Simpósio Brasil-Alemanha
Deutsch-Brasilianisches Symposium
Desenvolvimento Sustentável
Nachhaltige Entwicklung

UNIVERSITÄT HEIDELBERG
ZUKUNFT SEIT 1386

7th German-Brazilian Symposium for Sustainable Development

04. - 10. October 2015

Interaction between Earth resources and processes and human societies

Heidelberg University, Germany

Prof. Dr. Ulrich A. Glasmacher
Institute of Earth Sciences and Heidelberg Center for the Environment

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Nachhaltige Entwicklung

7th German-Brazilian Symposium for Sustainable Development

04. - 10. October 2015

Interaction between Earth resources and processes and human societies

Heidelberg University, Germany

Book of Programme and Abstracts

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FOREWORD

Dear Participants,

The 7th German-Brazilian Symposium of Sustainable Development will present and discuss the differences in sustainable development of human societies related to their cultural identities within the frame of Earth resources and processes. The use of the term sustainable development in this sense is an enlargement of the early definition (March 20, 1987) provided by the Brundtland Commision of the United Nations: „Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs“. The cultural identities of human societies have to be considered in the future change of their societies from using resources only to using resources with a strong view of the needs of future generations.

The Symposium in Heidelberg University assembles more than 220 scientists from different research fields. More than 200 abstracts cover nearly all fields of sustainability of human societies within 14 sessions. Natural resources of Planet Earth like Paleoclimate/Climate Change (Session 02), Water, Ocean (Session 03), Energy, Minerals, Ore deposits, Mining (Session 04), Biodiversity (Session 05) are the base of the evolution of human societies. The human use of these natural resources has to be organized within the society. Therefore, the fields of Bioeconomy (Session 06), Law (Session 07), Economy (Session 08), Politics, Social Action (Session 09), Agriculture, Forestry (Session 10), Global Geoparks & World Heritage Sites (Session 11), Cities of the Future – Megacities – Urban Areas (Session 12) provide insight into the governing process of handling the sustainability by individuals and their societies. Also important is teaching and training of all members of the human society in sustainability. Session 01 “Sustainable Development in Education and Society” will gain insight into methods and techniques for Sustainability in Education – Education of Sustainability. Changes within the natural and human environment cause an increase in infectious diseases. Research in this field is as important as in the other fields provided by lectures. Therefore, Session 13 “Infectious Diseases” will contribute by several lectures into future research necessaries. Finally, the Symposium will discuss the Sustainability of German - Brazilian projects and joined ventures (Session 14).

The public lecture (Tuesday, 6th of October) “ATTO, a giant tower for climate research in the AMAZON: The adventure of planning, construction and use” by Prof. Dr. Jürgen Kesselmeier (Max Planck Institute for Chemistry, Mainz) demonstrates how human society gains analytical data on the chemistry of the atmosphere above the Amazon Forest.

“ExpeditionN”, the expedition mobile of the Baden-Württemberg Stiftung will be present at the University square from Monday to Thursday. The information and education initiative "Expedition N" is unique in Europe, and invites visitors on an exciting journey of discovery in one of the most important issues of our time - sustainability.

Sustainability in the life of Baden-Württemberg’s and Hessen´s human society will be presented by two field trips on Friday, 9th of October.

On October, 4th of the Symposium will be opened by Prof. Dr. Bernhard Eitel (President of Heidelberg University), Theresia Bauer (Minister for Science, Research and the Arts Baden-Württemberg), and Prof. Dr. Herman Jacobus Cornelis Voorwald (Secretary of Education of the State of Sao Paulo) within the Alte Aula of Heidelberg University. A following panel discussion with introduction statements on “Sustainable Development in Education – Education in Sustainable Development” will discuss issues of education and sustainability. On Monday evening, 5th of October, the opening of three exhibition MINHASP, artistic objects of Cristina Barroso, and text and portrait of “Fritz Müller” guides into Sustainability in Art and Culture. The final event of the Symposium combines examples of Sustainability in Art and Culture such as the Brazilian choir ENCANTO and the presentation of “Visual arts in a German-Brazilian context” by Dr. Martina Merklinger with closing remarks.

These symposium might move us all forward in the direction of a sustainable human society that keeps the one planet we have for the needs of the future without loosing the cultural identity of the different societies of Earth. In that sense, I wish all participants and guests wonderful talks and poster presentations, eye opening discussions, a beautiful evening trip with the solar boat „Neckarsonne“, and sunny days in Heidelberg.

Prof. Dr. Ulrich A. Glasmacher

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General aim

The general aim of the symposium is to present and discuss the differences in sustainable development of two human societies related to their cultural identities within the frame of Earth resources and processes. The symposium is organized in 14 sessions and will use oral presentations, poster presentations, and a guided field tour to convey the general aim. The guided field tour will provide a human and natural example of sustainable development in Germany. The term "sustainable development" is used in the sense of the early definition (March 20, 1987) by the Brundtland Commission of the United Nations: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In general, sustainability is seen in the interaction of Environment, Social Actions, and Economics (Fig. 1).

Fig. 1: Sustainability in the interaction of environment, social actions and economics (www. http://macaulay.cuny.edu/eportfolios/akurry/2011/12/21/sustainable-development/).

Environment (Earth resources and processes) is connected with human societies (Social and Economic) by the terms "bearable" and "viable". These terms describe a possible way in which human societies can sustainably develop by living within the system Earth and using the resources of planet Earth. The focus of the symposium is to understand the Earth resources and processes, the cultural identities, and the unique conditions in Economy, Law, Politics, and Social actions between Europe and Latin America (Fig. 2).

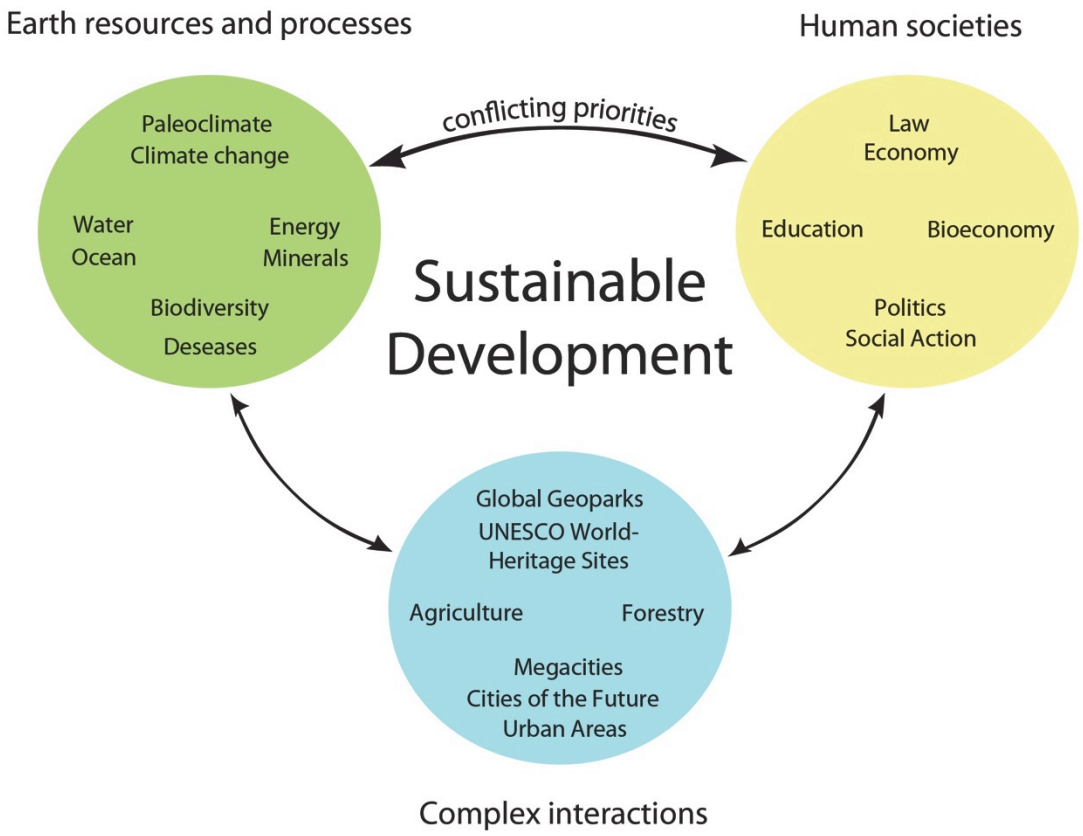

Fig. 2: Interaction between Earth resources and processes and Human societies.

The chance of the symposium is to discuss sustainable development of human societies considering the differences of the cultures. Therefore, the symposium will focus on the cultural identities, the Earth resources and processes (Palaeoclimate/Climate change, Biodiversity, Bioeconomy, Energy, Minerals, Water, Oceans), and present the sustainable development in human society (Economics, Law, Politics, Social actions, Fig. 2). Agriculture, Forestry, Cities of the Future, Megacities, and Urban areas, Global Geoparks and UNESCO World Heritage Sites are examples for fields of complex interactions between human society and natural resources. In addition, all themes related to Earth resources and processes would be discussed in the view of conflicting priorities of human needs. The topics of the symposium are given by the central themes of the Heidelberg Centre for the Environment (HCE), which supports the organisation of the symposium and the dissemination of its outcome. One outcome of the symposium could be a development scheme for sustainable actions within and between the different cultures. Furthermore, the symposium is strongly supported by the Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen, Baden-Württemberg International (bw-i) in Stuttgart and the “Deutsch-Brasilianische Gesellschaft e.V.”.

Programme

The 7th German-Brazilian Symposium is scheduled from Sunday, 04.10.2015 until Saturday 10.10.2015. It is is structured into four days of parallel sessions, talks, discussions, and poster sessions, and one day of a guided field tour. Each day starts at 08:30 h and will be finished at 18:00 h. Two coffee breaks and one lunch break structure the day and give room for further discussions and networking (Keynote speaker are in bold).

	Sunday 04.10.2015	**Monday 05.10.2015**			**Tuesday 06.10.2015**	
		Session 08	**Session 02**	**Session 10**	**Session 04**	**Session 05**
		Lecture hall 01	Lecture hall 02	Lecture hall 03	Lecture hall 01	Lecture hall 02
08:30 h - 10:30 h		**Chiu** **Vanka** Bernardes Weichert	**Jasper** Mayer Secchi Mächtle Matschullat	**Vohrer** Alvarez Latynskiy Siebold Winkler	**Tschamber** **Madruga** Pinto Michaelis Bianchi	**Fonseca** Moreira Koch **Rêgo Matos** Pressler
		Coffee break & Poster Session				
		Session 06				
11:00 h - 12:45 h		Krieg **Aragão** **Schebek** Eisner	**Jiang** **Leppe** Discussion: "Joined research"	**Spathelf** Matschullat Miola Silva	Brakemeier Hagemann **Peregovich** **Hiete**	**Vale** Gerold Mayer Discussion: "Joined research"
		Lunch & Poster Session				
			Session 12			**Session 11**
		Lecture hall 01	Lecture hall 02	Lecture hall 03	Lecture hall 01	Lecture hall 02
14:00 h - 15:30 h	14:00 h – 16:45 h Welcome desk	Dias Landa-Casigno Bradl Fonseca	**Eisenberg** Silva Kowaltowski Castaldelli-Maia	**Nauiack** Jaeger Naase Passos	Bradl Schmidt Freundt Discussion: "Joined research"	**Patzak** **Zouros** **Silva**
		Coffee break & Poster Session				
16:00 h - 18:00 h	17:00 h – 19:00 h Panel discussion Alte Aula	Discussion: "Joined research"	**Silva** Reis Garcia Discussion: "Joined research"	Jäger Discussion: "Joined research"		**Jiangfeng** Pletsch Guimaraes Weber Frey
17:00 h - 18:30 h		Official Poster Session				
		18:30 h Opening Exhibitions Open Meetings				
19:00 h - 21:00 h	Invitation by President Bel Etage				19:00 h Public lecture	

	Wednesday 07.10.2015			**Thursday 08.10.2015**			**Friday 09.10.2015**
	Session 03	**Session 07**	**Session 01**	**Session 03**	**Session 13**	**Session 14**	**Examples of sustainability**
	Lecture hall 01	Lecture hall 02	Lecture hall 03	Lecture hall 01	Lecture hall 02	Lecture hall 03	
08:30 h - 10:30 h	**Vent.** **Santos** Koch Pereira Höfer	**Kahl** Polido Derani Pinheiro	**Michelsen** Bastos Gomes Carvalho Denaro Mrazek	**Brandini** Glaser **Hackspacher** Venhor Disc.: "Joined research"	Jänisch **Marques** Krämer Horstick **Passos** Disc.: "Joined research"	Schulze **Overbeck** Cardoso Jr. Kupfer Dahl Trettin	08:30 h - 20:00 h A) Sustainable Development, Geo-Education and Science transfer B) Sustainable development of renewable energy, garbage separation, and the environment of *Homo heidelbergensis*
	Coffee break & Poster Session				**Session 09**		
11:00 h - 12:45 h	Dias Weiß Polli Fontes **Guo**	**Leite** Ayala Venancio **Mager** Kreter	**Nobre** Rocha de Souza		Tosun Müller Nascimento	Heinle Peregovich Matschullat Pereira De Melo-Reiners	
	Lunch & Poster Session						
	Lecture hall 01	Lecture hall 02	Lecture hall 03		Lecture hall 02	Lecture hall 03	
14:00 h - 15:30 h	Aeschbach-Hertig Imada Hilgert Neuffer	Marchesan Prates Yinan Moraes	**Hopkins** Oliveira Palheta Cardoso Jr.		Almeida Francois **Lisboa** Fenrich	Frattini Sperschneider Schulze Halm	
	Coffee break & Poster Session						
16:00 h - 18:00 h	**Cas Lass Erbe** Marchesan Discussion: "Joined research"	Discussion: "Joined research"	Murtinho Discussion: "Joined research"		Albuquerque Monteiro Djalma Discussion: "Joined research"	**Pokorny** Oesselmann Haltmayer Hellingrath	
17:00 h - 18:30 h	Official Poster Session						
				18:30 h Final event Sustainability in Art and Culture			
19:00 h - 21:00 h	19:00 h Trip with the sustainable boat "Neckarsonne"						

Session 01: Sustainable Development in Education and Society	Session 08: Economy
Session 02: Paleoclimate/Climate Change	Session 09: Politics, Social Action
Session 03: Water and Ocean	Session 10: Agriculture, Forestry
Session 04: Energy, Minerals, Ore deposits, Mining	Session 11: Global Geoparks & World Heritage Sites
Session 05: Biodiversity	Session 12: Cities of the Future – Megacities – Urban Areas
Session 06: Bioeconomy	Session 13: Infectious Diseases
Session 07: Law	Session 14: Sustainability of German-Brazilian projects/joined ventures

Sunday, 04.10.2015; 14:00 – 16:45 h; Neue Universität

14:00-16:45 **Registration at welcome desk**

Universität Heidelberg
Universitätsplatz, Grabengasse 1
Neue Universität, ground floor

Sunday, 04.10.2015; 17:00 h; Alte Aula

17:00-19:00 **Opening ceremony**

Universität Heidelberg
Universitätsplatz, Grabengasse 1
Alte Universität, Alte Aula, 1st floor

Simultaneous interpretation: Elisabete Köninger, Marten Henschel
Chair: Ulrike Sosalla, Südwestpresse Ulm

17:00-17:05 Musical frame by Sandro Machado, Brazilian vocalist, accompanied by Benedikt Moser, pianist

17:05-17:35 **Opening remarks**

- Prof. Dr. Bernhard Eitel, President of Heidelberg University
- Theresia Bauer, Minister for Science, Research and the Arts Baden-Württemberg
- Prof. Dr. Herman Jacobus Cornelis Voorwald, Secretary of Education of the State of São Paulo

17:35-17:40 **Welcome address**
Prof. Dr. Ulrich A. Glasmacher, Heidelberg University, Institute of Earth Sciences and Heidelberg Center for the Environment

17:40-17:45 Musical frame by Sandro Machado, Brazilian vocalist, accompanied by Benedikt Moser, pianist

17:45-18:05 **Introductory statements**

- Prof. Dr. Abílio Afonso Baeta Neves, Director President of Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul / Counsellor at Vice Rectorate for Research, Innovation and Development of Pontifícia Universidade Católica do Rio Grande do Sul
- Prof. Dr. Alexander Siegmund, Heidelberg University of Education, Interdisciplinary Institute for Natural Sciences, Technology, Society and Department for Geography / Heidelberg University, Heidelberg Center for the Environment and Institute for Geography

18:05-18:55 **Panel discussion on "Sustainable Development in Education – Education in Sustainable Development"**

- Theresia Bauer, Minister for Science, Research and the Arts Baden-Württemberg
- Prof. Dr. Herman Jacobus Cornelis Voorwald, Secretary of Education of the State of São Paulo
- Prof. Dr. Abílio Afonso Baeta Neves, Director-President of Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul / Counsellor at Vice Rectorate for Research, Innovation and Development of Pontifícia Universidade Católica do Rio Grande do Sul
- Christoph Dahl, Managing Director of "Baden-Württemberg Stiftung"
- Prof. Dr. Bernhard Eitel, President of Heidelberg University
- Prof. Dr. Raimunda Monteiro, Rector of Universidade Federal do Oeste do Pará
- Prof. Dr. Alexander Siegmund, Heidelberg University of Education, Interdisciplinary Institute for Natural Sciences, Technology, Society and Department for Geography / Heidelberg University, Heidelberg Center for the Environment and Institute for Geography

18:55-19:00 Musical frame by Sandro Machado, Brazilian vocalist, accompanied by Benedikt Moser, pianist

19:00 **Reception at Bel Etage by invitation of**
Prof. Dr. Bernhard Eitel, President of Heidelberg University

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 1 (HS 1): Morning Session

	Session 08: Economy	
	Chair: Marcio Weichert, Ulrich A. Glasmacher	
08:30 - 09:00	**Keynote lecture** **Anthony S.F. Chiu** JM Reyes Industrial and Mechanical Engineering, De La Salle University - Manila, Philippines	*Green Industry Initiatives in Asia Pacific through Eco-Industrial Development and RECP*
09:00 - 09:30	**Keynote lecture** **Sita Vanka** School of Management Studies, University of Hyderabad, India	*Capacity Building– A Sustainable Approach for Continuing Education of Women in Indian Businesses*
09:30 - 09:50	**E.M. Bernardes** UNESP - Univ Estadual Paulista, Campus de Dracena, Dracena-SP, Brazil	*Interaction between social and natural capital stocks in the State of Sao Paulo, Brazil*
09:50 - 10:10	**Marcio Weichert** Coordinator of the German House of Science and Innovation – São Paulo (DWIH-SP), Brazil	*Science and Business: How does the DWIH-SP bring them together?*
10:10 - 10:30	Discussion: "possible Joined Research Projects"	
10:30 - 11:00	Coffee break & Poster Session	
	Session 06: Bioeconomy	
	Chair: Thomas Hirth, Rüdiger Schaldach, Carlos Alberto Aragão	
11:00 - 11:20	**Sabine Krieg** Fraunhofer IGB, Stuttgart, Germany	*Bioeconomy in Baden-Württemberg*
11:20 - 11:50	**Keynote lecture** **Carlos Alberto Aragão** National Institute of Metrology, Quality and Technology, Directorate of Innovation & Technology, Rio de Janeiro, Brazil	*The role of Brazil in the global bioeconomy*
11:50 - 12:20	**Keynote lecture** **Liselotte Schebek** Institute IWAR, Technische Universität Darmstadt, Darmstadt, Germany	*Biofuels and Land Use Change: Mitigation options from Regional "Good Governance"*
12:20 - 12:40	**Peter Eisner** Fraunhofer Institute for process engineering and packaging, Department process development, Freising, Germany	*Innovative processing of oil seeds for simultaneous recovery of edible oil, solid fuel, antioxidants, and protein-rich food ingredients*
12:50 - 14:00	Lunch & Poster Session	

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 1 (HS 1): Afternoon Session

