

**CONTACT  
INFORMATION**

Faculty of Engineering Technology  
Water Engineering and Management Group  
Drienerlolaan 5, Enschede  
The Netherlands

Phone: +31 53 489 4209  
Fax +31 53 489 5377  
m.brugnach@utwente.nl

**CURRENT RESEARCH FOCUS AND INTERESTS**

- Adaptive and integrated water resource management
- Collective decision making. Participatory processes. Collaborative solutions
- Socio-environmental systems modeling. Participatory modeling
- Model assessment and evaluation. Uncertainty analyses and conceptualization
- Uncertainty in decision making processes. Ambiguity and framing issues

**GRADUATE STUDIES**

**PHD Bioresource Engineering**  
 Dept. Bioresource Engineering,  
 Oregon State University  
 Corvallis, OR, USA. December 2002

**Forest Ecology**  
 Dept. Forest Science, Oregon State University  
 Corvallis, OR, USA. December 2002

**Dissertation** New Tools and Approaches to Uncertainty Estimation in Complex Ecological Models

**Ingeniería de Sistemas** (Computer Science degree with orientation in Information Systems)  
 Universidad Nacional del Centro, Facultad de Ciencias Exactas, Tandil, Argentina. November 1990

**LANGUAGES**

Spanish (native speaker)

English (read-write-speak)

Italian (read-write-speak)

German (learning)

Dutch (learning)

**SCHOLARSHIPS & SHORT COURSES**

Honing your Facilitation Skills. 15-16/05/08. NeWater-TIAS Training. Montpellier, France.

Stakeholder Collaboration, Framing, Cognitive Mapping and Model Building. 15-16/02/07. NeWater-TIAS Training. Osnabrück, Germany.

Nonlinear Time Series Analysis in Biology. 17-20/12/00. University of Tennessee. Knoxville, USA. Invited.

Complex Systems Summer School. 5/31/98-6/26/98. Santa Fe Institute. Santa Fe, NM, USA. Invited.

## PEER REVIEWED

**Brugnach M.**, A. Dewulf, H.J. Henriksen and P. van der Keur (2011). More is not always better: Coping with ambiguity in natural resources management. *Journal of Environmental Management*. 92(1):78-84.

Pahl-Wostl C., P. Jeffrey, N. Isendahl and **M. Brugnach**. Paradigms in water management: reconciling what we do with what we know. *Water Resources Management*. In Press.

Van der Keur P., **M. Brugnach**, A. Dewulf, J. C. Refsgaard, P. Zorilla, M. Poolman, N. Isendahl, G. T. Raadgever, H. J. Henriksen<sup>1</sup>, J. J. Warmink<sup>7</sup>, M. Lamers and J. Mysiak (2010). Identifying Uncertainty Guidelines for Supporting Policy Making in Water Management Illustrated for Upper Guadiana and Rhine Basins. *Water Resource Management* (DOI 10.1007/s11269-008-9248-6).

**Brugnach M.** and H. Ingram (2010). Rethinking the role of humans in water management: towards a new model of decision-making. Accepted for publication in "Water, cultural diversity and environmental change," B. Rose Johnston, Editor-in-chief, Springer Verlag, 2010.

Rupp, D. E., R. F. Keim, M. Ossiander, **M. Brugnach**, and J. S. Selker (2009). Time Scale and Intensity Dependency in Multiplicative Cascades for Temporal Rainfall Disaggregation. *Water Resour. Res.*, 45, W07409, doi:10.1029/2008WR007321.

Isendahl N., A. Dewulf, **M. Brugnach**, G. François, S. Möllenkamp and C. Pahl-Wostl (2009). Assessing framing of uncertainties in water management practice. *Water Resources Management*, 23(15): 3191.

**Brugnach M.**, P. van der Keur, H.J. Henriksen and J. Mysiak (2009). Uncertainty in adaptive water management. *NeWater Synthesis Product # 2*. <http://www.newater.info/index.php?pid=1045>

Hart Q., **M. Brugnach**, B. Temesgen, C. Rueda, S. Ustin, K. Frame (2009). Daily reference evapotranspiration for California using satellite imagery and weather station measurements interpolation. *Civil Engineering and Environmental Systems*. <http://dx.doi.org/10.1080/10286600802003500>

**Brugnach M.**, P. van der Keur, J. Mysiak, H.J. Henriksen (2009). Uncertainty in water management. In "The Adaptive Water Resource Management Handbook." Edited by Jaroslav Mysiak, Hans Jørgen Henriksen, Caroline Sullivan, John Bromley and Claudia Pahl-Wostl. Earthscan, pp216. ISBN 9781844077922.

