DEUTSCHER AKADEMISCHER AUSTAUSCHDIENST

Programm Projektbezogener Personenaustausch

USA

Sachbericht

◆ Der Bericht ist bis spätestens zwei Monate nach Ablauf der Projektförderung vorzulegen ◆

A) PROJEKTDATEN

Projekttitel:	**Analysis and Management of Landscape Transitions in the Urban Rural Gradient**
Deutsche Institution:	Helmholtzzentrum für Umweltforschung, Department Landschaftsökologie.
Deutscher Projektverantwortlicher:	Prof. Dr. Ralf Seppelt
Amerikanische Institution:	Gund Institute for Ecological Economics, University of Vermont, Burlington, USA
Amerikanischer Projektverantwortlicher:	Prof. Dr. Alexey A. Voinov
Projektlaufzeit:	1.1.2005-31.12.2006
Berichtszeitraum:	1.1.2006-31.12.2006

B) KURZE BESCHREIBUNG DER IM BERICHTSZEITRAUM DURCHGEFÜHRTEN ARBEITEN (ggfs. auf gesondertem Blatt fortfahren)

Bemerkung: Intern verwenden wir für die Berichterstattung und Ergebnisdarstellung englische Dokumente, daher ist die folgende Zusammenfassung der Ergebnisberichte der drei Gastaufenthalte von Steffen Lauf, Sven Lautenbach und Ralf Seppelt ebenfalls auf Englisch.

In the second period of the project the aim was to test first developments on modelling processes within the urban-rural gradient as well as to identify further possibilities for research funding based on the established networks during the DAAD-PPP project period. To make a long story short: two important research projects have their starting point in the work and the discussions originating from this DAAD-PPP project: The project PLUREL, which is an EU-Integrated Project (total funds 7 Mio €) for the German Partner and the Moore Foundation Project for the US Partner were successful. UFZ is involved in the Moore Foundation project. The US Partner is no official partner in the EU Project but participates in the research support by the travel funds of the EU Project.

Reports in detail:

Trip 1: Urban-rural Land use Change Modelling, December, 4th – 16th, (Steffen Lauf, Master Student)

The opportunity to visit the Gund Institute for Ecological Economics was an excellent starting point for my master thesis. I was able to get an impression of how the Gund Institute works with system dynamic models. This was stimulating for setting up my master thesis concept. The overall objective of my master thesis is to set up an aggregated Land Use Change (LUCC) model for urban-rural regions. The aim of the trip thus was to figure out if there are

similar processes in the development of land use in cities and their surroundings in Eastern Germany and in the USA so that it is possible to reflect or to forecast LUCC in an aggregated simple model for a better comparability of actual processes in both countries.

First, Dr. Boumans explained me the functionality of the institute and introduced me in his work and his understanding of modelling. For this he showed me some of his system dynamic models. I have studied some models in more detail and to test the adaptability on the city of Leipzig. I figured out that most of these models are used to analyse global contexts of the considered coherencies. For that reason some of those models are not that useful to display regional coherencies, what was confirmed by the model results by pasting the data of Leipzig.

Second, we discussed his basic approach for all complex models: the four capitals (human, social, natural and economic). The basis for his researches is the equilibrium of all the 4 capitals, so disequilibrium is the driver for all human models. We concluded that for a regional model where many special influences are acting, it may be difficult to apply the 4 capital method. For my diploma thesis I decided to have decision making components of all the 4 capitals in my model, but in modified way with extra consideration of Eastern German developments.

Third, I took part in the modelling class from Dr. Boumans, where the participating graduate students presented their generated models, based on ecological relations. The presented results are part of the Project “Ecosystem Services” on processed Project at the Gund Institute. We discussed the functionalities and improved some of those models. In this context I learned how to use the software Simile, a system dynamics and object-based modelling and simulation software what is uses at the Gund Institute. The big advantages of the Simile software in contrast to Modelmaker 3 or 4 are the good graphical applications of the Simile software which are very useful for wide analysis. Furthermore the mathematical functions of Simile a very easy to understand and to use. So I decided to go on working on this platform in my master thesis.

Forth I got to know several colleagues of GIEE. Kenneth L. Bagstad is working in a PhD Program at the Gund Institute. We discussed sprawling and the possibility to model this phenomenon. We figured out the main drivers and realised a little model to simulate this problem in addiction to its magnitudes of influence. The outcomes are very useful for my system dynamic model, where I can integrate some of these coherencies. Galen Justus showed me his so called “Astronaut Model”, an agent based model that shows very simple the addiction of individuals with a special need and the resulting organisation in a closed system. This model or the idea of this model is by now not useful for my object based analysis, but it is absolutely possible to integrate such an individual content for visualising migration aspects at a future date.