	Session 06: Bioeconomy	
14:00 - 14:20	**O.A.T. Dias** College of Agricultural Sciences, São Paulo State University (UNESP), Botucatu, SP, Brazil	*Studies of lignin powder as reinforcement for plastics composites*
14:20 - 14:40	**Oriana Landa-Casigno** CIATEC, Technology Department, Leon, Guanajuato, Mexico, University College London; Civil, Environmental and Geomatic Engineering, London, United Kingdom	*Feasibility study to implement anaerobic digesters for agricultural and manure wastes: Guanajuato, Mexico case study*
14:40 - 15:00	**Heike Bradl** University of Applied Sciences Trier, Germany	*Use of Seaweed and Macroalgae by means of Hydrothermal*
15:00 - 15:20	**Mauricio G Fonseca** Chemistry Metrology Department, National Institute of Metrology, Quality and Technology, Rio de Janeiro, Brazil	*Adsorptive material from Biomass*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:30	Discussion: "possible Joined Research Projects"	
16:30 - 17:00		
17:00 - 18:30	Official Poster Session - Session 06, 08	

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 08: Economy

Chair: Marcio Weichert, Ulrich A. Glasmacher

C.R. Ferreira Federal University of Paraná (UFPR), Brazil	*Comparison between the German's and the Brazilian's laws for renewable energy and the possibilities of improvements in Brazil*
A.F. Schlichting Federal University of Mato Grosso, Cuiabá, Brazil	*Economic and environmental sustainability of small municipalities aided by the Federal University of Mato Grosso do Sul using geotechnologies*
C. Schoenberger Universidade Federal do Paraná (UFPR), Brazil	*Comparative analysis of reward sanction instruments and their application in Brazil and Germany*

Session 06: Bioeconomy

Chair: Thomas Hirth, Rüdiger Schaldach, Carlos Alberto Aragão

Daniela Baris Institut für Technische Chemie (ITC), Karlsruher Institut für Technologie (KIT), Germany	*Ashes – Recovery of Nutrients from Ashes Produced by Thermochemical Processes Based on Bagasse or Bagasse*
O.A.T. Dias College of Agricultural Sciences (FCA), São Paulo State University (UNESP), Botucatu, Brazil	*Comparative Study of Kraft Lignin from Different Sources for Composites Applications*
Anna Hampf Institute of Landscape Systems Analysis, Leibniz Centre for Agricultural Research (ZALF), Müncheberg, Germany	*Simulated future soybean productivity throughout Mato Grosso and Pará, Brazil*
A.L. Leao College of Agricultural Sciences (FCA), São Paulo State University (UNESP), Botucatu, Brazil	*Piteira and banana fibres as reinforcement in lignin based polypropylene composites*
Michael Walz Institute of Interfacial Process Engineering and Plasma Technology IGVP, University of Stuttgart, Stuttgart, Germany	*Carbohydrate-based polymers for the encapsulation by spray-drying as a substitute for microplastics*

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 2 (HS 2): Morning Session

	Session 02: Paleoclimate/Climate Change	
	Chair: Bertil Mächtle, André Jasper	
08:30 - 09:00	**Keynote lecture** **André Jasper** Centro Universitário Univates (PPGAD/UNIVATES), Lajeado, Rio Grande do Sul, Brazil	*The Gondwanan Late Paleozoic icehouse/greenhouse cycle: a palaeobotanical approach to understand actual and future climate change.*
09:00 - 09:20	**Simon Mayer** Institute of Environmental Physics, University of Heidelberg, Germany	*The role of soil air composition for noble gas paleotemperature reconstructions in tropical regions*
09:20 - 09:40	**Mariela Secchi** Botany and Palaeobotany Sector, Museum of Natural Science, Centro Universitário UNIVATES, Lajeado, Brazil	*Using archaeobotanical analysis to understand the pre-colonial occupations for Taquari Valley, Rio Grande do Sul State, Brazil*
09:40 - 10:00	**Bertil Mächtle** Institute of Geography and HCE, Heidelberg University, Germany	*Precolumbian cultural dynamics in southern Peru and the role of climatic variability*
10:00 10:20	**Jörg Matschullat** Interdisciplinary Environment Research Centre, TU Bergakademie Freiberg, Freiberg, Germany	*Caatinga and Cerrado vegetation reaction to regional climate change in north-eastern Brazil*
10:30 - 11:00	Coffee break & Poster Session	
11:00 - 11:30	**Keynote lecture** **Jiang Tong** National Climate Center, CMA, Beijing, China	*Drought and its Impact on Socio-economy*
11:30 - 12:00	**Keynote lecture** **Marcelo Leppe** Chilean Antarctic Institute, Punta Arenas, Chile	*Antarctica: a natural laboratory and a change sensor*
12:00 - 12:30	Discussion: "possible Joined Research Projects"	
12:30 - 14:00	Lunch & Poster Session	

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 2 (HS 2): Afternoon Session

	Session 12: Cities of the Future - Megacities - Urban Areas	
	Chair: Bernd Eisenberg	
14:00 - 14:30	**Keynote lecture** **Bernd Eisenberg** Institute of Landscape Planning and Ecology, University of Stuttgart, Stuttgart, Germany	*Adapting Strategies for Integrated Urban Planning - Challenges and Limitations*
14:30 - 14:50	**V.G. Silva** School of Civil Engineering, Architecture and Urban Design, University of Campinas – UNICAMP, Campinas, Brazil	*Sustainability performance tracking of social housing programs: the tale of two projects in Brazil*
14:50 - 15:10	**D. C.C.K. Kowaltowski** School of Civil Engineering, Architecture and Urban Design, University of Campinas – UNICAMP, Campinas, Brazil	*"Minha Casa Minha Vida" housing program: the gap between what we know and what we should know*
15:10 - 15:30	**João Mauricio Castaldelli-Maia** Department of Psychiatry, Medical School, University of São Paulo, São Paulo, Brazil	*São Paulo Megacity: investigating a general model of causality involving the extreme urban environment and mental disorders*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:30	**Keynote lecture** **J.D. Silva** PPGEA/FURB, Blumenau, Santa Catarina, Brazil	*Aspects of Environmental Sustainability in Blumenau City, State of Santa Catarina*
16:30 - 16:50	**Andre L.Q. Reis** Centro de Ciências Exatas e da Natureza, Universidade Federal da Paraíba, PRODEMA UFPB, João Pessoa, Brazil	*A Sustainability Index in a Environmental basin: An alternative approach to urban river management and planning*
16:50 - 17:10	**Manon Garcia** Pontifícia Universidade Católica do Paraná, Brasil	*Urban ecosocioeconomics: social sustainability indicators for accidents of bicycle and motorbike messengers in Brazil*
17:10 - 17:30		
17:30 - 18:00	Discussion: "possible Joined Research Projects"	
17:00 - 18:30	Official Poster Session - Session 02, 12	

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster A

Session 02: Paleoclimate/Climate Change

Chair: Bertil Mächtle, André Jasper

Vitor José Rampaneli Almeida Universidade Anhanguera Educacional, São Paulo, Brazil	*Paleoclimatic interpretations through the analysis of rock paintings in the Serra da Capiva National Park*
T.S. Costa Federal University of Western, Santarém, Pará, Brasil	*Characterization, synthesis and application of zeolites obtained from Amazon kaolin*
J. Monfroi Museu de Ciências Naturais, Setor de Botânica e Paleobotânica, Centro Universitário Univates, Lajeado, Brazil	*Successive Palaeowildfires events in Rio Bonito Formation levels, Lower Permian, Paraná Basin*
I.C. Osterkamp Botany and Palaeobotany Sector, Museum of Natural Science, Centro Universitário UNIVATES, Lajeado, Brazil	*Anatomical analysis of artificially charred wood of Araucaria angustifolia from Rio Grande do Sul and its palaeontological implications*

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster B

Session 12: Cities of the Future - Megacities - Urban Areas

Chair: Bernd Eisenberg

Reiner Jäger Institute of Applied Research (IAF), Karlsruhe University of Applied Sciences (HSKA), Karlsruhe, Germany	*Flight Control and Navigation for scalable and arbitrarily dimensioned UAV and manned Multicopters*
L.F.F. Miranda Department of Informatics, Federal Institute of Education, Science and Technology of Pernambuco, Recife, Brazil	*Environmental monitoring of pollutants related to climate change using sensors of low cost*
K.R.A. Nunes Institute IWAR, Chair of Material Flow Management and Resource Economy, Technische Universität Darmstadt, Darmstadt, Germany	*Comparative LCA of treatment options for packaging and residual waste in Germany: Case study*
A.L.Q. Reis PRODEMA UFPB e Centro Universitário João Pessoa UNIPE João Pessoa, Brazil	*Dashboard Sustainability applied in a Cuiá river basin, João Pessoa, Paraíba, Brazil*
E.D. Saatkamp Departamento de Engenharia Rural, Núcleo de Geotecnologias, Universidade Federal da Santa Maria, Santa Maria, Brazil	*The Geodetic Network used for environment georeferenced surveys and mapping in Brazil*
V.A. Fernandes Geographisches Institut, Mathematisch-Naturwissen-schaftliche Fakultät, Tübingen, Germany	*Resilience of Urban Mobility: A Research Introduction*
K. R. A. Nunes Institute IWAR, Chair of Material Flow Management and Resource Economy, Technische Universität Darmstadt, Darmstadt, Germany	*Environmental strategies for packaging waste in Brazil: the case of Rio de Janeiro*
R.S. Pegado Institute for Technology and Resources Management in the Tropics and Subtropics (ITT), Cologne University of Applied Sciences, Cologne, Germany	*Analisys of flood in Belém-Pará-Brazil using the DPSIR tool*
R.S. Pegado Institute for Technology and Resources Management in the Tropics and Subtropics (ITT), Cologne University of Applied Sciences, Cologne, Germany	*Risk analysis of urban flooding in lowland areas*

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 3 (HS 3): Morning Session

	Session 10: Agriculture, Forestry	
	Chair: Moriz Vohrer	
08:30 - 09:00	**Keynote lecture** **Moriz Vohrer** The Gold Standard Foundation, Freiburg, Germany	*Carbon Markets - How can forestry benefit from it?*
09:00 - 09:30	**Keynote lecture** **Maria del Carmen Alvarez Enciso** Center for Environmental Monitoring Purpose, Universidad Nacional de Asunción, Luque, Paraguay	*Study on the Vulnerability and Impact of Climate Change on the Great American Chaco (Gran Chaco Americano)*
09:30 - 09:50	**Evgeny Latynskiy** Department of Land Use Economics in the Tropics & Subtropics, University of Hohenheim, Stuttgart, Germany	*Can farmers in Mato Grosso benefit from the adoption of low-carbon agricultural and forestry systems?*
09:50 - 10:10	**Lucia Chamlian Munari** Department of Land Use Economics in the Tropics and Subtropics, University of Hohenheim, Stuttgart, Germany	*Agent-based assessment of GHG emissions from agricultural land use systems in Mato Grosso, Brazil*
10:10 - 10:30	**Thomas Winkler** Institute of System Sciences, Innovation and Sustainability Research, University of Graz, Graz, Austria	*Decreasing greenhouse gas emissions of meat products through food waste reduction - Framework for a sustainability impact assessment approach*
10:30 - 11:00	Coffee break & Poster Session	
	Chair: Peter Spathelf	
11:00 - 11:30	**Keynote lecture** **Peter Spathelf** Faculty of Forest and Environment, Eberswalde University for Sustainable Development, Eberswalde, Germany	*Tropical plantation forestry in transition – from uniform 'tree farms' to diverse production systems with added value*
11:30 - 11:50	**Jörg Matschullat** Interdisciplinary Environmental Research Centre, TU Bergakademie Freiberg, Freiberg, Germany	*Pedogeochemical mapping in north-eastern Brazil: a matter of scale*
11:50 - 12:10	**Ana Cristina Miola** Business and Environment Department, Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Porto Alegre/RS, Brazil	*German and Brazilian experiences and practices*
12:10 - 12:30	**J.A.A. Silva** Department of Forest Science, Federal Rural University of Pernambuco, Recife, Pernambuco, Brazil	*Productivity of fast-growth forests in the semiarid zone of Pernambuco, Brazil*
12:30 - 14:00	Lunch & Poster Session	

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 3 (HS 3): Afternoon Session

	Session 10: Agriculture, Forestry	
	Chair: Carlos Henrique Nauiack	
14:00 - 14:30	**Keynote lecture** **Carlos Henrique Nauiack** Universidade Estadual do Centro Oeste/UNICENTRO, Irati, Brazil	*Forest utilization by private forest owners in Paraná*
14:30 - 14:50	**Florentin Jaeger** Department of Forest Economics and Forest Business Studies, University of Applied Forest Sciences Rottenburg, Rottenburg, Germany	*What are the impacts of the new Brazilian legislation on forests from 2001 on the behavior of the local forest owners in regard to the forest treatment? Are there any changes visible because of the revision in 2012?*
14:50 - 15:10	**Karin Marita Naase** Institute for Comparative Cultural Research, Department of Cultural and Social Anthropology, Philipps-University of Marburg, Marburg, Germany,	*The rush on the tropical rainforest: strategies of appropriation and reconfiguration of nature and local population at the lower Amazon and Tapajós Rivers in West-Pará, Brazil*
15:10 - 15:30	**Carlos José Sousa Passos** Faculty UnB at Planaltina & Centre for Sustainable Development, University of Brasília, Brasília (DF), Brazil	***P**oor **L**and **U**se, **P**oor **H**ealth: primary prevention of human health through sound land-use for small-scale farmers of the humid tropic - The **PLUPH** Project*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:20	**Reiner Jäger** Institute of Applied Research (IAF), Karlsruhe University of Applied Sciences (HSKA), Karlsruhe, Germany	*Flight Contral and Navigation for Scalable and arbitaily dimensioned UAV and manned Multicopters*
16:20 - 17:00	Discussion: "possible Joined Research Projects"	
17:00 - 18:30	Official Poster Session - Session 10	

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster A

Session 10: Agriculture, Forestry

Chair: Moriz Vohrer, Peter Spathelf, Carlos Nauiack

Cleverson de Mello Faculdade de Engenharias, Universidade Federal do Mato Grosso do Sul, Campo Grande – MS, Brazil	*Economic Income of Reduced Impact Logging (RIL) in the Amazon: the case of the National Forest Jamari*
Victoria R.S. Ferreira Biodiversity and Forest Institute, Universidade Federal do Oeste do Pará – UFOPA, Santarém, Brazil	*Correlation analysis of chemical and energetic properties between base and branch of Piptadenia suaveolens native from Brazilian Amazon*
Manuel Esteban Lucas-Borja Department of Agroforestry Technology and Science and Genetics, School of Advanced Agricultural Engineering, Castilla La Mancha University, Campus Universitario s/n, Albacete, Spain	*Evaluation of flow in watershed in Villa Malea Spain*
Lutz Michaelis Master program SENCE, University of Applied Forest Sciences Rottenburg, Germany	*Innovative biomass production from root and stump wood of Eucalyptus Grandis* for energy generation in Brazil
D.A. Neuwald Competence Centre for Fruit Growing, Lake Constance, and Physiology of Specialty Crops, University of Hohenheim, Ravensburg, Germany	*Can the optimization of air flow in commercial CA storage room for apples reduce the consumption of energy?*
L.C. Munari Institute of Agricultural Economics and Social Sciences in the Tropics and Subtropics, Department for Land Use Economics in the Tropics and Subtropics, Universität Hohenheim, Stuttgart, Germany	*Modelling human-environment interactions in a mallholder agricultural system on the Atlantic Rainforest (Ribeira Valley, SP. Brazil), with the use of a coupled socio-ecological model*
M.A. Rios Federal University of the West Pará UFOPA-PROPPIT, Salé, Santarém-PA, Brazil	*Sustainable production of priprioca essential oil in the West Amazon*
Valdemir Antonio Rodrigues Department of Forest, Faculty of Agricultural Science, Universidade Estadual Paulista, FCA/UNESP, Botucatu, São Paulo, Brazil	*Flow rate and water infiltration in three covers soil*

Monday, 05.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster B

Session 10: Agriculture, Forestry

Valdemir Antonio Rodrigues Department of Forest, Faculty of Agricultural Science, Universidade Estadual Paulista, FCA/UNESP, Botucatu, São Paulo, Brazil	*Soil physical evaluation of Eucalyptus grandis reforestation in the periods dry and rainy*
Valdemir Antonio Rodrigues Department of Forest, Faculty of Agricultural Science, Universidade Estadual Paulista, FCA/UNESP, Botucatu, São Paulo, Brazil	*Evaluation of rainfall, throughfall and interception by canopies trees in pinus halepensis* - albacete - spain
Franciele F. Rovani Graduation Program in Geography, Federal University of Santa Maria, Santa Maria, Brazil	*Cultivation of pecan (Carya illinoinensis) in Rio Grande do Sul, Brazil and climatic requeriments*
Franciele F. Rovani Graduation Program in Geography, Federal University of Santa Maria, Santa Maria, Brazil	*Ecological-Economic Zoning of Silveira Martins-RS, Brazil*
Juliano B. Santos Department of Soils and Environmental Resources, Faculty of Agricultural Sciences, São Paulo State University, Botucatu Campus, Botucatu, SP – Brazil	*Water infiltration in the soil in vegetation cover of grassy*
J.A.A. Silva Department of Forest Science, Federal Rural University of Pernambuco, Recife, Pernambuco, Brazil	*Spatial occupation of the eucalyptus plantations and sustainable forest management plans (sfmp) of caatinga in semiarid region of Pernambuco-Brazil*
J.A.A. Silva Department of Forest Science, Federal Rural University of Pernambuco, Recife, Pernambuco, Brazil	*Productivity and survival rate of three forest species in agrestic southern of Pernambuco, Brazil*
Emanuela de Sousa Valentim Economics, Federal University of Western Pará - UFOPA,Santarém, Pará, Brazil	*The main aspects of soy production in the municipality of Santarém, Pará, Brazil*
Marcio Viera Federal University of Santa Maria, Santa Maria, Brazil	*Carbon stocks in a hybrid Eucalyptus plantation in southern Brazil*
B. Vollmar Competence Centre for Fruit Growing - Lake Constance, and Physiology of Specialty Crops, University of Hohenheim, Ravensburg, Germany	*Can the use of new storage strategies provide possible energy savings during apple storage?*

Monday, 05.10.2015; 18:30 – 21:00 h; Neue Universität: Opening of Exhibitions

18:30-18:35	**Welcome** Prof. Dr. Ulrich A. Glasmacher
18:45-19:05	**Introduction and guided tour through the exhibition MINHASP** Ronald Grätz, Stuttgart
19:05-19:20	**Introduction: Artistic objects of Cristina Barroso**
19:20-19:30	**Introduction: Exhibition about "Fritz Müller"** (German naturalist that immigrated from Germany to Brazil in the 19th Century and continued research in Biology in Brazil) Dr. Rainer Radtke, Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen
19:30-21:00	**Music and Dance "for all"** refreshments

Tuesday, 06.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2

Lecture Hall 1 (HS 1): Morning Session

	Session 04: Energy, Minerals, Ore deposits, Mining	
	Chair: Kátia Madruga, Michael Hiete, Bernhard G. Peregovich	
	1. Energy	
08:30 - 09:00	**Keynote lecture** **Carsten Tschamber** Solar Cluster Baden Württemberg e.V., Germany	*Photovoltaics in Brazil - feasibility of vertically integrated module production*
09:00 - 09:30	**Keynote lecture** **Kátia Madruga** Universidade Federal de Santa Catarina, Brazil	*Industrial energy efficiency management in Brazil: public policies, regulations standards and actors*
09:30 - 09:50	**Julian Pinto** Trier University of Applied Sciences, Trier, Germany	*Solar energy for social housing program in Brazil: advantages, limitations and challenges*
09:50 - 10:10	**Lutz Michaelis** Technology University of Applied Sciences Stuttgart, Stuttgart, Germany	*The social inclusion and access to renewable energy for low income population, through the reference project "Qualification of the population to install and use the low-cost solar hot water heater"*
10:10 - 10:30	**Patrícia Nunes Lima Bianchi** Salesian University Center of São Paulo, Brazil	*The implementation of renewable energies in Brazil and the European Union: diagnosis and general perspectives*
10:30 - 11:00	Coffee break & Poster Session	
11:00 - 11:20	**Björn Hagemann** SEW Eurodrive, Germany	*Premium efficiency motors sustainably contribute to climate protection – Normative and legal requirements of Brazil and Germany in comparison*
11:20 - 11:40	**Dietmar Brakemeier** Fichtner GmbH & Co. KG, Stuttgart, Germany	*The Brazilian Electricity Market - Specifics, Risks and Chances*
	2. Mineral, ore deposits, Mining	
11:40 - 12:10	**Keynote lecture** **Bernhard G. Peregovich** Universidade Federal of West Pará, Brazil	*Gold and Diamond mining in the Amazon Rain Forest - Ecologic, Economic, Social and Environmental Challenges*
12:10 - 12:40	**Keynote lecture** **Michael Hiete** Center for Environmental Systems Research, University Kassel, Germany	*Standard setting for mineral raw materials – a chance for more sustainability in newly industrialized countries?*
12:40 - 14:00	Lunch & Poster Session	

