 2005, 2006, 2007, 2008)
 Lütz, Michael, Dresden, DE (2005)
 Maceviciute, Ausra, Kalmar, SE (2003)
 Machado, Elia Axinia, Worcester MA, US (2005)
 Manning, Adrian, Canberra, AU (2006)
 Marazzi, Luca, Milano, IT (2008)
 Maxim, Laura, Guyancourt, FR (2005)
 Meffert, Peter, Berlin, DE (2008)
 Meier, Elle, Tartu, EE (2008)
 Metzger, Marc, Edinburgh, UK (speaker 2003, speaker and tutor 2005)
 Meybeck, Michel, Paris, FR (speaker 2005)
 Mölder, Andreas, Göttingen, DE (2006)
 Mooney, Harold A, Stanford CA, US (speaker 2008)
 Morales, Pablo, Lund, DE (2003)
 Munro, Nicola, Canberra, AU (2007)
 Mustin, Karen, Aberdeen, UK (2007)
 Ness, Barry, Lund, SE (2006)
 Nicholls, Robert, Southampton, UK (speaker 2003)
 Nilsson, Carin, Lund, SE (2005)
 Nghiêm, Sr. Tù, Loubès-Bernac, FR (speaker 2005)
 Nghiêm, Sr. Mãn, Loubès-Bernac, FR (speaker 2005)
 Nur, Muhammad Syukri, Bogor, ID (2003)
 Ohlberger, Jan, Berlin, DE (2007)
 Ónodi, Gábor, Vácrtót, HU (2008)

- Ostapowicz, Katarzyna Anna, Kraków, PL (2005)
 Padmanaba, Michael, Bogor, ID (2008)
 Parr, Terry, Lancaster, UK (speaker 2007)
 Patt, Anthony G., Laxenburg, AT (speaker 2007)
 Peh, Kelvin, Leeds, UK (2006)
 Peña, Juan, Alicante, ES (2006)
 Piquer-Rodriguez, Maria, Sydney, AU (2006)
 Pompe, Sven, Halle, DE (2007)
 Popp, Alexander, Potsdam, DE (2006, tutor 2007)
 Portillo, Carlos, Edmonton, CA (2007)
 Post, Joachim, Oberpfaffenhofen, DE (2003)
 Poulsen, Signe, Aarhus, DK (2005)
 Prior, Gina, Aberdeen, UK (2008)
 Proença, Vânia, Lisboa, PT (2008)
 Quétier, Fabien, Córdoba, AR (2003)
 Qvenild, Marte, Lillehammer, NO (2008)
 Rahmstorf, Stefan, Potsdam, DE (speaker 2005, 2006)
 Reckien, Diana, Potsdam, DE (2005, tutor 2006, 2008)
 Reidsma, Pytrik, Wageningen, NL (2003, tutor 2005)
 Reu, Björn, Jena, DE (2007)
 Reusswig, Fritz, Potsdam, DE (speaker 2007)
 Rickebusch, Sophie, Edinburgh, UK (2003)
 Rienks, Willem, Wageningen, NL (2005)
 Rounsevell, Mark, Edinburgh, UK (speaker 2003, 2005, 2007, 2008)
 Rüger, Nadja, Leipzig, DE (2006)
 Russo, Danilo, Napoli, IT (speaker 2005)
 Sabellek, Katharina, Bonn, DE (2008)
 Sandlund, Odd Terje, Trondheim, NO (speaker 2006)
 Santoso, Levania, Bogor, ID (2006)
 Saudyte, Silvija, Girionys, LT (2003)
 Schäfer-Guignier, Otto, Langerwisch, DE (speaker 2003)
 Schininger, Ingeborg, Zürich, ZH (2006)
 Schröter, Dagmar, Wien, AT (speaker and tutor 2003, 2005, 2006, 2007, convener 2006, 2007, 2008)
 Schulze, Roland, Scottsville, ZA (speaker 2005)
 Schüttler, Elke, Leipzig, DE (2006)
 Semeraro, Teodoro, Lecce, IT (2008)
 Settele, Josef, Halle, DE (speaker 2008)
 Sharman, Martin, Bruxelles, BE (speaker 2006, 2007, 2008)
 Siepel, Henk, Wageningen, NL (board member 2006–2008, speaker 2007)
 Sillence, Gordon, Monchique, PT (speaker 2003)
 Singh, Simron Jit, Wien, AT (speaker 2008)
 Sitch, Stephen, Wallingford, UK (speaker 2003)
 Slábová, Markéta, České Budějovice, CZ (2005)
 Smith, Pete, Aberdeen, UK (speaker 2003)
 Sowerby, Alwyn, Bangor, UK (2003)
 Špulerová, Jana, Bratislava, SK (board member 2007–2008, participant 2007)
 Stagl, Sigrid, Brighton, UK (speaker 2006, 2007)
 Steffen, Will, Canberra, AU (speaker 2005, 2006, 2007, 2008)
 Sterk, Marjolein, Wageningen, NL (2008)
 Straskrabova, Viera, České Budějovice, CZ (speaker 2006, 2007)
 Sutton, Mark, Edinburgh, UK (speaker 2005, 2006, 2007, 2008)
 Svarstad, Hanne, Oslo, NO (speaker 2007, 2008)
 Szablowska-Midor, Aneta, Kraków, PL (2005)
 Szabó, Rebeka, Vácrátót, HU (2006)
 Talkner, Ulrike, Göttingen, DE (2006)
 Tapella, Esteban, Rivadavia, AR (2008)
 Tarnavsky, Elena, London, UK (2005)
 Thapa, Shova, Brighton, UK (2006)
 Thibon, Maxime, Montpellier, FR (2006)
 Thomson, Bruce, Oxford, UK (2006)
 Tietjen, Britta, Potsdam, DE (2005)
 Timonen, Jonna, Jyväskylä, FI (2008)
 Trnka, Miroslav, Brno, CZ (2005)
 Vancompernelle, Jean, Wemmel, BE (speaker and guide all years)
 Van Delden, Hedwig, Maastricht, NL (2003)
 Van den Hove, Sybille, Valldoreix, ES (speaker 2005, 2006, 2008)
 Van der Leeuw, Sander, Tempe AZ, US (speaker 2008)
 Van Gelder, Arnold, Wageningen, NL (2007)
 Vandewalle, Marie, Lund, SE (2005)
 Vassolo, Sara, Hannover, DE (speaker 2003)
 Vidal Legaz, Beatriz, Almería, ES (2007)
 Vihervaara, Petteri, Turku, FI (2007)
 Villamor, Grace, Los Baños, PH (2006)
 Vohland, Katrin, Potsdam, DE (speaker 2008)
 Vrba, Jaroslav, České Budějovice, CZ (board member 2006–2008, speaker 2008)
 Watt, Allan, Edinburgh, UK (speaker 2007, convener 2008)
 Westerberg, Vanja, Montpellier, FR (2008)
 Wildenberg, Martin, Wien, AU (2006)
 Wilhelm, Susann, Berlin, DE (2005)
 Wilkerson, Brooke, Bergen, NO (2008)
 Willaarts, Bárbara, Almería, ES (2006)
 Wolters, Volkmar, Gießen, DE (speaker 2008)
 Xie, Yun, Beijing, CN (2003)
 Yohe, Gary, Middletown CT, US (speaker 2003)
 Zaehle, Sönke, Paris, FR (tutor 2003)
 Zaks, David, Madison WI, US (2005)
 Zebisch, Marc, Bolzano, IT (speaker 2005)
 Zemanova, Katerina, České Budějovice, CZ (2005)
 Zimmermann, Patrick, Bolzano, IT (2008)
 Zurek, Monika, Rome, IT (speaker 2003)