**Brugnach M.**, A. Dewulf, C. Pahl-Wostl and T. Taillieu (2008). Towards a relational concept of uncertainty: about knowing too little, knowing too differently and accepting not to know. *Ecology & Society*. 13(2). <http://www.ecologyandsociety.org/vol13/iss2/art30>

Van der Keur, P., H.J. Henriksen, J.C. Refsgaard, **M. Brugnach**, C. Pahl-Wostl, A. Dewulf and H. Buiteveld (2007). Identification of Major Sources of Uncertainty in Current

IWRM Practice Illustrated for the Rhine basin. *Water Resources Management*, DOI 10.1007/s11269-008-9248-6.

Holtz G., **M. Brugnach** and C. Pahl-Wostl (2007). Specifying “Regime” - A Framework for defining and describing Regimes in Transition Research. *Technological Forecasting and social change*. <http://www.sciencedirect.com/science/journal/00401625>

**Brugnach M.** and C. Pahl-Wostl (2007). A broadened view on the role for models in natural resource management: Implications for model development. In Pahl-Wostl, C., Kabat, P. and J. Möltgen. 2007. *Adaptive and Integrated Water Management. Coping with Complexity and Uncertainty*, Springer Verlag, 184-203.

**Brugnach M.**, C. Pahl-Wostl, K.E. Lindenschmidt, J.A.E.B. Janssen, T. Filatova, A. Mouton, G. Holtz, P. van der Keur and N. Gaber (2007). Complexity and uncertainty: rethinking the modelling activity. *Environmental Modelling and Software and Decision Support - Developments in Integrated Environmental Assessment (DIEA) - Vol – 3*.

**Brugnach M.**, A. Tagg, F. Keil, and W. de Lange (2007). Uncertainty matters: computer models at the science-policy interface. *Water Resources Management*, 21:1075-1090.

**Brugnach M.** (2005). Process level sensitivity analysis for complex ecological models. *Ecological Modelling*. 187:99-120.

Kittel T.G.F., N.A. Rosenbloom, J.A. Royle, C. Daly, W.P. Gibson, H.H. Fisher, P. Thornton, D.N. Yates, S. Aulenbach, C. Kaufman, R. McKeown, D. Bachelet, D.S. Schimel, VEMAP2 Participants. 2004. VEMAP Phase 2 bioclimatic database. I. Gridded historical (20th) century climate for modeling ecosystem dynamics across the conterminous USA. *Climate Research*, 27(2):151-170.

**Brugnach M.**, J. Bolte and G. Bradshaw (2003). Determining the significance of threshold uncertainty in rule-based classification models. *Ecological Modelling*, 160:63-76.

Bachelet D., **M. Brugnach** and R.P. Neilson (1998). Sensitivity of a biogeography model to soil properties. *Ecological Modelling*, 109:77-98.

#### **MANUSCRIPTS IN ADVANCED STAGE OF PREPARATION**

Brugnach M., H. Nieße, C. Varela and C. Pahl-Wostl. Modeling transitions to adaptive management: considering values and beliefs in decision making. To be submitted to *Ecology and Society*.

Dewulf A., M. Brugnach, H. Ingram and C. Termeer. Different ways of knowing climate change. Bridging knowledge frames and networks as a key challenge for climate policy.. In review in *Global Environmental Change*.

Henriksen H-J, M. Brugnach, E. Lopez-Gunn, P. Zorilla Miras, A.de la Hera and C.Dumas. Decision making under uncertainty: Methodological tools for adaptive water management. In review in *Journal of Environmental Management*.

Henriksen H-J, A.de la Hera, P. Zorilla Miras and M. Brugnach. Use of Bayesian networks for communicating divergent views and understandings in adaptive groundwater management. In review in *Integrated Environmental Assessment and Management*.

## REPORTS

**Brugnach M.**, H. Nieße, C. Varela and C. Pahl-Wostl. Modeling transitions to adaptive management: considering values and beliefs in decision making (2009). Deliverable of the EU 6th FP NeWater project ([www.newater.info](http://www.newater.info)).

Dewulf, A., G. François, **M. Brugnach**, N. Isendahl, T. Taillieu, C. Pahl-Wostl, S. Moellenkamp (2008). The role of uncertainty, ambiguity and framing in transition to adaptive management. About knowing too little, accepting not to know and knowing too differently. Deliverable of the EU 6th FP NeWater project ([www.newater.info](http://www.newater.info)).