Tuesday, 06.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2

Lecture Hall 1 (HS 1): Afternoon Session

	Session 04: Energy, Minerals, Ore deposits, Mining	
14:00 - 14:20	**Heike Bradl** University of Applied Sciences Trier, Germany	*Perspectives of the Sustainable Use of Biochar from Hydrothermal Carbonization Process (HTC) in Agriculture*
14:20 - 14:40	**Carlos José Sousa Passos** Faculty UnB at Planaltina & Centre for Sustainable Development, University of Brasília, Brasília (DF), Brazil	*No good answer to a wrong question: tracking the source of Hg in the Amazon*
14:40 - 15:00	**Mario Schmidt** Pforzheim University, Germany	*Mercury emissions in artisanal gold mining in the Amazonas region and the problem of considering Social Life Cycle Assessments*
15:00 - 15:20	**Florian Freundt** Institute of Environmental Physics and Heidelberg Center for the Environment, Heidelberg University, Heidelberg, Germany	*Geothermal energy exploration using helium isotopes in shallow*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:30	Discussion: "possible Joined Research Projects"	
16:30 - 17:00		
17:00 - 18:30	Official Poster Session - Session 04	

Tuesday, 06.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 04: Energy, Minerals, Ore deposits, Mining

Chair: Kátia Madruga, Michael Hiete, Bernhard Peregovich

Patryck de Araújo Ayala Federal University of Mato Grosso (UFMT). General Attorney of Mato Grosso State. Cuiabá/MT, Brazil	*Energy and climate changes: the social and environmental impacts of the hydroeletrics*
Eduardo Lima Costa Institute of Geoscience and Engineering, Program in Science and Technology, Santarém, Brazil	*Hydrothermal Synthesis and Characterisation of Crystalline Layered Lithium Manganese Oxide from Mn ores as Natural Source*
Regionaldo Geremias Energy Engineering, Federal University of Santa Catarina, Araranguá, Brazil	*Study of Brazilian Environmental Law Regulating Coal Mining Industry in Santa Catarina State*
Regionaldo Geremias Energy Engineering, Federal University of Santa Catarina, Araranguá, Brazil	*A brief study on the legal system history of the Brazilian energy sector*
Tathilene B. M. Gomes Arruda Departamento de Química Orgânica e Inorgânica, Universidade Federal do Ceará, Fortaleza-CE, Brazil	*Using of the sesame biomass (Sesamum indicum) as raw material for the production of biolubricants*
Ana Paula Rengel Gonçalves Law Department, Federal University of Santa Catarina (UFSC), Florianópolis/SC, Brazil	*Climate change and renewable energies: a legal approach of the case of biofuels production and use in Brazil*
Kátia Madruga Energy Engineering, Federal University of Santa Catarina, Araranguá, Brazil	*Energy efficiency and management: some examples of German organizations*
L.L.O. Rosa Institute for Higher Studies of the Amazon, Belém, Pará, Brazil	*Performance evaluation of an LED reflector solar-powered in Belém, Pará*
Alexandre Siqueira da Silva Institute of Engineering and Geosciences, Science and Technology Program, Santarém, Brazil	*Sizing and Installation of Micro Photovoltaic System isolated for sustainable development in São Círiaco do Urucurituba community the city of Santarém - Pará*
Alexandre Siqueira da Silva Institute of Engineering and Geosciences, Science and Technology Program, Santarém, Brazil	*Isolated scaling photovoltaic systems in the Amazon*
Flávia J. Uchoa Department of Organic and Inorganic Chemistry, Federal University of Ceará, Fortaleza-CE, Brazil	*Transesterification of oleic acid using methanol and mesoporous silica catalyst*
Camila P. do Valle Department of Organic and Inorganic Chemistry, Federal University of Ceará, Fortaleza-CE, Brazil	*Synthetic esters with lubricating properties from modified Castor Oil*

Tuesday, 06.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2

Lecture Hall 2 (HS 2): Morning Session

	Session 05: Biodiversity	
	Chair: Marcus Koch, William Vale, Vera Lucia Imperatriz Fonseca	
08:30 - 09:00	**Keynote lecture** **Vera Lucia Imperatriz Fonseca** USP, São Paulo, Brazil	*What is next for sustainable use and conservation of ecosystem services in Brazil?*
09:00 - 09:20	**Eliane Cristina Pinto Moreira** Federal University of Santa Catarina, Florianópolis, Brazil	*The Brazilian Law of Use and Biodiversity Access and Associated Traditional Knowledge and its incompatibility with the Treaties About the theme*
09:20 - 09:40	**Marcus Koch** Centre for Organismal Studies Heidelberg, Heidelberg University, Germany	*A Heritage of Biodiversity in Heidelberg Botanic Garden: Werner Rauh's Collections from Brazil.*
09:40 - 10:10	**Keynote lecture** **J.F. Rêgo Matos** Universidade Federal do Oeste do Pará, Santarem, Brazil	*Ethnobiodiversity, Sustainability and Traditional Knowledge: Cultural Practices in the Region of the Alter do Chão Aquifer, Focusing on the Conservation of the Amazon Rainforest*
10:10 - 10:30	**Neusa Gonzaga de Santana Pressler** Universidade da Amazônia Belém, Brazil	*Brazil - Germany and the cooperation for dissemination and practices of sustainable development in the Amazon*
10:30 - 11:00	Coffee break & Poster Session	
11:00 - 11:30	**Keynote lecture** **William G. Vale** Universidade Federal do Oeste do Pará, Santarem, Brazil	*Cattle in the brazilian Amazon: the importance of a systematic view*
11:30 - 11:50	**Gerhard Gerold** Landscape Ecology, University Göttingen, Germany	*Carbon sequestration, biodiversity and social structures in Southern Amazonia: models and implementation of carbon-optimized land management strategies (carbiocial)*
11:50 - 12:10	**Andreas Mayer** Alfred Kärcher GmbH & Co. KG	*Winnenden site landscaped close to nature*
12:10 - 12:40	Discussion: "possible Joined Research Projects"	
12:40 - 14:00	Lunch & Poster Session	

Tuesday, 06.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2

Lecture Hall 2 (HS 2): Afternoon Session

	Session 11: Global Geoparks & World Heritage Sites	
	Chair: Jutta Weber, Marie-Luise Frey	
14:00 - 14:30	**Keynote lecture** **Margarete Patzak** UNESCO, Earth Sciences and Geohazards Risk Reduction Section, Division of Ecological and Earth Sciences, Paris, France	*Global Geoparks – Looking towards the future*
14:30 - 15:00	**Keynote lecture** **Nikolaos Zouros** Global and European Geoparks Network, Greece	*Global Geoparks : Networking and collaboration between Europe and Latin America*
15:00 - 15:30	**Keynote lecture** **Elizabeth Silva** Portuguese National Commission for UNESCO, Lisboa, Portugal	*Building bridges between Sciences and Education: The role of the Global Geoparks*
15:30 - 16:00	Coffee break & Poster Session	
	Chair: Nikolaos Zouros	
16:00 - 16:30	**Keynote lecture** **Li Jiangfeng** China University of Geosciences, Wuhan, China	*Geotourism and the Sustainable Exploitation of the Chinese Geoparks: A case study of Jingpohu Global geopark, China*
16:30 - 16:50	**Pletsch, M.A.J.S** University of São Paulo, Brazil	*Feasibility of sustainable tourism implementation in protected areas: comparative analyse between Colônia (Brazil) and Ries (Germany) Craters*
16:50 - 17:10	**Thais Guimarães** Federal University of Pernambuco, Brazil	*Geo-education towards the interdisciplinarity and sustainable development. Study case at Cabo de Santo Agostinho (Pernambuco, Brazil)*
17:10 - 17:30	**Jutta Weber** Global Geopark Bergstrasse-Odenwald, Lorsch, Germany	*Global Geopark Bergstrasse-Odenwald (Germany): Sustainable development by geo-education, communication, regional cooperation and international networking*
17:30 - 17:50	**Marie-Luise Frey** UNESCO World Heritage Site Messel Pit, Messel, Germany	*Geotourism at Messel Pit World Heritage (WHS, Germany) by Earth Science Transfer & Geo-education offers: OUV, CI & media to raise public awareness*
17:00 - 18:30	Official Poster Session - Session 05, 11	

Tuesday, 06.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 05: Biodiversity

Chair: Markus Koch, Vera Lucia Imperatriz Foncesca, William G. Vale

Diana Vieira Brito Instituto Nacional de Pesquisas da Amazônia, Grupo de Pesquisas em Abelhas, Manaus, Brazil	*Genetics of sex determination in Melipona stingless bees and its relation to conservation and management of native pollinators*
R.F. Gonçalves Education Institute, Universidade Federal do Pará, Belém, Pará, Brazil	*Indigenous health and biodiversity in the Brazilian Amazon*
I.R. Machado UFOPA-Federal University of the West Pará, PROPPIT, Salé, Santarém-PA, Brazil	*Biological assays of extracts from industrial residues of "priprioca" (Cyperus articulatus var. nodosus) in Amazon rainforest*
Florian Raub State Museum of Natural History Karlsruhe, Karlsruhe, Germany	*From data to knowledge - A metadata portal on scientific studies in the southern Mata Atlântica of Brazil*
M.T.S. Trevisan Departamento de Química Orgânica e Inorgânica, Universidade Federal do Ceará, Fortaleza, Ceará, Brazil	*Chemical study of coffea arabica leaves: angiotensin converting enzyme and antioxidant potential*

Session 11: Global Geoparks & World Heritage Sites

Chair: Jutta Weber, Marie-Luise Frey

Mônica Amorim	*Geoparks, geoproducts and local sustainable development*
Marjorie Kauffmann Instituto de Geociências, UNICAMP, Campinas, Brazil	*Proposal to new geotourist sites from Parnaíba Basin in "Monumento Natural das Árvores Fossilizadas", Tocantins State, Brazil*
M. Margareth E. R. Lima Departamento de Arquitetura, UFMS, Campo Grande, Brazil	*The Independece Square at Corumbá: its history and typological identification as relevant element for a Geopark Project in the Mato Grosso do Sul State (Brazil)*

Tuesday, 06.10.2015: 19:00 – 20:30 h; Alte Aula: Public Lecture

19:00-19:05	**Welcome and introduction** Prof. Dr. Stephen K. Hashmi, Heidelberg University, Vice-President for Research and Structure
19:05-20:30	**ATTO, a Giant tower for Climate Research in the AMAZON: The adventure of planning, construction and use** Prof. Dr. Jürgen Kesselmeier, Max Planck Institute for Chemistry, Mainz

„ATTO“, the Amazonian Tall Tower Observatory (http://www.mpic.de)

ATTO stands for Amazonian Tall Tower Observatory. The German-Brazilian joint project was launched in 2009 and is coordinated by the Max Planck Institute for Chemistry. The tower aims at delivering ground-breaking findings, which will be the basis for improved climate models. With a height of 300 meters the tower will extend the ground-level boundary layer, and will provide information taken from approximately 100 square kilometres from the world´s largest forest area. The Amazon region is of global significance: it produces half of the word´s oxygen, impacts the water cycle through evaporation and stabilizes the climate.

ATTO is the counterpart of the 2006 completed ZOTTO tower that stands in Siberia and the Max Planck Institute of Chemistry is also involved. ATTO will integrate into an existing structure of smaller Brazilian measuring towers. The cost for the construction of ATTO including the first five years of running costs is estimated to be 8.4 million € which will be financed by Germany and Brazil in equal parts. http://www.mpic.de/en/research/collaborative-projects/atto.html

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 1 (HS 1): Morning Session

	Session 03: Water and Ocean	
	Chair: J. W. Metzger, D. Neuffer, M. Zimmer, P. Hackspacher	
08:30 - 09:00	**Keynote lecture** **Roberto Ventura Santos** Brazilian Geological Survey - CPRM, UNB, Brazil	*The Amazon Basin: learning how does it work*
09:00 - 09:20	**Hagen Koch** Potsdam Institute for Climate Impact Research, Potsdam, Germany	*Climate and land use changes in the São Francisco river basin, Brazil*
09:20 - 09:40	**S.D. Pereira** Minas Gerais State Government, Secretariat for Institutions Relations, Belo Horizonte, Minas Gerais, Brazil	*Paraopeba River Basin Program*
09:40 - 10:00	**Rene Höfer** Department Groundwater Remediation, Helmholtz Center for Environmental Research – UFZ, Leipzig, Germany	*The analysis of urban pattern for an Integrated Water Resources Management in the Distrito Federal do Brazil*
10:00 - 10:30	Coffee break & Poster Session	
10:30 - 10:50	**D.F. Dias** Santarem, Brazil	*Numerical Simulation of Groundwater Flow in Santarém-PA-Brazil county area*
10:50 - 11:10	**Holger Weiß** Helmholtz-Zentrum für Umwelt; Hochschule Weihenstephan-Triesdorf; Technische Universität Dresden, Germany	*Challenges of an integrated water resource management for the Distrito Federal, Western Central Brazil: climate, land-use and water resources*
11:10 - 11:30	**B.A. Polli** Graduate Program on Water Resources and Environmental Engineering, Federal University of Paraná, Curitiba, Brazil	*Modeling of temperature stratification patterns for a large run of a river reservoir in the North of Brazil*
11:30 - 11:50	**Roberto F.C. Fontes** Campus do Litoral, Univ Estadual Paulista (UNESP), São Vicente, Brazil	*Circulation in the State Marine Park of Laje de Santos (SP, Brazil)*
11:50 - 12:20	**Keynote lecture** **Qingjun Guo** Center for Environmental Remediation, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, China	*Environmental Quality of water and soil in Beijing, China*
12:20 - 14:00	Lunch & Poster Session	

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 1 (HS 1): Afternoon Session

	Session 03: Water and Ocean	
14:00 - 14:20	**Werner Aeschbach-Hertig** Institute of Environmental Physics and Heidelberg Center for the Environment and HCE,Heidelberg University, Heidelberg, Germany	*Groundwater depletion: Global overview and regional examples*
14:20 - 14:40	**Rafael G. Imada** São Carlos – SP/Brazil	*WaterCAD as a modeling tool to reduce water loss in the city of Pederneiras - São Paulo State, Brazil*
14:40 - 15:00	**S. Hilgert** Institute for Water and River Basin Management, Karlsruhe Institute for Technology (KIT), Karlsruhe, Germany,	*Enhancing reservoir management with hydro-acoustic information*
15:00 - 15:20	**Daniela Neuffer provides talk of C.F. Ferreira** Chair of Sanitary Engineering and Water Recycling, Stuttgart University, Germany	*Evaluation of the feeding in biodigesters for a demand-driven biogas supply for flexible power generation*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:30	**Keynote lecture** **Margarete Casagrande Lass Erbe** Universidade Federal do Paraná, PPGMAUI, Curitiba, Brazil	*Medical waste: why is it so dangerous?*
16:30 - 16:50	**Ana Maria Marchesan** Public Prosecution Service and Federal University of Rio Grande do Sul (UFRGS), Brazil	*The prior notification obligation between member states of La Plata Basin in hydraulic exploitation*
16:50 - 17:30	Discussion: "possible Joined Water Research Projects"	
17:00 - 18:30	Official Poster Session - Session 03	

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 03: Water and Ocean

Chair: Jörg W. Metzger, Daniela Neuffer, Martin Zimmer, Peter C. Hackspacher

Laura S. Corrêa Federal University of Western Pará, Santarém, Brazil	*Analysis of the variety of water quality parameters of Amazon River, in Peru, Colombia and Brazil*
Carolina Doranti-Tirtian Instituto de Estudos Avançados do Mar, UNESP, São Vicente, Brazil	*Heavy metals in seawaters of the stuarine region of Itanhaém River Drainage Basin (SP-Brazil)*
J.C.R. Ferreira Companhia de Saneamento do Paraná (SANEPAR), Unidade de Serviço de Gestão Ambiental (USGA), Curitiba, Brazil	*Evaluation of the use of powder activated carbon for removal of emerging micropollutants from wastewater*
Roberto F. C. Fontes Univ Estadual Paulista, Campus do Litoral, São Vicente, Brazil	*Extreme Climate Events in the Estuary of Santos (SP, Brazil)*
Oriana Landa-Casigno Civil, Environmental and Geomatic Engineering, University College London, London, United Kingdom	*Urban water reuse, benefits and linkages with environmental services*
Flávia Lima Faculty of Environmental Sciences, Institut of Urban and Industrial Water Management, Technische Universität Dresden, Dresden, Germany	*The Importance of Improved Water Treatment Technologies Applied in Produced Water*
Suzana Pereira Polak Programa de Pós-Graduação em Meio Ambiente Urbano e Industrial, Universidade Federal do Paraná (UFPR), Curitiba (PPGMAUI), Brazil	*Phosphorus and fluorine removal from an acidic effluent of mining by chemical precipitation using calcium sources.*
Barbara C. Smirdale Federal University of Paraná (UFPR), Curitiba, Brazil	*Comparing drinking water reservation systems between Brazil and Germany*
Carina Zang Heidelberg Center for the Environment, Heidelberg, Germany	*Water quality conflicts: The arid Huasco Valley – Chile during the last 25 years*

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 2 (HS 2): Morning Session

	Session 07: Law	
	Chair: James Brews **1. Sustainability in the international context**	
08:30 - 09:00	**Keynote lecture** **Wolfgang Kahl** Institute for German and European administrative law, University of Heidelberg, Heidelberg research center for sustainability, Heidelberg Center for the Environment, Germany	*European Environmental Law and Sustainability – An Introduction*
09:00 - 09:20	**Fabricio Bertini Pasquot Polido** Minas Gerais, Brazil	*Making states and international organizations extra-compliant to social and environmental safeguards: human rights and sustainable development as guiding principles for multilateral and bilateral financing projects (PAINEL)*
09:20 - 09:40	**Christiane Derani** Florianópolis, Brazil	*Environmental Law in north-south commercial relations*
09:40 - 10:00	**Giulia Manccini Pinheiro** Florianópolis, Brazil	*Environmental Refugees: The Brazilian position on Haiti immigration after the 2010 earthquake*
10:00 - 10:30	Coffee break & Poster Session	
	2. Sustainability, new technologies and crisis management	
10:30 - 11:00	**Keynote lecture** **José Rubens Morato Leite** Departamento de Direito, UFSC, Federal University of Santa Catarina, Campus Universitário, Trindade, Florianópolis, Brazil	*Constitutional environmental Law in Brazil: Jurisprudence in National High Court (STJ)*
11:00 - 11:20	**Patryck de Araújo Ayala** Federal University of Mato Grosso (UFMT), General Attorney of Mato Grosso State, Cuiabá/MT, Brazil,	*The regulation of new technologies as a way to secure a sustainable future: Labelling of genetic modified organisms in Brazil and Germany*
11:20 - 11:40	**Marina Demaria Venâncio** Law Department, Federal University of Santa Catarina (UFSC),Florianópolis, Brazil	*Disaster law in Brazil: Challenges in the global climate change era*
	3. Sustainability, water law and *fait* accompli	
11:40 - 12:10	**Keynote lecture** **Ute Mager** Institut für deutsches und europäisches Verwaltungsrecht und Heidelberg Center for the Environment, Heidelberg University, Germany	*The meaning of sustainable development in water law*
12:10 - 12:30	**Kristina Kreter** Cologne University, Germany and Autonomous University of San Luis Potosi (UASLP), Mexico	*Analysis of governance potentials and constraints for decentralized rural sanitation solutions in Rio de Janeiro*
12:30 - 14:00	Lunch & Poster Session	

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 2 (HS 2): Afternoon Session