Appendix 2

Coordinates of EU Projects with relation to the Summer Schools

- ACCELERATES, Assessing Climate Change Effects on Land use and Ecosystems; from Regional Analysis to The European Scale, EU FP5, EVK2-CT-2000-00061, <http://www.geo.ucl.ac.be/accelerates/>
- ALARM, Assessing Large Scale Risks for Biodiversity with Tested Methods, EU FP6, GOCE-CT-2003-506675, <http://www.alarmproject.net/alarm/>
- ALTER-Net, A Long-Term Biodiversity, Ecosystem and Awareness Research Network, GOCE-CT-2003-505298, <http://www.alter-net.info>
- ATEAM, Advanced Terrestrial Ecosystem Analysis and Modelling, EVK2-2000-00075, <http://www.pik-potsdam.de/ateam>
- AVEC, Integrated Assessment of Vulnerable Ecosystems under Global Change, EVK2-CT-2001-20010, <http://www.pik-potsdam.de/avec>
- BioAssess, The Biodiversity Assessment Tools Project, EU FP5, EVK2-CT-2000-57122, <http://www.nbu.ac.uk/bioassess/>
- CarboEurope-IP, Assessment of the European Terrestrial Carbon Balance, EU FP6, GOCE-CT-2003-505572, <http://www.carboeurope.org/>
- ENSEMBLES, EU FP6, GOCE-CT-2003-505539, <http://ensembles-eu.metoffice.com/>
- NeWater, New Approaches to Adaptive Water Management under Uncertainty, EU FP 6, GOCE-CT2003-51179, <http://www.newwater.info/>
- VISTA, Vulnerability of Ecosystem Services to Land Use Change in Traditional Agricultural Landscapes, EU FP6, EVK2-2001-000356

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