**Brugnach M.** and C. Pahl-Wostl (2007). Putting uncertainty into context: implications of model purpose in dealing with uncertainty. Global Assessments: Bridging Scales and Linking to Policy. GWSP, Issues in Global Water System Research. Report 2: 108-113.

Pahl-Wostl C., P. Jeffrey, **M. Brugnach** and J. Sendzimir (2007). Adaptive water management: How to cope with uncertainty. NeWater 6<sup>th</sup> framework program. Policy Brief. CAIWA International Conference on Adaptive and Integrated Water Management - Coping with Complexity and Uncertainty. Basel, Switzerland.

**Brugnach M.** and C. Pahl-Wostl (2007). Development of a model to analyze transitions to adaptive management regimes: Incorporating the role of humans and culture in decision making. Report on the CoMo model summarizing methods and first results. NeWater 6<sup>th</sup> framework program, Report D1.7.4a.

Pahl-Wostl C., N. Isendahl, S. Möllenkamp, **M. Brugnach**, P. Jeffrey, W. Medema and T. Tessa de Vries. Paradigms in water management. NeWater 6<sup>th</sup> framework program, Report D1.1.2.

Van der Keur P., **M. Brugnach**, C. Pahl-Wostl and J.C. Refsgaard (2006). The importance of uncertainties and how they are addressed in IWRM. In Framework for adaptive water management regimes and for the transition between regimes. NeWater 6<sup>th</sup> framework program, Report D 1.7.1.

Hart Q.J., **M. Brugnach**, and S.L. Ustin (2005). Calculation of daily reference evapotranspiration for California using goes satellite measurements and CIMIS weather station interpolation. Technical report, California Department of Water Resources.

## ORAL AND POSTER PRESENTATIONS

**Brugnach, M.** (2010). More information is not always better: coping with uncertainty in adaptive water management. International Workshop Advances in Flood Forecasting and the Implications for Risk Management. Alkmaar, The Netherlands, May 35-26.

**Brugnach, M.** (2010). From prediction to learning: the implications of changing the purpose of the modelling activity. International Congress on Environmental Modelling and Software. Ottawa, Canada. July5-8.

**Brugnach, M.** and H. Ingram (2009). Rethinking the role of humans in water management: towards a new model of decision-making. Symposium: "Water cultural diversity and global environmental change: emerging trends, sustainable

futures?"Organized by RIHN, UNESCO-IHP and UNESCO-IAS. Kyoto, Japan, 1-3 October 2009. Oral and poster presentation. *Invited*

Dewulf A., **M. Brugnach** and H. Ingram (2009). The Co-Production of Knowledge about Water Resources: Framing, Uncertainty and Climate Change. 7<sup>th</sup> International Science Conference on Human Dimensions of Global Environmental Change. Bonn, Germany. Paper and oral Presentation.

**Brugnach, M.** (2008). Managing uncertainty in ecological models: Linking model development and use. Public Lecture. Zentrum für Marine Tropenökologie. Bremen, Germany. Oral presentation. *Invited*.

**Brugnach M.**, P. van der Keur, M. Mysiak and H.J. Henriksen (2008). Uncertainty Guidelines. NeWater Final Conference. Sevilla, Spain. Oral presentation

**Brugnach M.** and C. Pahl-Wostl (2007). How can models better aid the decision processes for the management of water resources? American Geophysical Union, San Francisco, USA. Oral presentation. *Invited*.

**Brugnach M.**, A. Dewulf, C. Pahl-Wostl and T. Taillieu (2007). Towards a relational concept of uncertainty: Including the human experience. CAIWA International Conference on Adaptive and Integrated Water Management - Coping with Complexity and Uncertainty. Basel, Switzerland. Oral presentation.

Isendahl N., A. Dewulf, **M. Brugnach**, G. François, S. Möllenkamp, C. Pahl-Wostl (2007). How to assess framing of uncertainties in water management practice. CAIWA International Conference on Adaptive and Integrated Water Management - Coping with Complexity and Uncertainty. Basel, Switzerland. Paper and oral presentation.

**Brugnach M.**, A. Dewulf, C. Pahl-Wostl and T. Taillieu (2007). Towards a relational concept of uncertainty: about knowing too little, knowing too differently and accepting not to know. Proceedings of the 14th International Conference on Multi-Organisational Partnerships, Alliances & Networks MOPAN. Leuven, Belgium. Paper and oral presentation.