	Session 07: Law	
14:00 - 14:20	**Ana Maria Moreira Marchesan** Law Department, Federal University of Santa Catarina (UFSC), Florianópolis/SC, Brazil	*Incompatability between the application of the fait accompli theory and the transgenerational duty to preserve environmental quality*
	4. Sustainability and waste law	
14:20 - 14:40	**Luisa Ferolla Spyer Prates** WASTE, Stuttgart University, Germany	*Transition of dumpsites to sanitary landfill – Analysis of Brazilian situation*
14:40 - 15:00	**Yinan Tu** School of Public Administration, China University of Geosciences,Wuhan, P.R.China	*Rural Waste Dilemma in China: Law, Policies and its effect*
15:00 - 15:20	**Kamila Guimarães de Moraes** Postgraduate Program in Law, Federal University of Santa Catarina, Florianópolis/SC, Brazil	*Environmental justice and waste management: a transboundary and transdisciplinary analysis*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:30	Discussion: "possible Joined Research Projects"	
17:00 - 18:30	Official Poster Session - Session 07	

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 07: Law

Chair: James Bews

Kristina Kreter Cologne University for Applied Sciences, Germany and Autonomous University of San Luis Potosí (UASLP), Mexico	*Analysis of governance potentials and constraints for decentralized rural sanitation solutions in Rio de Janeiro*
C.S. Wessling Universidade Federal do Paraná (UFPR), Curitiba, Brazil	*Comparative evaluation between Brazilian and German procedures regarding permission to discharge wastewaters in rivers*

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 3 (HS 3): Morning Session

	Session 01: Sustainable Development in Education and Society	
	Chair: Alexander Siegmund	
08:30 - 09:00	**Keynote lecture** **Gerd Michelsen** Leuphana Universität Lüneburg, Germany	(Higher) Education for Sustainable Development
09:00 - 09:20	**Rossano Lopes Bastos** Instituto do Patrimônio Histórico e Artístico Nacional, Superintendência no Estado de Santa Catarina, Brazil	*Environmental Development and Heritage Education*
09:20 - 09:40	**Luis Alípio Gomes** Universidade Federal do Oeste do Pará, Santarém, Brazil	*Forest School: an experience in Education for Sustainable Development in the Amazon*
09:40 - 10:00	**Amasa Ferreira Carvalho** UFOPA, PGRNA, Santarém, Brazil	*Conceptual and behavioural representations of children of the 4th grade of a municipal school in Santarém, state of Pará, Brazil, about Sustainability and Conscious Consumption*
10:00 - 10:20	**G. Denaro** University Estadual Paulista, FCA, UNESP, Botucatu, São Paulo, Brazil	*Study of the case of children's perception with the environmental education at the "Projeto Trilha"*
10:20 - 10:40	**Julia Mrazek** Department of Geography, Heidelberg University of Education, Heidelberg, Germany	*Education for Sustainable Development (ESD) in teacher studies at Baden-Wurttemberg between teaching and research*
10:40 - 11:00	Coffee break & Poster Session	
	Chair: Nicole Vollweiler	
11:00 - 11:30	**Keynote lecture** **Sergio Nobre** UNESP, Rio Claro, Brazil	*On the Sustainability of a University Campus: a case of the UNESP Rio Claro's Campus in Brazil*
11:30 - 11:50	**F.S. Rocha** UFRRJ, Rio de Janeiro, Brazil	*Education for the Sustainable Development: the experience of the first four years of the Master's in Development Practice at the Federal Rural University of Rio de Janeiro (UFRRJ), Brazil*
11:50 - 12:10	**Bruno Gabriel Witzel de Souza** Georg-August-Universität Göttingen, Germany	*The Historical Dependency of Education: Implications for Sustainable Development from a Study for São Paulo, Brazil (1840-2010)*
12:10 - 14:00	Lunch & Poster Session	

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 3 (HS 3): Afternoon Session

	Session 01: Sustainable Development in Education and Society	
	Chair: Sergio Nobre	
14:00 - 14:30	**Keynote lecture** **Charles Hopkins** UNESCO Chair in Education for Sustainable Development, York University, Canada	*Education for Sustainable Development and Teacher Education: learning our way to a more sustainable future*
14:30 - 14:50	**Darluce Oliveira** Human Science Department (DCH I), State University (UNEB), Salvador, Brazil	*Educational Practices Contributing to Sustainable Development in the Brazilian Northeastern semi-arid region*
14:50 - 15:10	**Rosiane P. Palheta** Adriano Hospital Foundation, Manaus, Brazil	*Social Inequality in Indigenous Health: The Case Of Manaus*
15:10 - 15:30	**Alaer Cardoso Jr** SENAI Technology Institute of Environment and Chemistry, Curitiba, Brazil	*SENAI in Paraná Sustainable Center*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:20	**Caio Murtinho** Federal University of Western Pará, Santarém, Brazil	*The reuse of Pet bottles inside the Amazon*
16:20 - 16:50	Discussion: "possible Joined Research Projects"	
17:00 - 18:30	Official Poster Session - Session 01	

Wednesday, 07.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 01: Sustainable Development in Education and Society

Chair: Alexander Siegmund, Nicole Vollweiler, Sergio Nobre

A.F. Carvalho UFOPA, PGRNA, Santarém, Brazil	*Conceptual and behavioural representations of children of the 4th grade of a municipal school in Santarém, state of Pará, Brazil, about Sustainability and Conscious Consumption*
R.D.S. Carvalho UFOPA, LABE/ICS, Santarém, Brazil	*Ecological consciousness in the performing of Tribes Festival in Juruti, Amazonia, Brazil*
Bharat Kumar Chillakuri School of Management Studies, University of Hyderabad, India	*Sustainable Human Resource Management for Strategic Success*
Marilene de Sena e Silva Adriano Jorge Hospital Foundation, Teaching and Research Department, Manaus, Brazil	*Prevalent diseases in the city of Manaus: public policies to combat tuberculosis from 1932 to the present day*
Giulia Denaro Faculty of Agricultural Science, University Estadual Paulista, Botucatu, São Paulo, Brazi	*Study of the case of children's perception with the environmental education at the "Projeto Trilha"*
Miriam Friedrichs Karlsruher Institut für Technologie KIT, ZAK Zentrum für Angewandte Kulturwissenschaft und Studium Generale	*Supplementary Studies on Sustainable Development at KIT*
Sirley F. S. Melo PUC Rio, Civil Engineering, Rio de Janeiro, Brazil	*Solid waste management for between Municipalities Consortium in Brazil*
Darluce Oliveira Human Science Department (DCH I), Bahia State University (UNEB), Salvador, Brazil	*Educational Practices Contributing to Sustainable Development in the Brazilian Northeastern semi-arid region*

Wednesday, 07.10.2015; 18:45 – 21:00 h; Evening boat trip with flying buffet and drinks

18:45 **Meeting point**
Landing bridge of the "Neckarsonne" near to the Old Bridge „Karl-Theodor-Brücke" in the Old Town

19:00 - 21:00 **Trip on the River Neckar**
Introduction into Geology and History of the surrounding area by Prof. Dr. Ulrich A. Glasmacher, Heidelberg University, Institute of Earth Sciences and Heidelberg Center for the Environment

Sustainable boat "Neckarsonne" with the departure area
(www.heidelberg-marketing.de)

This evening is reserved for the very impressive boat trip from Heidelberg to Neckargemünd and return using the sustainable solar-powered boat "Neckarsonne". While without noise the boat is driving upstream the river Neckar an introduction will be given into the geological and human history of Heidelberg and surrounding areas. The boat is known as one of the largest solar-powered Catamarans in the world. 200 persons can be transported by the boat. While the boat "Neckarsonne" is carrying us upstream all can enjoy a Flying buffet and drinks.

Thursday, 08.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 1 (HS 1): Morning Session

	Session 03: Water and Ocean	
	Chair: Jörg W. Metzger, Daniela Neuffer, Martin Zimmer, Peter C. Hackspacher	
08:30 - 09:00	**Keynote lecture** **Frederico Brandini** Department of Biological Oceanography, Oceanographic Institute, São Paulo University, São Paulo (SP), Brazil	*The potential of southern Brazilian continental shelf for offshore cultivation of mollusks*
09:00 - 09:20	**Marion Glaser** Social-Ecollogical Systems Analysis Group, Leibniz Center for Tropical Marine Ecology, Bremen, Germany	*Of systems and networks: Social-ecological analysis in Brazilian coastal and marine areas*
09:20 - 09:50	**Keynote lecture** **Peter Christian Hackspacher** Universidade Estadual Paulista Júlio deMesquita Filho, Rio Claro, Brazil	*The sustainable development on Brazilian coastal and oceanic regions*
10:00 - 10:30	Coffee break & Poster Session	
10:30 - 10:50	**Markus Venhor** Dept. of Ecohydrology, Leibniz-institute of Freshwater Ecology and Inland Fisheries Berlin, Berlin, Germany	*Impact of urban systems on nutrient fluxes and surface water quality in the São Francisco Catchment*
10:50 - 11:30	Discussion: "possible Joined Ocean Research Projects"	

Thursday, 08.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 2 (HS 2): Morning Session

	Session 13: Infectious Diseases	
	Chair: Thomas Jänisch	
08:30 - 08:50	**Thomas Jänisch** Heidelberg University Hospital, Section Clinical Tropical Medicine and HCE, Germany	*Indroduction - Environmental links of current dengue pandemic*
08:50 - 09:20	**Keynote lecture** **Ernesto T. Marques** FIOCRUZ Pernambuco, Brazil and Graduate School of Public Health University of Pittsbugh, Pittsburgh, USA	*Urban Health and Emerging Arboviral Diseases in Brazil*
09:20 - 09:40	**Moritz U. G. Krämer** Spatial Ecology & Epidemiology Group (SEEG), Department of Zoology, University of Oxford, United Kingdom	*The distribution of Aedes aegypti and Ae. albopictus in Brazil, current knowledge and implications for dengue and chikungunya spread*
09:40 - 10:00	**Olaf Horstick** Instiute for Public Health, Heidelberg University, Germany	*Dengue in the urban context in Brazil: what can vector control contribute*
10:00 - 10:30	**Keynote lecture** **Carlos José Sousa Passos** Faculty UnB at Planaltina & Centre for Sustainable Development, University of Brasília, Brasília (DF), Brazil	*Chagas Disease in the Amazon*
10:30 - 11:00	Coffee break & Poster Session	
11:00 - 11:30	Discussion: "possible Joined Research Projects"	
	Session 09: Politics, Social Action	
	Chair: Jale Tosun, Marijane Vieira Lisboa	
11:40 - 12:00	**Jale Tosun** Institute of Political Science and Heidelberg Center for the Environment, Heidelberg University, Germany	*Extraordinary events, policy change and citizens' trust*
12:00 - 12:20	**Marcus Müller** Department of Language and Literature, Technical University Darmstadt, Darmstadt, Germany	*Changing Climates: debate around climate change in Brazilian and German news media*
12:20 12:40	**Daniele Vieira do Nascimento** ClimaCampus Hamburg / CliSAP, Faculty of Business Economics and Social Sciences, University of Hamburg, Hamburg, Germany	*How National Institutional Settings can foster Sustainable Development and a Climate Protection Scenario: Insights from Brazil*
12:40 - 14:00	Lunch & Poster Session	

Thursday, 08.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 2 (HS 2): Afternoon Session

	Session 09: Politics, Social Action	
14:00 - 14:20	**FHR de Almeida** Institute of Political Science, School of Economics and Social Science, University of Hamburg, Germany	*Biofuels: insights from Brazil and Germany*
14:20 - 14:40	**Davi Ezequiel François** Institute for Technology Assessment and Systems Analysis, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany	*Renewable energies and improvement of living standards in rural areas of Ceará - Brazil: challenges and opportunities*
14:40 - 15:10	**Keynote lecture** **Marijane Vieira Lisboa** Faculdade de Ciências Sociais, Pontifícia Universidade Católica de São Paulo, São Paulo, Brazil	*Social conflicts over the environment: Indigenous peoples, traditional populations, and developmentalist policies in Brazil*
15:10 - 15:30	**Eva Fenrich** Institute for Modelling Hydraulic and Environmental Systems, Universität Stuttgart, Germany	*Socio-environmental conflicts related to hydropower development in Brazil*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:20	**Leticia Albuquerque** Universidade Federal de Santa Catarina, Faculty of Law, Florianopolis, Brazil	*Environmental Justice and the issue of sustainable development in Brazil: are they possible?*
16:20 - 16:40	**Raimunda Nonata Monteiro** Universidade Federal do Oeste do Pará, UFOPA, Santarém, Brazil	*Territorial Planning and Dynamics of Wide Space in Central Amazônia*
16:40 - 17:00	**Djalma D. Silveira** Department of Chemical Engineering, UFSM, Brazil	*Post treatment of hospital sewage by moving bed biofilm reactor*
17:00 - 17:30	Discussion: "possible Joined Research Projects"	
17:00 - 18:30	Official Poster Session - Session 03, 09	

Thursday, 08.10.2015; 08:30 – 18:00 h; Neue Universität: Poster Area

Poster

Session 09: Politics, Social Action

Chaier: Jale Tosun, Marijane Vieira Lisboa

José Barbosa Filho Department of Economy,Universidade Federal do Amazonas (UFAM), Manaus, Brazil	*The Environmental Accounting of Impacts Generated by Family Establishment Process in Rorainopolis (RR) – Brazil*
David Cafruni Ferreira Secretaria Municipal de Meio Ambiente de Cachoeirinha – SMMA. Cachoeirinha. Brazi	*Sustainable Development and Challenges to Water Management in the Municipality Cachoeirinha/RS - Brazil*
R.F. Gonçalves Universidade Federal do Pará, Belém, Pará, Brazil	*Public policies and indigenous sustainability in the Brazilian Amazon*.
Adriana Ballón Ossio Chair of Silviculture, Albert-Ludwigs Universität Freiburg, Freiburg, Germany	*Putting environmental discourses into policies: The case study of Bolivia*
S.M. Silva Federal Institute of Education, Science and Technology of Pernambuco, Department of Environment, Health and Safety, Recife, Pernambuco, Brazil	*Compliance Social and Environmental Guidelines on Environmental Impact Assessment based on the Equator Principles. Case Study: Dam Serro Azul River Basin Una, Pernambuco - Brazil*

Thursday, 08.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 3 (HS 3): Morning Session

	Session 14: Sustainability of German-Brazilian projects/cooperation/joined ventures	
	Chair: Martina Schulze, Ulrich A. Glasmacher	
08:30 - 08:40	**Martina Schulze** DAAD, Director of the regional Office in Rio de Janeiro, Brazil	*Indroduction*
08:40 - 09:10	**Keynote lecture** **Gerhard E.Overbeck** Instituto de Biociências, Departamento de Botânica, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil	*Brazilian-German cooperation for conservation: joint research on the South Brazilian grasslands, a success story*
09:10 - 09:30	**Alaer Cardoso Jr.** SENAI Technology Institute of Environment and Chemistry, SENAI CIC, Curitiba, Brazil	*The partnership between SEWNAI in Paraná and the German Government Supporting the Industrial Sustainable Development*
09:30 - 09:50	**Eckhard E. Kupfer** Martius-Staden Institut, São Paulo, Brazil	*5 Centuries of German-Brazilian Relationship*
09:50 - 10:10	**Christoph Dahl** Baden-Württemberg Stiftung, Stuttgart, Germany	*The Baden-Württemberg Stiftung: Research and cooperation with Brazil*
10:10 - 10:30	**Annegret Trettin** Baden-Württemberg International, Stuttgart, Germany	*Discover your opportunities with Baden-Württemberg International*
10:30 - 11:00	Coffee break & Poster Session	
11:00 - 11:20	**Sabine Heinle** Baden-Württembergisches Brasilien-Zentrum, Tübingen, Germany	*A bridge between Baden-Württemberg and Brazil - Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen -*
11:20 - 11:40	**Bernhard Peregovich** Universidade Federal do Oeste do Pará – UFOPA, IEG, Santarém, Brazil	*Possibility and Potential of German-Brazilian Projects on Sustainability of Amazon through Joint Ventures Collaboration*
11:40 - 12:00	**Jörg Matschullat** Interdisciplinary Environ Res Centre, TU Bergakademie Freiberg, Germany	*What makes a SUCCESSFUL applied scientific project? Lessons learned from Minas Gerais, Brazil*
12:00 - 12:20	**Christiane Pereira** Waste and Resource Management, TU Braunschweig, Germany	*Brazilian German Joint Venture on Mechanical Biological Treatment*
12:20 - 12:40	**Irma de Melo-Reiners** Bayrisches Hochschulzentrum für Lateinamerika (BAYLAT), Germany	*BAYLAT: Wissenschaft und Forschung – Internationalisierung und Nachhaltigkeit* *BAYLAT: Science and Research – Internationalization and Sustainability* *BAYLAT: Ciência e Pesquisa – Internacionalização e Sustentabilidade*
12:40 - 14:00	Lunch & Poster Session	

Thursday, 08.10.2015; 08:30 – 18:00 h; Neue Universität: HS 1, HS 2, HS 3

Lecture Hall 3 (HS 3): Afternoon Session

Session 14: Sustainability of German-Brazilian projects/cooperation/joined ventures		
14:00 - 14:20	**Matthias Frattini** BMBF, Project Management Agency, Bonn, Germany	*German-Brazilian Cooperation in Science and Technology*
14:20 - 14:40	**Anne Sperschneider** Alexander von Humboldt Stiftung, Bonn, Germany	*Funding Programmes of the Alexander von Humboldt Foundation and the Cooperation with Brazil*
14:40 - 15:00	**Martina Schulze** DAAD, Director of the regional Office in Rio de Janeiro, Brazil	*German-Brazilian Cooperation - The funding schemes of DAAD*
15:00 - 15:20	**Dietrich Halm** Deutsche Forschungsgemeinschaft, Bonn, Germany	*Research Cooperation with Brazil, DFG Statistics, Programmes, and Future Perspectives*
15:30 - 16:00	Coffee break & Poster Session	
16:00 - 16:30	**Keynote lecture** **Benno Pokorny** Faculty of Environment and Natural Resources, Freiburg, Germany	*Cooperation for sustainability: A critical reflection on the success of the German-Brazilian cooperation initiatives*
16:30 - 16:50	**Dirk Oesselmann** EH Freiburg, Germany	*Development: a multifaceted concept with multiple perspectives*
16:50 - 17:10	**Sabine Haltmayer** Steinbeiss GmbH & Co. KG für Technologietransfer, Stuttgart, Germany	*Sharing Steinbeis experience across borders*
17:10 - 17:30	**Bernd Hellingrath** Brasilien-Zentrum der Universität Münster, Germany	
17:00 - 18:30	Official Poster Session - Session 03, 09	

Thursday, 08.10.2015; 18:00 – 20:00 h; Neue Universität: Neue Aula

Chair: J. Kärcher, President of the German-Brazilian Society e.V., District Baden-Württemberg

18:00-20:00	**Final event: Sustainability in Art and Culture** Universität Heidelberg Universitätsplatz **Neue Universität, Neue Aula**
18:00-18:10	**Welcome and introduction into the programme** Johannes Kärcher, President of the German-Brazilian Society e.V., District Baden-Württemberg
18:10-18:20	Musical frame by Cristina Marques, Brazilian vocalist, solo
18:20-18:35	**Presentation "Visual arts in a German-Brazilian context"** Dr. Martina Merklinger
18:35-18:45	Musical frame by ENCANTO, Brazilian choir in Stuttgart, directed by Cristina Marques
18:45-19:20	**Literary session: Extracts from literary and scientific travelogues written by some early German explorers** To be read in the original German by Jessica Gehring, University of Tübingen (handout in Portuguese) Presented by Dr. Rainer Radtke, Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen
19:20-19:30	Musical frame by ENCANTO, Brazilian choir in Stuttgart, directed by Cristina Marques
19:30-19:50	**Closing Remarks** - Prof. Dr. Bernhard Eitel, President of Heidelberg University - Prof. Dr. Herman Jacobus Cornelis Voorwald, Secretary of Education of the State of São Paulo - Prof. Dr. Stefan Laufer, Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen - Baden-Württemberg International
19:50-20:00	**Conclusion and outlook** Prof. Dr. Ulrich A. Glasmacher, Heidelberg University, Institute of Earth Sciences and Heidelberg Center for the Environment

Monday – Thursday, 05.10 - 08.10.2015; University Square: Expedition mobile

The expedition mobile of the Baden-Württemberg Stiftung will be part of the symposium from 05.10.2015 to 08.10.2015 in Heidelberg and will be available at this time for lectures, discussions or student internships.

The information and education initiative "Expedition N" is unique in Europe, and invites visitors on an exciting journey of discovery in one of the most important issues of our time - sustainability. The aim of the initiative is to give the people of Baden-Württemberg in dialogue expertise for sustainable action in everyday life.