Finally, Dr. Boumans and I discussed the coherencies of my model in progress, which is part of my diploma thesis “A projection of LUCC by a system dynamic model with special focus on demographic and household changes in the shrinking city of Leipzig and their surroundings". The method of different household types as a driver for land use change he affirmed. He proposes to add to it an economic differentiation like income for the already existing household types. This is already part of my model. We considered the possibilities to integrate parts of my model into the General Human Model by Kenneth Mulder (PhD) and worked on the first steps.

We also discussed processes of shrinking due to population decline besides a constant growing of land consumption that take place in eastern German cities, their impacts and reasons and how to model that process. We came to the conclusion that it is a good idea to compare the city of Leipzig with Baltimore, a north American city with nearly the same side, what is a good possibility to test my or any other LUCC model on two cities with different backgrounds. We will work on this together with Galen Justus who is going to organise the data of Baltimore.

I also could gain a small insight in UrbanSim, a model which is already used as a successful planning tool in many different countries.

The exchange of knowledge with Dr. Boumans was very interesting und useful. I could acquire new ideas to implement into my LUCC model and my diploma thesis. Furthermore a few common projects accrued to work on, what intensified the relationship between the UFZ and the Gund Institute.

Trip 2: Spatial explicit hydrologic modelling, July 7th – 28th (Dr. Sven Lautenbach, Scientist)

The aim of my second stay at the GUND institute was threefold: (1) present the first results of my work connected to the research stay in Burlington 2005 at the IEMSs conference which was hosted in Burlington as well and (2) get feedback from Alexey Voiniov to further improve the model, (3) get involved into the ideas of the Moore Foundation project on Ecosystem Services. During the time between the two research stays (December 2005 and July 2006) the implemented hydrological model has been set up and evaluated. Calibration and validation results have been promising as well as first results on the effect of the spatial pattern of land use change on discharge. Discussions during the presentation of the results at the conference gave a quite positive feedback on this work. The work has been published in the conference proceedings.

During the first week afterwards the conference I discussed with Alexey Voinov details of the hydrological model as well as technical details of the SME framework. The second week started with discussions with Serguei Krivov (GUND institute) about how data mining strategies could be used to transfer model results between different basins and to derive general rules from the regionalization patterns. In between I had the chance to join a class by Robert Constanza, Head of the GUND Institute, on ecological and economics. I also talked with Azur Moulaert, project manager of the Moore Foundation project about this project and how the Department of Computational Landscape ecology could contribute to this project.

At the time of writing this report, a first draft is being prepared which will hopefully be submitted for publication in the next months.

Trip 3: Organization of further work, July 7th-14th (Prof. Dr. Ralf Seppelt, PI)

The trip of the PI was of course to discuss further development of the cooperation. As mentioned in the abstract of the report, the final outcome of these discussion was

- To agree on a further exchange of students
- To follow a concerted strategy on the development of spatially explicit modelling tools (putting SME on SourceFourge, building up a sustainable group of people investigating the capabilities of the framework an to put the developed model to onto a parallel computer

These activities are embedded in the following projects, that evolved form the discussing enable by the DAAD-PPP funding

- EU-IP PLUREL (http://www.plurel.net/default.aspx), especially Module 4 on modelling urban rural gradient, PI at UFZ Leipzig
- Moore foundation project on Ecosystem Serices (http://www.uvm.edu/giee/?Page=research/ecosystemservices/index.html), PI at GIEE, Burlington, US

The project was extremely useful for the entire group of the Computational Landscape Ecology Department at the Helmholtz-Centre for Environmental Research as it offered the possibility for all people in the group to have intense exchange with groups aboard. Several

trips got possible besides DAAD funding (for instance DFG based) that were not possible without the established contacts and which broadened out network by visiting also other groups in the U.S.

In Summary, the project was excellent improve the internationality of the group at the UFZ.

A major drawback was the lack of funding for the U.S. partner. Just now in 2007 we managed to get funding for student to come to Germany and work in the lab at the UFZ. In future DAAD and NSF should aim at setting up a joined exchange program again. A possible consequence is that the research performed here focuses mostly on the objective of the German Partner. (This again displays in the authorship of the publications.)