**Brugnach M.** and C. Pahl-Wostl (2007). Putting uncertainty into context: Implications of model purpose in dealing with uncertainty. 7th International IWA Symposium on Systems Analysis and Integrated Assessment in Water Management. Watermatex. Washington DC, USA. Paper and oral presentation.

**Brugnach M.**, A. Dewulf, G. Francois, T. Taillieu and C. Pahl-Wostl (2006). The role of uncertainties in water management: connecting theory and practice. NeWater General Assembly. Hortobagy, Hungary. Poster presentation.

**Brugnach M.** and C. Pahl-Wostl (2006). Uncertainty, models and decision making. HarmoniRib workshop. Brussels, Belgium. Poster presentation.

**Brugnach M.** and C. Pahl-Wostl (2006). Complexity and uncertainty and a new role for models. 3rd Biennial meeting of the International Environmental Modelling and Software Society. Vermont, USA. Paper and oral presentation.

**Brugnach M.** and P. van der Keur (2005). Characterization of uncertainties. NeWater General Assembly. Mallorca, Spain. Oral presentation.

**Brugnach M.** (2004). On ecological models, uncertainty and inference. International Institute of Applied Systems Analysis. Laxenburg, Austria. 04/06/2004. Oral presentation. *Invited*.

**Brugnach M.**, R.P. Neilson and J. Bolte (2001). A Sensitivity Analysis Method to Study the Behavior of Complex Process-based Models. *Eos Trans. AGU*, 82(47). Poster presentation.

**Brugnach M.**, J. Bolte, G. Bradshaw and R.P. Neilson (2000). Distinguish Ecological Significant Pattern from Modeling Artifacts: A Spatially-Explicit Method to Identify and Classify Model Uncertainty. 85<sup>th</sup> Annual Meeting of Ecological Society of America. Utah. USA. Poster presentation.

Rupp D.E., R.F. Keim, M. **Brugnach**, M. Ossiander and J.S. Selker (2000). A scale variant random cascade model of temporal rainfall. *Eos Trans. AGU*, 81(48). Poster presentation.

Ossiander M., E.C. Waymire, J.S. Selker, D.E. Rupp, R.F. Keim and **M. Brugnach**. (2000). Estimation for multiplicative cascades, some statistical developments. *Eos Trans. AGU*, 81(48). Poster presentation.

**Brugnach M.**, J. Bolte, G. Bradshaw and R.P. Neilson (1999). Behavioral changes of Global Vegetation Models across scales. 2<sup>nd</sup> European Ecological Modelling Conference. Pula, Croatia. Oral presentation.

**Brugnach M.**, G. Bradshaw and R.P. Neilson (1999). Effects of scaling bias introduced by spatial pattern-resolution interactions in Dynamic Global Vegetation Models. 84<sup>th</sup> Annual Meeting of Ecological Society of America. Spokane, Washington. USA. Oral presentation.

Waichler S., M. Wigmosta, R.P. Neilson and **M. Brugnach** (1998). A hydrology-biogeochemistry model for investigating impacts of climate change and timber harvest on watersheds. *EOS Trans. AGU*, 79(45), 353. Poster presentation.

Hibbard K.A., **M. Brugnach**, A. Franz, J.M. Lenihan, S. Waichler, R.P. Neilson and S.W. Running (1998). Implications of changing land-use on global carbon and water budgets: Simulations with the BIOME-BGC-MAPSS Dynamic Global Vegetation Model. GCTE/LUCC, Barcelona, Spain. Oral presentation.

Bradshaw G., **M. Brugnach** and R.P. Neilson (1997). Articulating the science policy gap: The problem of validation for global change models. Chile National Ecological Conference. Pucon, Chile 10-15 Nov. 1997. Oral presentation.

## RESEARCH POSITIONS

**Assistant Professor.** Water Engineering and Management Group. Faculty of Engineering Technology. University of Twente. Under the supervision of Prof. dr. Arjen Hoekstra.

Period: 1/09/2009-Present

**Senior Researcher.** Full time researcher in the NeWater project (New Approaches to Adaptive Management under Uncertainty), under the 6th EU Framework Program. Based on the Institute of Environmental Systems Research. University of Osnabrück. Germany.

Responsibilities: (1) Development of a multi-objective model to understand transitions in managing regimes (2) Development of concepts and guidance of uncertainty for natural resource adaptive management. In addition to scientific research and modeling work, these tasks included writing reports, scientific papers and documents oriented to a non-scientific audience. Also, this position required the organization of international workshops, teaching courses in adaptive management, and the participation in grant development and fund raising activities. The work in uncertainty involved the coordination of a crosscutting "Uncertainty Group" that operated under my leadership. In this group several activities were carried out, such as the organization of scientific and working meetings as well as workshops and focused groups with decision makers.