Monday, 05. 10. 2015

10:30 – 19:00	Expedition Mobile open for all participants
12:00/14:00/ 16:00/18:00	Live Presentation at the Expedition Mobile (15 min), Live Sustainability
16:30 – 17:00	Guided Tour (30 participants)

Tuesday, 06. 10. 2015

10:30 – 19:00	Expedition Mobile open for all participants
12:00/14:00/ 16:00/18:00	Live Presentation at the Expedition Mobile (15 min), Live Sustainability
16:00 – 17:00	2 guided Tours (30 participants)

Wednesday, 07. 10. 2015

10:30 – 19:00	Expedition Mobile open to all participants
12:00/14:00/ 16:00/18:00	Live Presentation at the Expedition Mobile (15 min), Live Sustainability
16:30 – 17:00	Guided Tour (30 participants)

Thursday, 08. 10. 2015

10:30 – 18:00	Expedition Mobile open to all participants
12:00/14:00/ 16:00/18:00	Live Presentation at the Expedition Mobile (15 min),

All pictures are provided by the FLAD & FLAD Communication GmbH, Heroldsberg, Germany

Friday, 09.10.2015; 08:00 – 20.00 h; Guided Field Trip including lunch pack + dinner

Meeting point: Entrance of the Neue Universität at 08.00h

A: Sustainable Development, Geo-Education and Science transfer – regional and international: UNESCO-World Heritage Messel Pit and Global Geopark Bergstrasse-Odenwald

Guides: Dr. Marie-Luise Frey (UNESCO-World Heritage Site Messel Pit); Dr. Jutta Weber (Global Geopark Bergstrasse-Odenwald)
The Field trip starts with the visit to the UNESCO-World Heritage Site Messel Pit (Visitor Centre and Messel Pit), where the non-profit ltd. Company Welterbe Grube Messel presents the concept and her contribution to the formation of a Science Society on the basis of transmitting earth sciences to the general public. Highlighted will be especially the collaboration with the Global Geopark Bergstrasse-Odenwald and the approach of a sustainable marketing of this World Heritage Site together with the tourism destination and the Geopark. After our lunch in the bistro of the visitor centre Messel Pit the field trip will follow up to other sites in the Global Geopark Bergstrasse-Odenwald such as:

- Sea of rocks (Lautertal) with visitor centre and walk: Sustainable collaboration, Geo-Education, regional Info-Networking, „Geotop“ of the Year and National Geotop
- Vine and rock-discovery trail Heppenheim: Sustainable collaboration with „Bergsträsser“ vine growers, development of the trail, common products, collaboration partners, small vine tasting in the vineyard.
- Heidelberg: Geopark-on-site – a programme for a sustainable networking and transmittance of regional knowledge in the Geopark: Geopark-on-site in Heidelberg is integral part of the platform „Natürlich Heidelberg“, which has been awarded as UN-Decade project for sustainable Environmental Education. The exemplary guided tour comprises: Haarlass (Geotop 2011), NSG Russenstein, Mausbachwiese)

The guided tour will end at Heidelberg and join the participants of the excursion B. Together we will have a warm up with home-brewed beer and food at Abbey “Stift Neuburg” in Heidelberg.

UNESCO World heritage site Messel (Archive Messel)

Propalaeotherium parvulum (E. Haupt)

Education Messel (Archive Messel)

UNESCO Geopark Odenwald (J. Weber)

Friday, 09.10.2015; 08:00 – 20.00 h; Guided Field Trip including lunch pack + dinner

Meeting point: Entrance of the Neue Universität at 08.00h

B: Sustainable development of renewable energy, garbage separation, and the environment of Homo heidelbergensis, Heidelberg – Sinsheim – Mauer – Heidelberg

Guide: Prof. Dr. Ulrich A. Glasmacher (Heidelberg University, Institute of Earth Sciences)

The field trip is three fold. In the beginning, the visit of the sustainable use of energy (Biomass-Energy production) by the Town of Sinsheim (company AVR) will guide into the future of cities and a whole region. The second stop will provide insight into the modern separation of waste. The third stop will gain information on the environment and the living of Homo heidelbergensis (600.000 years old) at the type locality in the village Mauer. The guided tour will visit the cultural heritage site, the museum, and the exhibition of *Homo heidelbergensis*. The guided tour will end at Heidelberg and join the participants of the excursion A. Together we will have a warm up with home-brewed beer and food at Abbey "Stift Neuburg" in Heidelberg.

http://www.avr-umweltservice.de/de/Unternehmen/Nachhaltigkeit/Biomasseheizkraftwerk.php

http://www.homoheidelbergensis.de

Abstracts

Oral and Poster presentations

Session 01: Sustainable Development in Education and Society

Convener:

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The negative consequences of non-sustainable development around the world become more and more clear: Climate change, pollution, loss of biodiversity, poverty, economic disparities are only a few examples of future challenges. To counteract this trend in the future, the current UN Decade “Education for Sustainable Development (ESD)" will be transferred in a world program for sustainability and ESD by the end of 2014. The aim is to further stimulate the overall societal discourse, to stabilize the existing activities in the area of ESD and to transfer project-orientated approaches in permanent structures and institutional settings.
Key areas of action should in particular include the

- Creation of an environment for tight integration of ESD into national and international education and development policy
- Promotion of holistic institutional ESD approaches in educational institutions
- Training of teachers, coaches, instructors, educators and other "change agents" in ESD skills
- Support of young people as important agents of change
- Intensification of ESD activities in local educational settings.

On this background, both best-practice examples of the implementation of ESD as well as conceptual approaches will be presented and discussed in the session “Sustainable Development in Education and Society”. We invite stakeholders from government ministries and agencies, NGOs, universities and the academic and non-formal education to submit proposals for presentations and posters.

Keynote Lecture:

Prof. Dr. Gerd Michelsen, Lephana University Lüneburg, Germany
Prof. Dr. Sergio Nobre, UNESP, Rio Claro, Brazil
Prof. Dr. Charles Hopkins, UNESCO, York University, Canada

Oral Presentations

(Higher) Education for Sustainable Development

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Sustainable development involves comprehensive and far-reaching societal transformations and fundamental changes in perspectives, especially regarding humanity’s relationship to nature. Such a fundamental re-orientation also requires an extensive change in consciousness on the part of individuals in society. Innovative learning processes play an important role in initiating the corresponding changes in attitudes and should thus become an established part of the educational system.

The Leuphana Semester at Leuphana University Lüneburg, together with the module “Science bears responsibility” is an example that demonstrates how innovative methods of teaching and learning can be combined with the topic of sustainable development and how new forms of university teaching can be introduced. With regard to module content, it has become apparent that, due to the complexity of the field of sustainability, a single discipline alone is unable to provide analyses and solutions. If teaching in higher education is to adequately deal with this complexity, then it is necessary to develop inter- and transdisciplinary approaches that go beyond a purely specialist orientation.

Environmental Development and Heritage Education.

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The Brundtland Report was published in April 1987, was result of the work of a committee presided by Gro Harlem Brundtland and Mansour Khalid. It presents a complex view of the causes of the socio-economic and ecological problems of society and of the inter-relationships between economy, technology, society and politics. The publication of this report spread the concept of sustainable development that was being refined since the 1970s. Within this understanding, the report confirmed the urgent need for a policy to raise everyone's awareness of the size of task of reverting the bleak scenario that is heading towards a depth that would result in extinction of not only resources, but of life itself. Our view is of education as development, as a practical category and goal, that is life itself. In this scenario overshadowed by various educational formulations that transmit and repeat knowledge and which do not provoke critical thinking, we are losing our best opportunity for change and creativity. It is in this field with a thousands hues that we desire to introduce the possibility of heritage education as a category of cultural instruction, a legitimate educational segment that uses traditional knowledge, from the field of cultural heritage, wisdoms, abilities and celebrations to raise awareness, stimulate, create, invent, and inventory the several ways of understanding the world and how to position and beguile one self in it. Among ways of educating, heritage education in Brazil has acquired, although with much effort, a position that aims to provide the opportunity for several expressions of traditional and indigenous peoples which are connected to sustainable development and which have practices that allow harmonious coexistence and tolerance with different ways of life. Thus, our contribution aims to shed light over this educational tool, which is key to cultural literacy and emancipatory knowledge. Given the failure of educational paths developed and implemented to this day, we believe that adding up strategies that combine traditional knowledge, cultural heritage, wisdoms, abilities and tolerance can be the way towards a more egalitarian, socially just and culturally diverse society.

Forest School: an experience in Education for Sustainable Development in the Amazon

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In the current century, the social, political, economic and cultural areas, experienced profound transformations slowly, with direct impacts on the environment generating, motivated a concern with the issue of development, production of wealth and the individuals education to assume another position on the market and consumption. Education began to occupy a prominent role, one example is the publication of the document United Nations Decade of Education for Sustainable Development (2005-2014) under UNESCO's responsability. The document highlights the Education for Sustainable Development, its characteristics, socio-cultural, environmental, economic prospects, as well as emphasizing the role of actors at the local level to the global. Considering the focus on the local perspective, the Amazon region has aroused interest not only in economic, but in scientific academic aspect, that represents a strategic region for sustainable development. There are scientific articles about human presence in the Amazon. There are different studies in anthropological, archeological, historical areas with special emphasis on the education (COLARES, 2003; SOUZA, 2009; GONDIM, 2007; BATISTA, 2007). Education is considered an strategic area for the future and current generations with principles, ideas, values and knowledge that can contribute to the ethical care of the ecological question or Education for Sustainable Development. The municipality of Santarém in the North of Brazil located in Pará State has been conducting, since 2008, an innovative experience in environmental education with the Forest School (Escola da Floresta). This school aims to conduct practical activities guiding the students to acquire values concerning the preservation and conservation of the Environment. In a complex scene changes is important to know educational initiatives like this, mainly linked to the Amazon region, demonstrating potential in Education for Sustainable Development.

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Conceptual and behavioural representations of children of the 4th grade of a municipal school in Santarém, state of Pará, Brazil, about Sustainability and Conscious Consumption

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The theme around the Conscious Consumption and Sustainability opens a big opportunity to stimulate the students to become multipliers and critics of behaviors and relations that arise from this greater consciousness in itself, of others and of the world. And, for so, the aim of this research is to investigate what are the concepts and behaviors of children from 4th grade of a municipal school of Santarém, state of Pará, about the Conscious Consumption and Sustainability. It is a quantitative-qualitative research, concerned to study a sample of 15 students, with ages between 11 and 12 years old, in which was applied the analysis of a core idea content in 8 semi-structural questions discussed based in Trigueiro (2012) and Teixeira (2012). The result found was that the interviewed students do not know the term "Sustainability" and "Conscious Consumption", however, their behavior is concerned about conservation. Probably, this happens because in the National Curriculum Guidelines, the environmental is worked in schools as a value, but not its relation with consumption and the role of the consumer consciousness and his acts related to environmental impacts. As results, 73,3% of students know the necessity of throw the garbage in the dump, 13,3% selects the garbage that can be turned into toys, 13,3% said that recycles and re-uses the garbage of their houses and 6,7% argues with people that throw garbage on the floor. As to water economy, 60% saves water during the shower and when are brushing the teeth, closes the tap and makes reservoirs in case of lack of water. When the students were asked if they prefer a new toy or one built by themselves with recycled materials, 73,3% answered that prefer a new toy, because as one of the subjects of the research said: "what it's new it's best". As conclusion, we understand that is no longer possible to reference the life in society with the consumption in larger scale, on individualistic and consumeristic behaviors and it is need to lead the children to dialogues where there is more care and esteem for the world and where it can be more ethical and sustainable and the values may be more human and less materialistic.

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Study of the case of children's perception with the environmental education at the "Projeto Trilha"

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Before the continuous environmental wastage and the need for rehabilitation in the individual training, this study aimed to analyze the environmental awareness in children aged between 8 to 11 years old with emphasis on the importance of environmental education projects in the formation of a more conscious individual. This study was carried out at the State University of São Paulo, Faculty of Agricultural Sciences (FCA) of Botucatu, with the "Projeto Trilha" (Trail Project), a proactive, self-sustaining and transversal proposal of the academic environmental education where visitors trail an interpretive and guided path. The methodology of the research was divided into two steps. The first step was a semi-structured questionnaire applied to 40 students of the "Escola Municipal núcleo habitacional Angelino Pascoalinotti" located in Pratânia/SP between October and November of 2014. The questions were according to the experience at the "Trilha" (Trail) and approached issues of the environmental education and preservation of nature. For this work it is only being discussed the results of the children's questionnaire, thus composing the second step of the research. At this second moment pizza-graphics were used for discussion of the results. According to the graphics what children liked learning most was to relate the five human senses to the environment they witnessed. Over 50% of the children answered that what they liked to watch most in the trail was the landscape. One of the questions asked them to select the three issues they considered the most important and the chosen ones were: selective garbage collection, garbage recycling and burning, possibly because these issues are the ones most talked about at schools and more constant in the most accessible media. About 45% of the children answered that they would use the knowledge acquired during the walk anywhere and not only with their Family, at school or community. The last question of the questionnaire was "How can environmental education help the world "and the most constant answer was "to help nature" and some of them even completed "because it gives us food". The results showed that children aged between 8 to 11 years old assimilate considerably environmental perception, being able to put into practice sustainability concepts in a natural way through their own individual and collective consciousness.

Education for Sustainable Development (ESD) in teacher studies at Baden-Württemberg between teaching and research

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Education for Sustainable Development (ESD) is one of six compulsory guiding perspectives of the new curricula 2016 of the federal state of Baden-Württemberg. Moreover, in the context of the new Bachelor and Master studies ESD is highlighted as a mandatory part in the new framework regulations and discipline guidelines (Ministerium für Kultus, Jugend und Sport Baden-Württemberg, 2015).

In this context the Department of Geography at the Heidelberg University of Education conducted an online evaluation to get an overview of the Status Quo of the implementation of ESD in teacher studies at higher education institutions in Baden-Württemberg (Jahn & Siegmund, 2014). At present, the Department of Geography prepares a qualitative study to get a deeper understanding of barriers hampering the implementation as well as of potentials, which might foster ESD integration into teacher studies. Furthermore, there are different projects that develop and examine methods and concepts to promote ESD in different educational contexts. The project “sun is life” for example aims at fostering primary and secondary school students´ skills on renewable energy production, consumption etc.

In 2001, the Interdisciplinary Institute for Science, Technology and Society (in German “NTG-Institut”) was founded at the Heidelberg University of Education. Since several years the focus of the institute is on ESD, for example on its colloquium in which lectures present a wide range of sustainability issues, especially from an interdisciplinary point of view. The institute is also involved in the general studies at the Heidelberg University of Education, organizing for example a lecture called “Education for Sustainable Development” and a group of project-based courses. In one of those courses, which is given in cooperation with the Heidelberg Center for the Environment (HCE) at the Heidelberg University, students are trained to become “sustainability coaches” who are taught to teach sustainability in local schools. This concept has also been the base for the development of a teacher training course on ESD, which has been awarded on the “CampusWELT”-contest by the Ministry of Science, Research and the Arts and the Ministry of the Environment, Climate Protection and the Energy Sector of Baden-Wuerttemberg.

Jahn, M. and Siegmund, A. (2014): Education for Sustainable Development in Teacher Training in Baden-Württemberg: From Theory to Implementation. In: von Carlsburg, G.-B., Vogel, T. (Hrsg.): Bildungswissenschaften und akademisches Selbstverständnis in einer globalisierten Welt, Baltische Studien zur Erziehungs- und Sozialwissenschaft, Bd 28, S. 183-198

Ministerium für Kuluts, Jugend und Sport Baden-Würrtemberg (2015): Bildungsplan aktuell. URL: www.km-bw.de/Kultusportal-BW,Lde/Startseite/schulebw/Bildungsplan+aktuell#anker 2083592 [15.06.2015]

On a Sustainability of a University Campus: a case of the UNESP Rio Claro's Campus in Brazil.

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In this talk, we will introduce some elements that establish the connection of the Campus of UNESP Rio Claro with themes related to the environment and sustainability. These academic activities are present specifically in undergraduate and postgraduate, like the courses of "Environmental Engineering" and "Ecology" (both undergraduate) and "Geosciences and Environment" and "Ecology and Biodiversity (both graduate) besides the fact that in other undergraduate and postgraduate courses of the Campus this theme is also present. Individually researchers also develop scientific research on this subject. Some examples will be shown.

Education for the Sustainable Development: the experience of the first four years of the Master's in Development Practice at the Federal Rural University of Rio de Janeiro (UFRRJ), Brazil.

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According to the International Commission on Education for Sustainable Development Practice, convened in 2007 to analyze existing education programs for development practitioners, there were no cross-disciplinary programs at that time to train people in the full range of challenges of sustainable development (SD). With emphasis on policy and implementation, the Master's in Development Practice (MDP) program was then proposed, rooted in four main disciplines: health sciences, natural sciences, social sciences and management. The main aim of MDP in UFRRJ (Brazil), created in 2011, is to contribute towards poverty alleviation and the enhancement of social, economic and environmental development both in Brazil and in other developing countries in Latin America and Africa. It is coordinated by UFRRJ, but three other Universities in Brazil and one in Mozambique are part of the course; inside UFRRJ, four institutes are committed to the program. In the first four years, our MDP had 80 students from all around Brazil and also from other countries, as Argentina, Peru, Venezuela, Mexico, USA and Mozambique. Half of the students' background is on Biological Sciences and the other half is very diverse, showing that, indeed, it is a multi and interdisciplinary course: Agronomic Engineering, Geography, Journalism, Social Sciences, Architecture, Law, Tourism and International Affairs are some of the examples. Most of them are employed at the time of entry into the program (government and companies, mainly). Field training is a very important component and aim to provide the opportunity to gain firsthand experience of integrated development approaches within the real-world context through hands-on, practical experiences. Some examples of projects developed by the students are: "Benefit sharing and use of natural resources in the Niassa Reserve, Mozambique", in 2012, in cooperation with Uni Lurio University (Mozambique), "Social Perception of Risks Associated with Extreme Phenomena and Measures for Adaptation to Climate Change in Teresópolis, RJ", in 2013, with Humboldt Universität zu Berlin/GIZ and "Monitoring of the Green Grant Program (support to environmental conservation by small rural producers) in Pará", in 2014, with Conservation International Brazil. Until now, 40 students are graduated and 20 more will graduate in 2015. The Atlantic Forest is the most studied ecosystem, with the students' final reports focusing mainly on conservation of protected areas and public policy. Other themes such as family agriculture, traditional populations, urban ecology and climatic change are also recurrent. The main challenges for the MDP Brazil in the near future are to ensure the necessary resources for program sustainability in the medium and long terms; ensure scholarships for students; diversify the opportunities of field training; and align the curriculum with the new SD Goals that will be launched by the United Nations Sustainable Development Solutions Network in September 2015.

The Historical Dependency of Education: Implications for Sustainable Development from a Study for São Paulo, Brazil (1840-2010)

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The author discusses some implications of his master's thesis on Development Economics dealing with the persistence of educational performance over history.

The German-speaking immigration to the Province/State São Paulo, Brazil (1840-1920), is used as a quasi-natural experiment which implied a positive, exogenous shock on the local demand for education: it is found that these immigrants had an educational level comparatively higher than the local population and that their demand for education spilled over to regions where such immigrants settled. In short, the historical parcel of the work shows that human capital differentials of these immigrants constitute their main contribution to the long-run economic performance of the region considered. In a second period, schools founded by these immigrants are found to have had large impacts on enrollments in private and State schools.

Using these historical determinants, current education is instrumented to observe its positive impact on current income levels of the municipalities in the State São Paulo, Brazil. Especially interesting is the positive and significant impact of jobs requiring secondary education on the income levels of the municipalities, while only primary or tertiary education proved to be non-significant.

There are two main implications of these results for policies on sustainable development. First, the strong historical dependency shows that educational policies propagate strongly and persistently over time - such that current investments in education for sustainable development will potentially endure for long periods. Second, the results about secondary education show that there is a window of opportunities for investments at this educational level, including technicians and professionals related to environmental activities and sustainable development. This shows a potential complementarity between economic performance and sustainability provided by means of education.