C) ERGEBNISSE DES GEMEINSAMEN FORSCHUNGSPROJEKTS

Anzahl der aus Ihrem Projekt im Berichtszeitraum hervorgegangenen

1. Diplom- bzw. Magisterarbeiten	1
2. Dissertationen	1
3. Publikationen	4
davon zur Veröffentlichung angenommen:	3
zur Veröffentlichung eingereicht:	1
4. Konferenzbeiträge/Poster	2
5. Patentanmeldungen	-
davon angemeldet:	-
patentiert:	-

Dissertationen

1. Annlie Holzkämper *(2007): Spatial optimization of land-use patterns with respect to habitat functions.* Martin-Luther Univesity Halle-Wittenberg

Tagungspräsentationen/Poster

1. Session: ‘Beyond growth? Integrated models, simulations and scenarios of the future shape urban-rural regions’ Burlington, US, 10 July 2006, organized by **Dagmar Haase** and **Ralf Seppelt** (UFZ).
2. S. Lautenbach, A. Voinov and R. Seppelt (2006): "Localization effects of land use change on hydrological models", in: Voinov, A., Jakeman, A., Rizzoli, A. (eds). Proceedings of the iEMSs Third Biennial Meeting: "Summit on Environmental Modelling and Software". International Environmental Modelling and Software Society, Burlington, USA, July 2006. CD ROM.

Publikationen

1. Holzkämper, A., **R. Seppelt** (2007) LUPOlib – A generic library for optimising land-use patterns and landscape structures. Environmental Modelling and Software. (in print)

2. **Holzkämper, A., Lausch, A., Seppelt, R.** (2006): Optimizing landscape configuration to enhance habitat suitability for species with contrasting habitat requirements *Ecological. Modelling* 198 (3-4), 277-292 http://dx.doi.org/10.1016/j.ecolmodel.2006.05.001
3. Matthies, M., Berlekamp, J., **Lautenbach, S**., Graf, N., Reimer, S. (2006): System analysis of water quality management for the Elbe river basin *Environ.Modell.Softw*. 21 (9), 1309-1318 Onlinepublikation http://dx.doi.org/10.1016/j.envsoft.2005.04.026

6. Bitte geben Sie an, ob Sie sich im Zusammenhang mit Ihrem Projekt erfolgreich um finanzielle Förderung aus anderen Quellen beworben haben (wenn möglich, bitte Geldgeber und Fördersumme angeben).

1. PLUREL: Peri-urban Land Use Relationships: Strategies and Sustainability Impact Assessment Tools for urban-rural Linkages (EU-IP,2006-2008)
2. ECOSYSTEM SERVICES, Dynamics, Modelling, and Valuation to Facilitate Conservation, Principal Investigator: Robert Costanza, Program Manager: Azur Moulaert, Project Period: July 1, 2006 through June 30, 2007, Funded by: Gordon and Betty Moore Foundation

7. Betreffen die unter Pkt. 6 genannten Anträge außer Ihrem Partner noch weitere Wissenschaftler/Gruppen? Wenn ja, nennen Sie hier bitte die Institutionen und Projektleiter.

Ad 1) PLUREL:

- University of Copenhagen [KU], Danish Centre for Forest, Landscape and Planning, Copenhagen, Demark, Dr. Kjell Nilsson
- Centre for Agricultural Landscape Research [ZALF], Department for Land use Systems and Landscape Ecology, Muncheberg, Germany, Dr. Armin Werner
- Green World Research [ALTERRA], Landscape centre, Wageningen, The Netherlands, Ir. Carmen Aalbers
- International Institute for Applied Systems Analysis – IIASA [IIASA], World Population Programme, Laxenburg, Austria, Prof. Wolfgang Lutz,
- Austrian Research Centres GmbH [ARC], Systems research dicision – regional development department, Wien, Austria, Dr. Wolfgang Loibl
- Université catholique de Louvain [UCL], Department of Geography, Louvain-La-Neuve, Belgium, Dr. Mark Rounsevell
- Institute for Local Government Studies [AKF], Environment and Energy, Copenhagen, Denmark, Dr. Søren Arnberg
- The Finnish Environment Institute [SYKE], Research Department, Programme for Enviromental Policy,Helsinki, Finland, Dr. Mika Ristimäki
- Universite Paris 1 Pantheon-Sorbonne [UP1], Centre d'Economie de la Sorbonne / ERASME, Paris, France, Prof. Paul Zagame
- Agricultural and environmental engineering research centre [CEMAGREF], Cemagref groupements de Montpellier, Grenoble, Bordeaux, France, Dr. Sylvain Labbe
- Centre for European Economic Research GmbH [ZEW], Department of Environmental and Resource Economics, Enviromental Management, Mannheim, Germany, Dr. Klaus Rennings
- Christian-Albrechts-University of Kiel [CAU], Ecology Centre, Kiel, Germany, Dr. Felix Müller
- University of Thessaly [UTh], Department of Planning and Regional Development,Volos, Greece, Dr. Konstatinos Lalenis
- Metropolitan Research Institute LTD. [MRI], Budapest, Hungary, Dr. Ivan Tosics, Web: www.mri.hu
- University College Dublin, National University of Ireland [UCD], School of Geography, Planning and Environmental Policy, Dublin, Ireland, Dr. Brendan Williams
- Commission of the European Communities – Directorate General Joint Research Centre [EC-DG JRC], Institute for Environment and Sustainability – Land Management Unit and Natural Hazards Unit, Ispra, Italy Dr. Marjo Kasanko & Dr. Steve Peedell
- Polish Academy of Sciences [IGiPZPAN], Stanilaw Leszczycki Institute of Geography and Spatial Organization, Warszawa, Poland, Prof. Piotr Korcelli
- University of Ljubljana [UL], Biotechnical faculty, Agronomy department, Centre for Agricultural

Land Management and Agrohydrology & Department of Forestry and Renewable Forest Resources, Ljubljana, Slovenia, Prof. Marina Pintar

- University of Bath [UBATH], Department of Economics and International Development,Bath, United Kingdom, Prof. Anil Markandya
- The University of Manchester [UOM], Planning and Landscape, School of Environment and Development, Manchester, United Kingdom, Dr. Joe Ravetz
- Edinburgh College of Art [ECA], OPENspace Research Centre, Edinburgh, United Kingdom, Dr. Simon Bell
- Scandinavian Branding A/S [SCANDING], Copenhagen, Denmark, CEO Johan Adam Linneballe
- Büro für urbane Projekte [BUP], Leipzig, Germany, Dr. Marta Doehler-Behzadi
- Studio Mediterana, architecture designing, advisory and investment inc., Izola, Slovenia, Manca Plazar Mlakar
- Munich Design International [MUDI], Irene Burkhardt Landschaftsarchitektur, München, Germany, Ms. Irene Anna Margarete Burkhardt
- RAL2005 Architects [RAL2005], Rotterdam, The Netherlands, Mr. Duzan Doepel
- Queen's University Belfast [QUB], Agri Food and Land Use, School of Biological Sciences, Belfast, United Kingdom, Prof. William George Hutchinson
- University of Groningen [RuG], Faculty of Spatial Sciences, Department of Planning, Urban and Regional Studies Institute, Groningen, The Netherlands, Prof. Gert de Roo
- Research Institute of Forestry Policy and Information, Chinese Academy of Forestry, [RIFPI, CAF], Beijing, China,Dr. Li Zhiyong

Ad 2: Ecosystem Services

- Keith Alger, Conservation International
- Brett Bryan, CSIRO
- So-Min Cheong, Kansas University
- Dan Childers, Florida International University
- Cutler Cleveland, Boston University
- Rudolf deGroot, Wageningen University, the Netherlands
- Steve Farber, University of Pittsburgh
- Kathy Hibbard, National Center for Atmospheric Research
- Charles Hopkinson, Marine Biological Lab
- Richard Howarth, Dartmouth College
- Hal Mooney, Stanford University
- Robert Muetzelfeldt, Simulistics
- Kenneth Mulder, Michigan State University
- Robin Naidoo, WWF
- Dennis Ojima, Colorado State University
- Trista Patterson, USDA Forest Service, Juneau, AK
- Rosimeiry Portela, Conservation International
- Fred Sklar, South Florida Water Management District
- Paula Swedeen, Earth Economics
- Paul West, The Nature Conservancy

8. Sind an Ihren Forschungsarbeiten auch Partner aus der Industrie beteiligt? Wenn ja, bitte spezifizieren.

nein

9. Bitte kreuzen Sie an, in welchem Maße Ihrer Ansicht nach die Ziele Ihres Projekts erreicht wurden
(1 = Ziele in vollem Umfang erreicht)

	2			

10. Raum für Ihre Anmerkungen

Datum und Unterschrift des Projektverantwortlichen