Period: 2/1/2005-31/7/2009.

**Post Doctoral Researcher.** CalcSpace, UC Davis, Davis, USA.

Responsibilities: Development of an automated platform to produce daily evapotranspiration maps for the State of California. The goal of this project was to implement a near real-time monitoring capability based on satellite imagery, to be used in the development and evaluation of water management strategies, taking into account the effects of climatic variability and land use on evapotranspiration. I was topically responsible for the identification of interpolation methods which in combination with satellite information could render a good representation of climatic variables. Within the scope of this modeling exercise, part of my work was devoted to making this research applicable to environmental management objectives as determined by the California Department of Water Resource, the CIMIS program and collaborating clients. This involved the organization of group discussions, communication among colleagues and stakeholders, interviews, writing reports and scientific material.

Period: 9/1/2002 – 6/1/2004.

**Graduate Research Assistant.** Forest Science Dept, OSU, Oregon. USA.

Responsibilities: To work as part of a team of diverse ecologists, resource specialists, and computer scientists in the development of the dynamic global vegetation model BIOMAP, that consisted in linking the biogeographical model MAPSS and the biogeochemical model BGC. I was topically responsible for the generalization of the biogeochemical model BGC from being a one life form, one soil layer model to that of a complex structure with competing over/understory vegetation and multiple soil layers.



This task involved technical and computational aspects of model development, and also required detailed scientific (field and theory) knowledge about vegetation dynamics in the context of global climate change.

Period: 4/1/96-6/1/2002.

**System Analyst.** Geomática S.A., Bs. As., Argentina.

Responsibilities: Analysis and design of a cadastral system for the Santa Fe Province, using GIS and Remote Sensing technology. This task involved interactions and in depth discussions with clients from the Ministry and Municipalities to identify their requirements and determine their needs, as well as the more technical tasks of designing a cadastral system that was commensurate to the identified requirements.

Period: 6/95-03/96

**Research Assistant.** Forest Science Dept, OSU, Oregon. USA.

Responsibilities. To develop spatial-explicit ecological model based on GIS technology. This tasks involved programming, exchange with ecologist, presentation and writing of scientific material.

Period: 03/93 – 11/95

## TEACHING EXPERIENCE

Graduate course (master level): “Tools for Policy Analysis”. Faculty of Engineering Technology. Period: 1/2/2010-30/03/2010. University of Twente. The Netherlands.

Graduate course: “European Water Management in Theory and Practice”. Department of Geography. University of Osnabrueck. Period: 17/04/07 - 10/07/07. Osnabrück, Germany

Post-Graduate course: “How to analyze transitions? Uncertainty analyses and Implementing learning cycles in water management”. NeWater summer school. Transitions to Adaptive River Basin Management. 2007. Bad Krozingen, Germany.

Post-Graduate course: “Role of uncertainties in water management”. In NeWater autumn school. Adaptive Management in the context of Integrated Water Resource Management. 2006. Peyresq, France.

Graduate courses in: System Analysis and Design. Universidad del Centro, Argentina. Period: 01/04/87-90 – 15/11/87-90

Graduate courses in: Programming and Software Engineering. Necochea, Argentina. 01/04/91-92 – 30/11/91-92

Supervised student. Hendrik Niese, 2007. Diploma Thesis: “Modeling the influence of culture in water management”. Department of System Science, University of Osnabrück.

## **WORKSHOPS ORGANIZED AND OTHER SCIENTIFIC ACTIVITIES**

Uncertainty Discussion Group. Faculty of Engineering Technology (CTW). University of Twente. 01/02/2010-Present.

Scientific Committee member of CAIWA International Conference on Adaptive and Integrated Water Management - Coping with Complexity and Uncertainty. Basel, Switzerland. 12-15/11/2007.

Session on the topic of uncertainty in water resource management organized as part of CAIWA International Conference on Adaptive and Integrated Water Management - Coping with Complexity and Uncertainty. Basel, Switzerland. 12-15/11/2007.

Complexity and uncertainty and a new role for models. Workshop held as part of 3rd Biennial meeting of the International Environmental Modelling and Software Society. Vermont, USA. 2006.

Stakeholder Dialogues on Uncertainty. Workshop held in Leuven, Belgium, 31/05-01/06/2006.