ESD and Teacher Education: learning our way to a more sustainable future

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Ever since the concept of sustainable development was envisioned in practice by Agenda 21 at the Earth Summit in 1992 the crucial role of the worlds 60,000,000 teachers in creating a more sustainable, just and peaceful world has been identified. As separate chapter on education, public awareness and training was specifically identified as a concrete means of implementing sustainability. This initiative was further heightened with the declaration of The UN Decade on Education for Sustainable Development, (2005-2014). Now education and teacher education in particular is again included in the new UN Sustainable Development Goals about to be launched this year. The UNESCO Global Action Programme on ESD has also been launched and one of the five core objectives is engaging teachers and trainers in ESD. The largest gathering of the World's ministers of education at the World Education Forum in Incheon, Korea in 2015 also called for ESD as an integral component of a quality education.

A huge issue however remains. How can we further engage the world's teacher education institutions in meaningful and effective ESD preservice and in-service programs?

This presentation will address a number of issues facing education systems and teacher education institutions including ESD, the quest for education "quality", relevance to students, societal change and the new request for Global Citizenship Education from the UN Secretary General Ban Ki Moon. In particular I will speak to the role that geography is currently and could play as a unifying approach to the numerous requests for phenomena focused, interdisciplinary courses.

Educational Practices Contributing to Sustainable Development in the Brazilian Northeastern semi-arid region

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The primary focus of this research is represented by the study of environmental education (Caride and Meira, 2004) and its implications for the sustainable development process (Oliveira, 2007) through the educational practices in formal and not formal spaces (Pardo, 2003) of the northeastern Brazilian semi-arid zone in Bahia State. Interest in this theme emerged from issues near my reality, which also impose on the world stage. This reality portrays issues that are associated with environmental degradation of school and out of school communities, and their surroundings, which live at risk situation. Methodology: In this qualitative and ethnographic research (García Ferrando et al., 2010), I do a hermeneutic analysis of the meanings issued by public school teachers and monitors of the Expanding School Time of the Child Labor Eradication Program (PETI) on what they understood by sustainability (Cavalcanti, 2002). The overall objective for this study focuses, in the teachers' and monitors' speeches and their practices, on identifying which the meanings they attribute to sustainability and analyzing the relationship between the discourse and the educational practices of such social and educational actors, regarding to the sustainability. Results: emerged through the following categories of analysis: conception of environmental education and sustainability, educational practices and the social/environmental changes. The conclusion indicates possible ways for a line of Environmental Education work based on principles of community awareness, participation with involvement, care and attention, facing the challenges, education for sustainability, comprehensive view of education, quality of life and public policies.

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Social Inequality in Indigenous Health: The Case Of Manaus

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The work is part of my PhD research on indigenous policies for indigenous people in the city of Manaus in Amazonas State, Brazil. Historically indigenous peoples were considered a hindrance to developmental ideas carried out by the State, which led the implementation of indigenous policies in order to " develop " indigenous peoples and bring them to the same level of development of the rest of the country . The policies have been developed in all sectors, especially in education, health, environment and territory. The methodological procedures used were bibliographic, documentary and field research using interviews and observation in the Special Secretariat for Indigenous Health (SESA) and the Municipal Health Secretariat of Manaus (Semsa) . The research points among other reasons that the failure accompanying health policy for indigenous peoples is a reflection of the developmental order history " civilize" the Indians and " develop " the Amazon . The implementation of Indigenous health care is the responsibility of the Special Indigenous Health (SESA), however in practice, the Indians living in the city are excluded from the implementation of health policy in the two organs. The SESAI outsources actions for non-governmental organizations in many cases are indigenous organizations. Such situation has translated into dilemmas for indigenous people who are involved in health care because you need one hand to dedicate the indigenous cause of involvement in other projects as executors of policy, makes them co - responsible for the equalization of the problems which should claim. Moreover, the tangle Brazilian health system requires managers and executors of the shares are empowered to respond adequately to the complex bureaucratic apparatus of the Unified Health System (SUS). In this sense it is important to consider that a failure in health policies for indigenous peoples in the Amazon product is not only the historical Brazilian indigenous policy, but a number of factors that make an indigenous health issue that should be widely discussed, especially with Indians who are the key stakeholders in the implementation of the policies implemented.

SENAI in Paraná Sustainable Center

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The SENAI Sustainable Center Project was idealized in 2012 and in September 2013 SENAI in Paraná launched its Sustainability Center, an innovative project showcasing sustainable technologies applied to building systems, environment and energy. This Center is also a space to promote discussions and activities related to education for sustainable development (EDS) involving students, professors, partners, companies, industries and community members in general, therefore favoring interactions between academia, private and public institutions. Moreover, it is part of the SENAI Technology Institute of Environment and Chemistry where consultants provide technological services; develop applied research and technological innovation projects and perform laboratory essay services in the environmental and chemistry areas promoting industrial development in Paraná and Brazil. The success of this project is due to the contributions received from various partner companies and industries, especially from the Baden-Württemberg State (Ministry of Finance and Economics) that provided essential assistance in transferring the wood frame technology to Brazil and in helping find other partners. Among the various partners and sustainable technologies applied in the Center, some may be highlighted, such as: wood frame building system; sustainable architecture, including natural light and ventilation systems; green roof; ecological plastic wood composite, automated management systems; reuse of wood scraps; photovoltaic energy generation system integrated to the State electric utility network (Copel), which receives the exceeding energy that is produced; energy saving system and rainwater reuse system, supplying water for toilet flushing, floor washing and garden watering. Since its construction and launching, the Center received over 870 visitors, including representatives from industries, enterprises, partners, unions, research institutes, students and professors from Paraná, Brazil and other countries. The visitors learn about the sustainability pillars adopted by SENAI in Paraná (ecological, economic, social, cultural and safety) and are informed about sustainable alternatives through virtual reality technology. In November 2014 the Sustainable Center project represented the RCE-Curitiba-Paraná in the 9th Global RCE Conference (UNU-IAS) and received one of the awards in the category “Community Engagement: Mobilising Local Innovations for Sustainable Development”, in Okayama, Japan. The SENAI in Paraná Sustainable Center has reached its objectives and has played a key-role in promoting sustainable alternatives and education for sustainable development.

The reuse of Pet bottles inside the Amazon.

Caio Murtinho

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Santarém, municipality of 294,580 thousand inhabitants (IBGE: 2010), a medium-sized town situated on the banks of two towering basins (Tapajós and Amazonas) in the Brazilian Amazon-which has the largest continuous tropical forest on the planet, which houses significant mineral wealth, water, fauna, biodiversity and plant-is a critical case of the disordered occupation of the Amazon where the production and inappropriate disposal of garbage is a problem that affects environmental health and urban floodplain ecosystems and land still, some high ecological sensitivity.

In the face of this situation, we have seen that it is necessary to develop a project of short, medium and long term with a view to a lasting solution and integrated with other public policies that aim to reduce poverty in the municipality frames and in Brazil, as well as contribute to a policy of environmental sustainability with impact on quality of life of the local population.

In the short term: creating an organizational base of collectors and suppliers of recyclable solid waste (PET bottles), with the creation of a cooperative of collectors of Perema, sensitization and awareness of suppliers of these materials and the formatting of a platform of reuse of this waste for processing into polyester fibers. In medium term: the economic organization of selective collection, industrialization and commercialization of sub-products, having as main material, polyester fabrics replacing cotton fabrics and plastics that can be used in bags, clothing, inner lining of automobiles, etc. Are new raw materials sought by industries. In the long term: the consolidation of this project on economic, social and environmental terms, constitute in a technological alternative with a social and environmental impact of great importance for the municipality. At its peak of operation, expected 66 direct jobs in the plant industry, income generating stations 60 formalized in the cooperative of Scavengers and other indirect jobs.

With the city of Santarém, there are also possibilities of the project come to be one of the activities of the cooperation within the articulation of 50 German cities partners of projects that contribute to lessen the impact of climate change.

The extension work created in Perema generates one social dialogue around a wider project which is expected to contribute to various income generation opportunities through recycling and reuse reuse of solid wastes in the municipality. From the point of view of environmental sustainability, this project contributes to reduce emissions of GHG-Greenhouse Gases, being one of the pioneers in this thematic projects in the Amazon region.

Poster Presentations

Ecological consciousness in the performing of Tribes Festival in Juruti, Amazonia, Brazil

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The present work is a descriptive-explanatory field research that aims to highlight the ecological consciousness in festivals. Juruti is a city located in Western Pará, in the heart of Amazonia, where the real Munduruku Tribe inhabited before colonization and where take place the tribe duel nowadays, titled Festribal, that attracts thousands of people per year that sympathize with the open sky event. The main reason for this cultural manifestation it's due to the non-extinction of indigenous cultures and traditions of these people that once inhabited Juruti. The Tribes Festival is a celebration that happens for 20 years, between the two folkloric associations Munduruku Tribe and Muirapinima Tribe, bringing to the arena the indigenous traditions (singing, costumes and rituals), and paying tribute year after year to all existentes ethnicities. During the festival making of, there is a care with the costumes, scenery, allegory and all performance moments related to ecological consciousness, where both tribes do anappeal for Amazonia preservation, both in it's indigenous singing and in each one's consciousness to performan splendorous espectacle, without degrade nature. To this end, associations abolished the use of birds feather and avoid using natural materials. Today, they only use synthetic pheasant, peacock, duck and rooster feather. So, in conclusion, the Juruti Festival and others are reaching a never before seen level of ecological consciouness. The preservation sense must start from each one of us, once nowadays comsumption society are dangerously modifying our biosphere and continuously destructing our flora and fauna. Let us all be actors for Amazonia preservation, protectors of the goddess of ecology.

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Sustainable Human Resource Management for Strategic Success

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The premise that Human Resource is scarce is established for quite long. (Boxall, 2003) Organizational experience also proves that Human Resources are consumed and are not reproduced. (Kira, 2002, 2003; Thom and Zaugg, 2004; Muller-Christ, 2001; Ehnert, 2006, 20009). Sustainable HRM, as it is referred to in HR parlance, argues that the human resources are consumed physically, cognitively, socially and emotionally because of the increased work load at the workplace. Thus, the need for nurturing the skills, knowledge, cooperation, trust, motivation, employability, industrial relations (Docherty, 2002) thereby, striking a balance between quality of work life and performance assumes significance. It becomes incumbent on the leadership to embed sustainable values among the employees in an organizational context. Similarly, the need for the HR practitioners to play a pivotal role in creating a sustainable vision, mission and strategy, create an organizational structure to drive sustainable agenda, develop capabilities, competencies, skills of the human resources in creating sustainable HR systems and processes becomes critical in organizational survival and growth (Ernst & Young, 2013). Added to this, globalization and internationalization have pushed the need for skilled, technical and competent human resources for success. HRM Scholars opine that intensive work, internationalization and globalization, diversity, demographic trends, aging workforce, labor markets, employment relationship, shortage of skills, lack of quality in educational systems etc. also contributed to the rise in Sustainable HRM (OECD, 2004, 2005). The study is an attempt in this direction and seeks to examine the sustainable HR practices in the Indian IT sector that would contribute to the overall sustainable outcomes – Economic, Ecological and Environmental.

Prevalent diseases in the city of Manaus: public policies to combat tuberculosis from 1932 to the present day

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This is a descriptive study, in general, we can say that the History of Public Health in the Amazon effectively began when the creation of the province of Amazonas in 1852.. This documentary collection stands out a set of very interesting topics, among which we highlight the following: medical records, vaccines, epidemics, regions most affected by diseases, medical health actions and policies for the region. In the city of Manaus, the History of Tuberculosis, which was one of the diseases that come from the time of the Province, had its beginning in 1932, with the Pro-Tuberculosis Association, which aimed to take care of tuberculosis patients. The fight against TB was continuous. For this reason it was created the Sanatorium Adriano Jorge, and other sanatoriums, thanks to the tireless struggle and effort of many doctors of the time. The organization of the fight against tuberculosis in Brazil is initially in the late nineteenth century, the Holy Mercy Homes that housed the sick, the poor majority. Leagues Against Tuberculosis have been created since 1900 had important non-governmental role. With the release of "Plan to fight Tuberculosis in Rio de Janeiro, by Plácido Barbosa in 1917 and later, in 1920, the creation by Carlos Chagas, Prophylaxis Inspectorate Tuberculosis, were outlined the first systematic government action. But it was only in 1941, with the creation of the National Tuberculosis Service and the National Campaign Against Tuberculose- CNCT- that the State effectively assumes control actions. Our objectives are: To rescue the history of the fight against Tuberculosis in Manaus-Am and actions organized by the Public Health and Government institutions for combating tuberculosis in the city of Manaus-Am from 1932 to the present day; Identify and rescue the history of major health institutions in the State of Amazonas, such as: Holy House of Mercy, St. Sebastian Hospital, Dispensary Cardoso Fontes and Sanatorium Adriano Jorge; Highlight the action of the health workers and intellectuals who were key players in the ideological construction process not only of State structures but the very public policies which help in the reconstruction of the Memory of Public Health in the state of Amazonas. Because it is a documentary research, information sources were analyzes on documents, such as newsletters from government agencies of Amazonas state, city newspapers, photographs, printed articles and available on the internet, books and other media.

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Supplementary Studies on Sustainable Development at KIT

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Supplementary Studies on Sustainable Development at the Karlsruhe Institute of Technology (KIT) provide students with various approaches to transformation knowledge, as well as with the basic principles and application areas of Sustainable Development. The focus is both on experiential knowledge and application-oriented competencies as well as on theories and methods. The aim is to support students in taking responsibility for sustainability issues and for their own actions as individuals, citizens, researchers and future decision-makers.

The curriculum includes the following features:

- Overview of the basic principles of current research on sustainability
- Introduction and application of theories and methods
- Freedom of choice and selection from a wide range of seminars for students: from technology assessment to yoga
- Hands-on sustainability research and solution development
- Promotion of team skills, presentation competencies and reflective abilities
- Interdisciplinary learning and teaching in cooperation with social and business partners
- Integrative concepts for sustainability as a global social challenge
- Open for all students, including PhD students
- Certified qualification, credit points recognized for key skills module

Solid waste management for between Municipalities Consortium in Brazil

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In Brazil, one of the most pressing issues in public administration is the lack of financial resources for planning, implementation, operation and maintenance of storage systems, collection, treatment and final disposal of waste; because these actions involve the permanence of specialized technical teams, operational and administrative; machinery and equipment; whose mobilization, allocation and maintenance cover a significant portion of the budget. The legislation determines the universalization and regularity of attendance of public cleaning services, treatment and final disposal adequate; provides for shared responsibility between public authorities and Civil society; and conditions the fulfilment for which the municipalities administrations to obtain new financing, tax incentives or fostering made available by the Federal Government. This research addresses on an between municipalities Consortium, located in the Southeastern Region, which used an environmental diagnosis, social and cultural, locational and drew up a plan of Integrated Waste Management (PGIRS). The Consortium was created through a State decree that specified the regional division of Municipalities, has determined that the costs of collection and transport of generating sources to the Station of Transhipment (ET) are the responsibility of Municipal Government and ruled that the transportation costs of ET for the Landfill (ATS), the operation and maintenance of the landfill are the Consortium. The ET is the place of temporary storage of wastes which facilitates the logistics and reduces maintenance costs of trucks. In practice, the trucks carry collectors collection route in their municipalities, transporting the waste to the ET, transfer the waste to another truck with greater capacity (bi-articulated) that transports finally for final disposal in the Public Consortium Regional Landfill, operated by a specialized utility company. The elaboration of PGIRS included the planning, setting goals, targets, indicators, procedures and criteria for the classification and management of residues from prevention in generation to the final disposal; with the completion of steps and deadlines, that allowed the obtaining and the transfer of information about the results and practices adopted for all Stakeholders. Integrated management has been made compatible with the Solid Waste Management Plans of Health Services (PGRSS); Waste Management Plan of Construction (PGRCC); Municipal Sewerage Plan and with the Municipal Program of Environmental Education. It was concluded that the Management Consortium facilitates the application of public resources, provides the sharing of assignments, and allows the enforcement of legislation. The observation of the activities of choice of areas for installation of ET and ATS allowed was effected the integrated analysis of technical issues, legal, physical, social and environmental; fact that resulted in the identification of problems, technical and operational execution; and demonstrated that the Environmental Engineering and Civil Engineering has the challenge of finding the best way to plan, develop, execute, and finalize projects that allow full compliance with the requirements of legislation and mainly the expectations of Stakeholders.

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Session 02: Paleoclimate/Climate Change

Convener:

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The talks will provide insight into the process of climate evolution from the past to the present and describe causes for the recent climate change. In addition, all talks should provide hints on the possibilities to sustainably deal with the climate change. Key examples from the past to the present will be shown.

Keynote Lecture:

André Jasper, UNIVATES, Brazil
Tong Jiang, China Meterological Administration, National Climate Centre, China
Marcelo Leppe, Insituto Antártico Chileno, Chile

Oral Presentations

The Gondwanan Late Paleozoic icehouse/greenhouse cycle: a palaeobotanical approach to understand actual and future climate change.

André Jasper

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Global environmental changes are probably amongst the most important human challenges for the XXI century and the prediction of future developments of the environment is currently an important point of discussion in different spheres and areas of science. To be able to establish future scenarios is necessary to take a look at the evolution of the environment during time, mainly to see how and why the Earth has gone through numerous changing events. One way to use this approach is the current debate about global climate change in which the discussion has so far not resolved whether the current global warming reflects short-term climate oscillations or a unidirectional long-term trend. A global greenhouse stands in marked contrast to the past 20 m.y. of glaciation and icehouse climate and, consequently, the most recent icehouse period may be a poor model to deduce the dynamics of environmental change in continuously directional warming, as expected by current IPCC scenarios for future global warming. The only time in Earth history in which the mosaic of the terrestrial environments was subjected to a long term transition from icehouse to greenhouse conditions, similar to the one the Earth will maybe experience in the near future, was the Late Paleozoic. Understanding and explaining the different events connected to the Gondwanan icehouse/greenhouse cycle will, therefore, help to establish efficient local and global policies for future environmental issues.

The role of soil air composition for noble gas paleotemperature reconstructions in tropical regions

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Dissolved noble gases (NGs) in groundwater provide a well-established tool for paleotemperature reconstruction [1]. Although most noble gas temperature (NGT) studies have been conducted in northern temperate latitudes, the few results from the tropics, in particular a study from Brazil [2], have provided important proofs of a significant glacial – interglacial temperature change in tropical regions.

However, reliable NGT determination requires a detailed understanding of the dynamics of reactive and inert gases in the soil air with which the infiltrating water equilibrates. Due to microbial gas consumption and production, the NG partial pressures in soil air can deviate from atmospheric air, an effect that could offset NGT estimates if not taken into account [3]. Because biological activity is expected to be particularly strong in humid tropical soils, we studied NGs in soil air as well as young groundwater at different sites near Santarém (Pará, Brazil) and for comparison near Heidelberg (Germany).

Soil air data confirm a correlation between the sum value of O_2+CO_2 and NG partial pressures. We find significant NG enhancements in soil air by up to 7%. The strongest increase is observed in tropical Santarém, whereas NG excesses vary seasonally in temperate Heidelberg. An observed mass dependent fractionation of NG isotopes in Heidelberg can be explained by the seasonality of O_2+CO_2. However, there is no such effect in Santarém, indicating a year-long NG enhancement in soil air and supporting the expectation that this effect is particularly important in the tropics.

The determination of reliable absolute NGTs also requires a correct accounting for bubbles of soil air that are entrapped and (partly) dissolved in the water during groundwater table fluctuations. The resulting excess air component is reasonably well described by the closed system equilibration (CE) model for excess air [4]. An according NGT fit was performed for the groundwater data from Santarém. A systematic underestimation of the real groundwater temperature is found under the assumption of atmospheric NG contents in soil air, while a good agreement is reached if the enhanced NG partial pressures in the local soil air are taken into account. These findings allow for more reliable NG paleotemperature records, in particular in humid tropical areas such as the Brazilian Amazon region.

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Using archaeobotanical analysis to understand the pre-colonial occupations for Taquari Valley, Rio Grande do Sul State, Brazil.

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To understand and explain the changes that are occurring with the environment nowadays is necessary to seek the answers in cases involving events in the past. The Archaeobotany helps to solve some of the actual questions, as through the use of techniques of this science can support the understanding of the eventswhich reached the past environment (vegetation, climate, man-environment relationship). They cover a wide range of activities, and among them, the study of charred woods fragments - macroscopic charcoal and palinomorphs rescued from the sediment, are important tools for paleoenvironmental studies. the present study aims to apply the results of Archaeobotanical analysis (anthracological and pollen analysis) to be performed on Archaeological Sites RS-T-123 and RS-T-114, located in the municipalities of Arvorezinha and Marques de Souza, respectively, both in Rio Grande do Sul State, Brazil, to assist in understanding the paleoenvironmental history of the Taquari Valley region. Some preliminary anthracological analyses already indicate the occurrence of charred wood fragments from the sites, and these samples have affinities angiosperms. Moreover, related fungi structures are also present in some samples, indicating the possibility that the past populations made use of dead wood (showing some degree of decomposition) as fuel. The first collection of material from the peatbog next to the Site RS-T-123, shows that the sediment is composed of clay soils with portions of sandstones. Pollen analysis will be made after.

Precolumbian cultural dynamics in southern Peru and the role of climatic variability

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The desert margin of coastal southern Peru and the highland of the Andean Altiplano were populated during the whole Holocene. However, cultural boom and favored regions changed several times. Along the coastal oases, during the Nasca and its precursors as well as during European middle ages cultural activity rose, but alternated with cultural boom in the highlands. This seesaw pattern between the contrasting landscapes of the coast and the Andes was triggered by rapid changes in environmental favorability. Changes in the characteristics of the interhemispheric temperature gradient, the ENSO system and the reach of the South American Summer Monsoon were responsible for these spatial and temporal shifts.

Caatinga and Cerrado vegetation reaction to regional climate change in north-eastern Brazil

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The topic "climate change" in Brazil is a critical issue. Politically seen as a low priority theme, there is little support for related efforts beyond international commitments. And yet, at least parts of the country are highly vulnerable. While attention in this respect is focused on the Amazon basin, northeastern Brazil (NEB) with its large population share (ca. 55 million, 28%) and dynamic growth rates shows a significant vulnerability that is reflected in the semi-dry climatological conditions and partly highly impoverished soils (Gottsberger and Silberbauer-Gottsberger 2006).
Existing meteorological and climatological data are not as adequate for regional climate change investigations as they should be. Thus proxy information such as satellite-based vegetation observation appears useful to assess biome behavior and related changes – at least on the time scale of a recent climate normal (30 yrs). The spatio-temporal variability of trends in vegetation greenness in dryland areas is a well-documented phenomenon in remote sensing studies at global to regional scales.
Here, we analyzed the vegetation greenness for the semi-arid NEB, and examined the relationships between those dynamics and climate anomalies such as the El Nino Southern Oscillation (ENSO) phenomenon for the period 1982 to 2010, based on the annual Normalized Difference Vegetation Index (NDVI) values from the latest version of the Global Inventory Modeling and Mapping Studies (GIMMS) dataset (NDVI3g).
Contrary to assumptions in environmental and socio-economic research (Mesquita et al. 2012), the results of our inter-annual trend analysis of NDVI and precipitation indicate large areas of significant greening in the observation period. It needs to be kept in mind, however that GIMMS NDVI3g pixel size of about 8 x 8 km. Thus sub-pixel processes may not be represented by the data. The spatial extent and strength of greening is a function of the prevalent land-cover type or biome in the region. Greening does not reflect quality, e.g., of plant growth potential (e.g., very green but non-palatable species may replace palatable species with lesser green tissue). A regression analysis of ENSO indicators and NDVI anomalies reveals a close relation of ENSO warm events (El Niño) and period of reduced vegetation greenness, with a time lag of 12 months. The spatial patterns of this relationship vary in space and time. Thus, not every El Niño event is reflected in negative NDVI anomalies. Xeric shrublands (Caatinga) are more sensitive to ENSO teleconnections than other biomes in the study area (Erasmi et al. 2014).

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Drought and its Impact on Socio-economy

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Monthly data from 530 meteorological stations in China were used to calculate the time series of Standardized Precipitation Index (SPI) for the period 1960-2013. The time series were analyzed for ten hydrological regions of China respectively. Then characteristics of drought including intensity, area and duration in China were extracted and analyzed respectively by the SPI. Relationships between intensity and area at a specific duration were analyzed by the Intensity-Area-Duration (IAD) method. Results show that zone with significant dryness trend were found from southwest to northeast regions of China. The differences in this zone are that significant wetness trends were detected in northern basins while Southwest regions of China kept the dryness trend in early 21st century. This phenomenon is related to the similarities that intensity and duration of drought events became stronger and larger except for Haihe River basin and middle and lower Yellow River basin in this zone. Droughts in China shifted from Northwest and north of China with larger area to northeast and southwest of China with smaller area during 1960-2013. The most severe droughts with larger area mainly occurred in the north and west of China before the early 21st century. At the early 21st century, most severe droughts are located at Southwest of China with smaller area less than 0.7 million km2. Droughts are more likely undergoing a aggregation process and most severe drought with smaller area can be found along with the changing climate.

Antarctica: A Natural Laboratory and A Change Sensor

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In March 24, 2015 occurred the highest temperature recorded by instruments in Antarctica (17.5 Celsius). Four days later, more than 5.000 km to the north, on the Chilean coast, in the Atacama Desert, rains fell in 24 hours equaled that fell in 14 years over Earth's driest place, causing destructive flooding that left nine people dead. Were these events connected? Today we know that the influence of Antarctica has been instrumental in shaping the landscape and biota of South America and continents that formed Gondwana. What the future holds for this relationship? Can we grasp and incorporate the dynamism to a society constructed around static models?

Poster Presentations

Paleoclimatic interpretations through the analysis of rock paintings in the Serra da Capiva National Park – PI, Brazil.

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In Serra da Capivara National Park and adjacencies there is a wide range of archeological sites which provides diverse information about the first human settlements in America since it holds many characteristics from their existence in different ecosystems of the region. There are more than 1,000 registered sites (not definitive) in the park, about 657 of them have cave paintings; the others are villages, cemeteries and settlements. The cave paintings picture routine activities such as hunting, giving birth, sex, social struggle, games, relationships and rituals. These paintings have multiple functions which reveal that, in that territory, the first settlers' daily life was very dynamic and can also provide evidence that there was history, education, socialization, communication and religiousness in Brazilian history ancient times. It is possible to identify in the paintings – from the various rock zoomorphic representations and their likely interpretations – species absent today in the region and others completely extinct; some are so well done that it is possible to identify the gender of the printed animal through antlers and other species gender determinant characteristics. It is common to see paintings of crabs, lizards, siriemas, armadillos, pacas, cats, crocodiles, coatis, camelids, tailed deer and capybaras – these last ones disappeared from the region due to the current extreme aridity, what leads to the hypothesis that it was a more humid area in a not very distant past. Another specie often potrayed in the paintings is the emu *Rhea Americana*, extinguished from the area not long ago. Based on the identification and a deep study of the fauna pictured in the cave paintings of the Serra do Capivara National Park as well as on the information gathered from the literature, the aim is to rebuild the probable environmental conditions from the period when the paintings were made, thus becoming a reliable paleoenvironmental reference.

Characterization, synthesis and application of zeolites obtained from Amazon kaolin

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Zeolites are hydrated aluminosilicates of alkali and alkaline earth metals, and may have natural or synthetic origin. It has been a few decades that the zeolites are becoming increasingly attractive to industries, once they have their properties originated from the microporous structure (MAIA apud ABREU, 2012). The zeolite materials present themselves as great allies in control, preservation and maintenance of watersheds. Due to the high uniformity of composition and the high-purity, species of synthetic zeolites are commonly used as catalysts, once the natural ones are used in the treatment of effluents (Aguiar et al apud SHINZATO, 2007). An important aspect of Amazonia is its own large and numerous freshwater basins. It is also known that much of the Amazon rivers has some type of contamination by toxic chemicals uncontrolled discharges from the open sewers of some cities and cases of rudimentary prospecting activities. Thus, the synthesis of a zeolite type NaA from Amazon natural kaolin using the hydrothermal method was performed. The material obtained was characterized by techniques of X-ray diffraction and infrared spectroscopy. After the synthesis, the zeolite was mixed with sawdust powder of definite particle size, in the form of long cylindrical bulk in a hydraulic press and sintered at 600 ° C for use as a filter. After sintering, new diffraction X-ray tests carried out to verify the maintenance of the crystallographic phase of the zeolite. Once the tablets were finished, application was developed as a filter prototype for water treatment, using as one of its phases zeolite filter tablets. The experimental apparatus is structured from PVC pipes and, as a filter, coal seams, sand and zeolite sintered tablets were used on. Preliminary results of water samples filtered by the prototype showed change in turbidity, pH and total dissolved solids. However, you will not be able to see the real contribution of zeolites as filter because in the first test, the material is insufficient for analysis. However, the production of tablets is still in progress, requiring also further testing about the material.

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Anatomical analysis of artificially charred wood of Araucaria angustifolia from Rio Grande do Sul and its palaeontological implications

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Fossil charcoal, as direct evidence of palaeo-wildfires, is known from the Silurian onwards and there is increasing evidence that fire has been an important factor of disturbance in many ecosystems since this time. An important prerequisite for the taxonomical and palaeoenvironmental interpretation of charcoal is the understanding of taphonomy of such material. Despite the significance of anatomical features for charcoal recognition, as well as palaeoecological interpretation only a few studies have dealt with changes of cell structures during charring. However, charcoalified plant organs like wood and flowers have repeatedly been used to describe new taxa, mostly without considering anatomical and morphological changes that occur during charring. To fill this gap we started a project dealing with anatomical changes occurring during charring of plant material and influence of such changes on taxonomically important characters. We are conducting experiments on anatomical changes during charring of fossil conifers, currently focussing on Araucariaceae. Here we report first results from charring experiments performed with wood derived from stems of Araucaria angustifolia. This material has been collected from several localities in Rio Grande do Sul State (Brazil), where Araucaria angustifolia is native. Therefore, dry woods fragments of Araucaria angustifolia (Bert.) O. Ktze., with 1.0 cm^3, in transverse, tangential and radial sections, were submitted to controlled charring in a low-oxygen system for 60 minutes, with temperatures varying from 50°C to 900°C. After artificial charring, the macroscopic charcoal produced was anatomically analysed under scanning electron microscopy (SEM). Homogenization of the wall occurred started at temperaturereaching 300°C. At 500°C the cell walls showed thinning and early cracking. So is possible to see that the minimum temperature to which there are changes in the cell walls of woods of Araucaria angustifolia is 300°C, as it may enrich the paleoenvironmental interpretations of paleowildfires vegetation based on the occurrence of macroscopic charcoals in sediments of different ages.

Successive Palaeowildfires events in Rio Bonito Formation levels, Lower Permian, Paraná Basin

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Integrated studies of paleontological and faciological nature, focused on the Quitéria outcrop, Rio Bonito Formation - Paraná Basin, Rio Grande do Sul, Brazil, has been generating significant data for the understanding the of the development and deployment process of the wet biomes in the Lower Permian of Gondwana. The outcropping section of the Quitéria outcrop is characterized by two depositional intervals, which represent different conditions of a dynamic coastal system. The basal interval, from light gray to dark gray in color, contains significant amounts of organic matter and is characterized by fine levels of coal and carbonaceous shales. In contrast, the top interval, yellowish in color, is characterized by clastic sediments and presents a singular fitofossil assemblage preserved in a roof-shale level. It is inferred that an episodic deposit, associated with a washover system, reconfigured the morphology of the depositional system, generating the relatively abrupt gradation of a peatland system to a sandy soils poor in nutrients system. In previous studies related to the organic-rich interval of the outcrop, the occurrence of macroscopic charcoal was described. Hovewer this occurence was restricted to only one of the outcropping facies. Despite the relevance of previous studies to confirm definitively the occurrence of Palaeowildfires in the Lower Permian of the Paraná Basin, in recent detailed analyses of the outcropping section, macroscopic charcoal fragments were found in all exposed levels, including the roof-shale. In this way, this new data allow to infer that, differently to what was thought until now, the palaeowildfires events in Quitéria outcrop depositional system were successive, reaching constant and recurrently the peats and surrounding areas during the Lower Permian.

Session 03: Water and Ocean

▪ Convener:

Prof. Dr. J. W. Metzger[1], Prof. Dr. M. Casagrande Lass Erbe[2], Dr. D. Neuffer[1],
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Freshwater is a resource supplied by natural environment and is used intensively by human activities. Aquatic ecosystems accommodate a large biodiversity and are important to build up biomass as a base for alimentation of other species and finally for humankind. According to the UN-General Assembly for Human Rights people are entitled to water and sanitation. Based on the considerations mentioned above, a reliable water treatment and distribution as well as a secure wastewater draw-off and treatment before discharging it to the water body are inevitable. The talks/posters describe water resources, their use by human activities and provide information of sustainable use in the future. Furthermore, this session accepts also papers on all aspects related to sustainability of water supply and handling wastewater.

Oceans are resources, supplied by the natural environment and are used intensively by the human society. The rising awareness in Brazil of more than 8.000 km of coast combined with the latest findings of giant Oil and Gas deposits seeks for a sustainable development. Germany on the other hand is using the Ocean resources and has developed research programs, such as Future Oceans, that are concerned with the sustainable use of Oceans. The talks should describe the Ocean resources, their use in human societies, and provide information on the sustainable use in the future.

Keynote Lecture:

Prof. Dr. R. Ventura Santos, UNB, Brazil
Dr. Qingjun Guo, Chinese Academy of Sciences, Institute of Geographic Sciences and Resources Research, China
Prof. Dr. Margarete Casagrande Lass Erbe, UFPR, Brazil
Prof. Dr. Frederico Brandini, USP, Brazil
Prof. Dr. Peter C. Hackspacher, UNESP, Brazil

Oral Presentations

THE AMAZON BASIN: LEARNING HOW DOES IT WORK

ROBERTO VENTURA SANTOS

UNB/CPRM

The Amazon basin hosts the largest forest of the world and one to the largest tropical river of the planet, which has a mean measured flow of about 209,000 m^3 s^1. The basin has an area of more than $6\times10^6 km^2$ t and is part of many countries in South America including Brazil, Peru, Ecuador, Bolivia, Venezuela, Colombia among others. The basin has been subjected by major changes along its history, which on a long term basis has been strongly influenced by the rise of the Andean Mountain chain. The Andes bounds the western side of basin and play a key role on its climate and hydrology, with a major impact on its supply of suspended materials and nutrients. Besides the long term evolution, the basin has been subjected to major changes in the last few years in land use and climate. While land use changes induced by human occupation has a profound impact in biodiversity, recent climatic variations have affected significantly the water cycle in the region. For instance, the years 2005 and 2010 registered two of the most severe droughts ever recorded in the region. On the other hand, the year 2009 recorded an exceptional flood with important impact for the whole region. The long term sustentability of the Amazon basin requires a comprehensive understanding of its major environmental processes such soil-water-atmospheric interaction, the role of the "várzeas" and shallow aquifers on the water cycle, the dispersion and recycling of nutrients, the relationship between geochemical, ecological and climatic cycles, among other topics.

The geochemical cycles are particularly important since they connect different reservoirs within the Amazon basin. For instance, we will show that there are major differences in water chemistry among drainages in the basin as exemplified by their wide range of dissolved strontium isotopic composition. While the Madeira River is characterised by radiogenic dissolved isotope values with a large annual fluctuation, the Sr isotopic composition of the Solimões River is much less radiogenic and present a more constant pattern throughout the year. The Sr isotopic differences among the rivers as well as its annual fluctuation is a robust geochemical tool both to better understand fish migration habits within the basin as well as to monitor commercial fish origin. Similarly, isotope tracers are important to address the origin and transport suspended sediments in the basin, including those related to human induced erosion processes. Finally, it is important to understand how these geochemical cycle have evolved at different time scales, thus allowing the construction of models that show us how to better interact with this complex system.

Climate and land use changes in the São Francisco river basin, Brazil

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Within the scientific Brazilian-German cooperation project INNOVATE different scenarios for the São Francisco river basin (Brazil) were developed. The eco-hydrological model SWIM, calibrated and validated for this highly managed river basin, was used for simulations of land-use and climate change scenarios.
The used climate scenarios (SRES A2 and B1) show a clear sign of increasing air temperatures but depending on the climate model increasing or decreasing annual precipitation ('wet' and 'dry' in the following). The simulation of the natural state (i.e. without management effects of reservoirs, water transfers etc.) for the wet scenario shows an increase of mean annual discharges at gauge Traipu, located in the lower part of the river basin, with highest increase in August and September, and lowest increase in January. The simulation of the dry scenario shows a decrease of mean annual discharges, with the highest decrease in December and a small increase in April.
The simulation of the managed system including hydropower generation (hydropower plants at Tres Marias, Sobradinho, Itaparica (Luiz Gonzaga), Apolonio Sales, Paulo Afonso I-III, Paulo Afonso IV and Xingo), gives a mean annual generation of 50,550 GWh/a for wet scenario. For the dry scenario the mean annual generation is 39,933 GWh/a. Also proposed new reservoirs, mainly used for hydropower generation, and new irrigation schemes were included in the scenario analysis. By the new reservoirs Riacho Seco (generation capacity 240 MW) and Pedra Branco (generation capacity 320 MW) the mean annual generation increases by 2,661 GWh/a for the wet scenario and in the dry scenario by 2,014 GWh/a. Making use of data available from Companhia de Desenvolvimento dos Vales do São Francisco e Parnaíba (CODEVASF) regions with potential for irrigated and rain-fed agricultural use were derived. In scenario A2 all planned and potential irrigation projects of CODEVASF are implemented, while in B1 only projects already started will be realized. The water demand in scenario A2 increases to a mean value of 370 m3/s in the year 2030, while in B1 the mean water demand is 155 m3/s. Although the irrigation water demand in scenario A2 is much higher than in scenario B1, for both scenarios a high safety of water supply is simulated in the wet scenario. In the dry scenario even for scenario B1 high deficits are simulated. The impacts of irrigation water requirement on hydropower generation are rather low as strict observation of minimum discharges is assumed in the simulations. This means, only water above minimum discharges can be withdrawn for irrigation or other uses.
The results of the climate impact study for the São Francisco river basin show a large bandwidth, depending on the scenario applied.

Paraopeba River Basin Program

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In 2010, through Resolution 64/292 adopted by the United Nations General Assembly, it was defined that countries and international organizations have to provide financial resources, infrastructure and transfer technology in order to provide safe, clean, accessible and affordable drinking water and sanitation to all people. According to that, almost 884 million people lack access to safe drinking water and more than 2.6 billion do not have access to basic sanitation which shows the lack of equitable access of safe water and the failure to observe the full enjoyment of human rights[1].
The aim of the presentation is to analyse the Paraopeba River Basin Program, one of the sustainable projects of COPASA - the subnational state company for water supply in Minas Gerais State, in cooperation with KfW Development Bank. Its major objective is the improvement of the environmental and living conditions for the population in the near of Paraopeba[2] river basin – BHRP - through water decontamination and watershed protection. The BHRP has great importance as it is responsible for supplying water for 3 million people in Belo Horizonte metropolitan region[3].
The Program is highly connected with the principals of the sustainability of water supply and handling wastewater to be retourned to the original environment. Therefore, it will be explored the success of the program in providing social mobilization, diminishing sewer network maintenance by the correct use of sanitary facilities and protecting the Paraopeba watershed, surface and groundwater resources. It will be also discussed to what extent the effectiveness of this project can be expanded taking into account legal and public policy aspects.

1: Resolution 64/292, adopted by the General Assembly on 28 July 210. Accessed by http://www.un.org/es/comun/docs/?symbol=A/RES/64/292&lang=E in 29 June 2015.
2: The Paraopeba river is part of Três Marias reservoir and it is located in the central region of Minas Gerais.
3: Plano para incremento do percentual de tratamento de esgotos sanitários na bacia hidrográfica do Rio Paraopeba / Fundação Estadual do Meio Ambiente. --- Belo Horizonte: FEAM, 2011. 515 p. ; il.

The analysis of urban pattern for an integrated Water Resources Management in the Distrito Federal do Brazil

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Population growth and urbanization, higher water consumption, and waste water production, are likely to have substantial effects on water resources. These effects include reduced groundwater recharge, shift in infiltration-runoff ratio, waste water collection (treatment and drainage), and water quality issues.
The analysis and prediction of these effects of urbanization are a major challenge for applied research. The present research was part of the IWAS-ÁGUA DF project that aimed at developing an Integrated Water Resources Management (IWRM) for the Greater Brasília region.
The main objective of the present study is to monitor and characterize the urban area using the concept of Urban Structure Types (UST) derived from satellite data. The UST approach divides and classifies the urban area into homogeneous regions which can be linked e. g. to water-related issues. In this study the UST concept is applied to characterize the urban area in the study region on a neighborhood level and to link the resulting data with water-relevant information.
The results of the analysis show that a large number of water-relevant parameters are represented by UST. These characteristics were further used as input data for the prediction of the consequences of changing land use.
Our study contributes substantially to an IWRM in an already heavily urbanized region. Altogether, the Brasília region offers the unique opportunity to study the effects of rapidly growing and changing urban areas on water resources based on a comprehensive database.

Numerical Simulation of Groundwater Flow in Santarém-PA-Brazil county area.

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This work carries out a numerical simulation of groundwater flow in the macro-region of Santarém County us driving the Finite Difference Method to solve differential equations. The study area is located in the lower Amazon River region, in the city of Santarém, in the west region of Pará state, and comprises approximately 150,000 km^2 in area. The system of differential equations that determines the behavior of the hydraulic head in the studied aquifer system was performed in steady state with the aid of MODLFOW software. The boundary conditions of the model were established based on the geographical, geomorphological and hydrogeological structures existing in area, dominated primarily by the Alter do Chão formation. The evapotranspiration data needed to run the model was obtained by the method proposed by Thornthwaite (1948), using a mean value of 1230 mm/year. Soil infiltration characteristics were also taken into consideration so that, in urban areas, a rate of only 4% total recharge (30 mm/year) was considered, in accordance with the Green and Ampt (RAWLS, et. al. (1983), apud MENDONÇA, 2001) model. Additionally, conductivity data known for the most representative wells was used to make an interpolation using the Nearest Neighbor Method, so that this boundary condition was defined heterogeneously in the aquifers. This conductivity distribution, combined with the hydraulic conductance of the Tapajós and Amazonas Rivers, close the entire region model. Calibration was performed with recharge taken as a variable, with a minimum residual value of 2.7%, which fell within the maximum tolerated residual of 10%. The result shows that the groundwater flow reaches a maximum speed exceeding 2 m/day for the unconfined aquifer and 19.3 and 6.12 cm/day for the underlying semi-confined subsequent aquifers. The total mass balance of water between subsystems of the aquifer system concords well with the behavior of the hydraulic head in steady state. Our study provides the first complete model for groundwater flow in the Alter do Chão geologic formation, Santarém county region, for the most superficial part of the aquifer system—to depths of approximately 200 m.

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Challenges of an integrated water resource management for the Distrito Federal, Western Central Brazil: climate, land-use and water resources

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Land-use/cover change (LUCC) and climate change are major controlling factors for water resources in the Distrito Federal in Western Central Brazil. Dynamic LUCC in the region has severe impacts on water resources, while climate changes during the last three decades is thought to have only moderate effects. LUCC affects water quantity mostly during base flow conditions. River basins with substantial expansion of agriculture since the end 1970s show a dramatic decrease of base flow discharge by 40–70%, presumably due to irrigation. In contrast, the effects of urbanization on runoff are less distinct, since factors controlling runoff generation might be more variable. For water quality, we found urban areas to have a strong influence on the parameters CSB, $NH4^{+}$, and suspended solids. In addition, we assume emerging pollutants, e.g. organic (micro)pollutants, might play a major role in the future. The project IWAS-A´ GUA DF focuses on creating the scientific base to face these problems in frame of an IWRM concept for the region. Results of our study will be a contribution to an IRWM concept for the Distrito Federal and will help to maintain high standards in water supply for the region.

Modeling of temperature stratification patterns for a large run of a river reservoir in the North of Brazil

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Freshwater reservoirs are used for many purposes as water supply, irrigation, flood control, navigation and power generation (UNESCO/IHA, 2009). According to the National Energy Balance of 2013, hydropower energy corresponds to 70.1% of the Brazilian demand. Nowadays hydropower is associated with the creation of reservoirs that may impact the physical, chemical and biological characteristics of the water body (FRIEDL et al., 2002) and in the last few years have also been associated with greenhouse gas emissions. Water quality is strongly related to water temperature, specially its vertical distribution, creating density stratifications (HENDERSON-SELLERS, 1984) which can control heat and dissolved substance transport (ESTEVES, 1988).

As temperature is a key factor for reservoir management, an one-dimensional heat transport model has been developed to identify the seasonal thermal behavior and critical periods (related to stratification or mixing). The model has been applied to a tropical monomictic lake in South Brazil and showed good agreement with measurements and high temporal resolutions. In this work, we additionally show an application to a large run of a river reservoir in North Brazil, with high inflows and outflows and a meteorological more uniform condition compared to South Brazil. It has been shown how the inflows and outflows can affect the thermal structure of the water body and the results were compared with a three-dimensional model (Delft3D). In addition physical indices were calculated to estimate the periods of mixing and stratification that can affect water quality and can be used as a tool for the reservoir management.

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Circulation in the State Marine Park of *Laje de Santos* (SP, Brazil)

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The State Marine Park of *Laje de Santos* (Santos Rock) is in the Southeastern Brazilian Coast and consists of a small marine fragment represented by a large rock formation, some cliffs and small reefs (SMPLS). The region is in a 50 km^2 polygon and harbors a great biological diversity, such as fishes, chelonian, cetacean and sea birds. It is also a route for other species. Although it is in a wider buffer zone, the region is permanently threatened by anthropogenic activities like illegal fishery and pollution. Located at 20 n.m. off the Port of Santos and 40 m depth, the SMPLS is subject to environmental impairments related to heavy traffic of cargos and small ships, including those that goes or remain in nearby berthage areas. In this ongoing project, we just closed a year of oceanographic measurements from a moored acoustic current Döppler profiler (ADCP) and meteorological data collected from a station installed at the top of *Laje de Santos*. The local wind field points to the high variability of the atmospheric circulation, once they are predominantly N-NE (35.3%) and S-SW (20.0%) distributed. The minor expression of those distributions suggests meteorological systems, such as cold fronts, are present in the year-round record. Also, the major NE winds are defined from the South Atlantic Subtropical High. On the other hand, the currents in the SMPLS are mostly W-E oriented, accordingly to the local bathymetric features. The classic Fourier spectral analysis of wind and currents shows most of the energy is distributed in the sub inertial band, as expected in this portion of the inner continental shelf. The tidal circulation is at lower spectral energy levels but may be relevant to residual long-term time evaluation phenomena, such as oil spill fate and pollutant dispersion at the sea. The knowledge of the physical characteristics such as temperature, salinity, wind-driven circulation and tides are prior to the proper management, prevention and conservation of the SMPLS marine resources.

Environmental Quality of water and soil in Beijing, China

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Increasing anthropogenic pressure on the environment and the subsequent decline of water and soil quality in the Chinese capital Beijing have led to serious concerns regarding the health of the local population. The high degree of industrial pollution exerts a prominent impact on Beijing's environment. In order to assess the magnitude of anthropogenic perturbation, we performed a comprehensive survey of rain, river, lake and tap water as well as soil samples collected in the Beijing urban area. These were analyzed for multiple stable isotopes (S, O, N), selected anions, heavy metals and trace elements.
Analytical results of tap water indicate urban sewage as the major origin of anthropogenic pollutants probably released in large amounts by leaking wastewater pipes to the local groundwater. Substantial pollution by urban sewage and industrial emissions were also detected in Beijing rivers. The low water quality of numerous tap and river water samples will ultimately become hazardous for human health and highly destructive for the ecology in the respective rivers.
Analysis of the sulfate concentration and $\delta^{34}S$ values of Beijing precipitation collected between August 2010 and December 2012 showed that anthropogenic sulfur was the prime contribution to the sulfur load in rainwater.
Concentration and isotope results of heavy metals, organic carbon and different sulfur species from soil profiles collected at a former industrial sites in Beijing provide important information about the sources of these compounds.
Water and soil are most affected by urban pollution in the highly industrialized areas of Beijing. The results of this combined geochemical and multiple stable isotope study point to a critical status of the local soil, rivers and aquifers, caused by the rapid growth of Beijing accompanied by an irresponsible handling of urban effluents.

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Groundwater depletion: Global overview and regional examples

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Groundwater constitutes the world's largest freshwater resource with central importance for irrigated agriculture and hence global food security. Yet, excessive extraction of groundwater for irrigation has led to widespread depletion, especially in large groundwater systems in semi-arid regions, where the groundwater is only slowly renewed [1]. Globally aggregated groundwater depletion has accelerated markedly since the mid-twentieth century and has contributed non-neglibly to sea-level rise [2]. Obviously, the current groundwater use in many regions with rapidly falling water tables is not sustainable. However, groundwater sustainability criteria are more complex than simply requiring that pumping shall not exceed natural recharge. Technical approaches such as water diversion, artificial groundwater recharge and efficient irrigation have been tried in some regions but have often failed to balance groundwater budgets.

Among the most dramatic examples of groundwater depletion are regions of intense agriculture in parts of India, China and the United States, where the water loss can be detected at the basin scale by gravity measurements from the GRACE satellites [3]. It is important to quantify the hydraulic properties of aquifers in such basins in order to be able to build reliable groundwater flow models that can be used to project future changes due groundwater utilization, technical measures, and climate change. In order to obtain quantitative estimates of parameters such as recharge and flow rates, isotopes and tracers for groundwater dating are important and useful tools.

Recent examples of tracer studies in regional aquifers affected by strong utilization in China and Jordan will be presented. The large aquifer system of the North China Plain plays a central role in China's food production, benefiting from extensive groundwater exploitation for irrigation. The sustainability of this production is threatened by widespread declines in groundwater level, locally at a rate of more than 1 m per year [4]. The strong increase of evapotranspiration due to the intensive cropping system has led to an imbalance in the groundwater budget, which could be confirmed by recharge estimates based on groundwater ages [5]. In Jordan, groundwater extraction for irrigation has led to the drying-up of the important wetland area of the Azraq Oasis. Some wells in the area are affected by increasing salt contents, the origin of which could be elucidated by the use of tracers including in particular helium isotopes [6].

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WaterCAD as a modeling tool to reduce water loss in the city of Pederneiras - São Paulo State, Brazil.

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The average flow in Brazilian rivers is 179,000 m^3/s, which represents about 12% of the world availability of water resources[1], the Amazon River basin alone is accountable for 70% of country's total. Therefore, water was never addressed as an exhaustible natural resource and Water Management was not an inherent concern throughout the process of urbanization, only recently this vision was changed. Since 2003, the State of São Paulo (where there average flow within the state limits is 1.7% of the national average) is experiencing draughts, affecting in its reservoirs, and threatening the security of water supply of millions of people. The State Administration moves to implement drastic measures in order to avoid this disruption, including water rationing. Located 320 kilometers away from the State capital, Pederneiras, similarly to other Brazilian cities, suffers from severe losses in its water supply system. Between 08/2012 and 09/2013, almost 50% of all the treated water did not reach the final consumers, either due to leakages or to fraudulent connections in the distribution system. Managing such deficient system was made more challenging for the administrators since most of the information regarding the system was scattered and outdated. WaterCAD is a powerful modeling tool that helps engineers project and study intricate pressurized piping systems[2]. The operational and commercial data were collected, and subsequently, the information was inserted into the WaterCAD platform. The model was divided into sectors and pressure zones, with hydraulic elements inserted punctually, representing an accurate model of the existing system. Water consumption statistics was obtained from historical records of the management entity, and patterns of consumption were generated from field measurements of pressure and flow in different points of the city, which contributed to the calibration of the digital model. Physical losses refer to the fraction of water produced that does not reach the consumers due to leakage. To determine the physical loss, the FAVAD method was applied, according to which, the discharge leaked depends on the characteristics of the leakage; on the material of the pipe; and on the pressure of the water in the system. Besides identifying critical areas, such as high-pressure zones, the modeling software also allowed the operators to determine the age of the infrastructure and if the head water loss was above the desired limit. Different alternatives were proposed and compared technically, economically and environmentally. The analysis considered a 30 years project spam, adopting the highest water consumption scenario. The proposed alternatives, to be implemented immediately, would be sufficient to reduce leakages in about 15%. The short, medium, and long-term actions could result in a reduction of 50% in the amount of water lost. This paper presents all the stages underwent so that the city of Pederneiras could increase drastically the efficiency of its water supply system and contribute to a rational use of a natural resource increasingly scarce.

1: Brazilian Water Resource Plan, 2006
2: WaterCAD: Water Distribution Modeling Software, Volume 5 - User's Guide.

Enhancing reservoir management with hydro-acoustic information.

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Since decades, Brazil has focused on the use and development of reservoirs for a variety of purposes. The first and most important use is the production of electricity followed by the storage and supply of drinking water. Brazil now has a supply rate of around 78% of the national electricity demand from hydroelectric plants. In comparison to other countries, Brazil has above average sized reservoirs including the famous examples of Itaipú and the Belo Monte project. However, the construction of reservoirs leads to severe disruptions of riverine ecosystems. Transported material is trapped in front of the dams and accumulates as sediment in the impoundment. Depending to sedimentations rates and the quality of the sediment, this process may have consequences for the use and management of the reservoir. The formation of nutrient depots e.g. phosphorous in the sediment may enhance algae blooms in drinking water reservoirs causing higher costs for the water treatment and a potential threat to the public health. The massive accumulation of sediment material and consequently the loss of storage volume leads to a reduced capacity of the reservoir. Additionally, if the amount of volume loss is unknown a precise management of the reservoir is hardly possible. Especially during dry phases, as seen during the year 2014, a sophisticated water management is necessary to prevent severe impairments for the economy and the society. To produce the desired information about the amount and quality of the sediment in a reservoir, echo-sounding technology represents an effective approach for extensive measurements on large scales. This study gives an overview about several investigated aspects of sediment characterization and detection in a Brazilian reservoir. The results encompass the distribution of sediment types and sediment volumes as well as chemical parameters like carbon content or total phosphorous. Based on the combination of hydro-acoustic sediment characterization and sediment core sampling the distribution of the named parameters in the reservoir was interpolated. Highly significant correlations between hydro-acoustic and sediment features allow the creation of precise maps, illustrating sediment characteristics of the reservoir. Sediment accumulation rates are calculated. The resulting information may serve as a basis for an improved reservoir management.

Medical waste: why is it so dangerous?

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The medical field, which constantly seeks the cure for diseases and brings comfort and a longer life to humans, is responsible for generating different types of waste that, by its distinct features, are considered dangerous. Waste that presents biological agents, due to their direct origin in health care, are the ones that stand out, as they bring with them the possibility of disease transmission through viruses and bacteria, arising from patients who come to clinics and hospitals in search of treatment. The population that works directly in clinics, hospitals and other health establishments is vaccinated to acquire antibodies from different kinds of diseases and make use of personal protective equipment such as disposable gloves, masks, aprons and, in specific procedures, glasses, boots, among others. Here, comes the perception that materials made with plastics and textiles, also come to be characterized as biological waste, because they had contact with patients with diseases and deserve appropriate treatment and adequate disposal. In addition to the concern about occupational diseases, there is the concern about what should be done with the hospital waste. The responsibility for the proper destiny of every unusable material that comes out of health facilities should already occur when there is the need for the acquisition of different materials, by the different sectors involved. It is at the time of purchase, when the material is coming to the establishment that the question should be asked: after the use, how will this material be discarded? Can it be disposed as common waste? Can it be recycled? Can the material contaminated be dropped straight into the ground? Are the expired medicinal product or leftovers also dangerous? Must chemotherapeutic materials necessarily be incinerated? Can the containers that come in contact with contaminated materials be recycled? Do the radioactive drugs after use remains radioactive? Will the excreta of patients also be contaminated? Just as the health facilities are responsible for the fate and treatment to be given to the waste generated, the different sectors of these establishments should be held accountable to separate these materials, enabling a cost minimization management. Recyclable materials such as plastic, paper / cardboard and glass, when not contaminated may be sold, reducing the amount of material to be treated and / or destroyed. Only part of this waste presents risk to the public health and the environment and, if not disposed properly, can contaminate the soil and consequently the groundwater. The use of these waters be it for quenching the animals thirst or for watering the crops bring risks of contamination due to the presence of biological agents, wastes with chemical characteristics, including waste that can cause mutagenicity and genotoxicity and radioactive waste. The classification of the wastes guides for the destination to be given to different materials which, if not properly segregated start to be characterized as dangerous waste, of difficult treatment and with a high cost of destruction or remediation. An additional challenge is in the micropollutants management, resulting from the ingestion of drugs, which return to the environment through excreta, characterized as persistent.

The prior notification obligation between member states of La Plata Basin in hydraulic exploitation

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La Plata Basin is of immeasurable value to the countries in which it lays (Brazil, Argentina, Uruguay, Paraguay and Bolivia) for its wealth of water (large availability of fresh water), its functionality from a transport point of view, economic value, presence of biomes such as Atlantic Forest, Pantanal, Pampa, not to mention its amazing potential for energy use. Standing among the world's largest, La Plata River Basin has an area of 3.1 million square kilometers, equivalent to 17% of the area of South America, and is the second largest basin of the continent. Furthermore, the ecosystem of this basin is connected with the system of the Guarani Aquifer (the largest underground reserve in the world), establishing a deeply dependent relationship. Starting from the river basin as a unit of planning design and of management of transboundary rivers as the most correct of the ecosystem point of view, this study analises international treaties and conventions celebrated by the countries of the basin as well as some disputes in which these States were involved. The conclusion of this research is that an egoistic and uncompromising vision of fragmented planning still prevails. Moreover, there is no consideration of an intergenerational perspective and sustainable environmental, social and economical development. It also seeks to show how the obligation of prior notification is relevant and linked to the principles of cooperation, prevention and precaution, all of which are very important in environmental matters. The prior notification obligation can now be considered a true custom in International Environmental Law. However, it has been little fulfilled by the countries of the River Plate Basin when they decide to carry out their projects and enterprises.

The potential of southern Brazilian continental shelf for offshore cultivation of mollusks.

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Production grounds of mollusks have been developed in the last 3 decades along the south Brazilian coast, causing water eutrophication, visual pollution and hence conflicts with other socio-economic activities. This presentation shows the potential for commercial production of scallops, oysters and mussels out of the coast, based exclusively on the particulate organic matter derived from deep chlorophyll maxima at the base of the euphotic layers in the open mid-shelf areas. Carbon biomass at these layers is mostly due to the accumulation of diatoms, growing in response to bottom intrusions of nutrient-rich oceanic waters. During summer seasons intrusions move further onshore to balance the surface Ekman transport offshore of surface waters in response to northeast winds. These onshore fertilization of mid-shelf waters (50-100 m) enhanced diatom production in the water column, providing more food for the growth of filter feeders. Preliminary experiments made in Parana State have confirmed the offshore culture of mollusks in southern Brazil is economically and environmentally sustainable.

Of systems and networks: Social-ecological analysis in Brazilian coastal and marine areas

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The embeddedness of humanity in nature and consequent need to analyze social-ecological dynamics as integrated systems are now widely accepted (Crutzen, 2002, Biermann, 2014). More recently, a new type of globally encompassing science that links disciplines, knowledge systems and societal partners to support a more agile global innovation system is being sought (see www.futureearth.org). The generation of global sustainability knowledge does not work from the top down only. It needs analyses at multiple spatial and institutional levels including the national, regional and local. It also requires active social networks to generate and integrate such knowledge. This presentation outlines approaches and results from the authors' work in three regional coastal and marine social-ecological systems studies in Brazil. Case study work in the states of Pará, Pernambuco/Alagoas and Santa Catarina, and the recently initiated PainelMar (*Brazilian Future Ocean Panel*) national network are presented to showcase major elements from the past two decades of collaborative research between Brazilian and German partners which aims to support the sustainable governance and management of social-ecological systems along the coast of Brazil.

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The sustainable development on Brazilian coastal and oceanic regions

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The sustainable development in Brazilian coastal and oceanic regions needs to be observed with a political, social and an economic focus. The Portuguese colonialist policy, among the 16th and 18th centuries imprints, in Brazil, a cultural identity of exploration without any sustainable policy. At that time, Brazil was used as a source of natural resources (gold) and agriculture. This concept is ingrained until now with large impact in continental and coastal/oceanic areas. Current views understand the coastal/oceanic regions as a discharge area. The policy for sustainable development in coastal/oceanic regions needs to involve federal, state and local authorities. In this context, coastal and oceanic Environmental Protection Areas (APAS) were created along the 8 000 km of Brazilian coastline.

The economic use of natural resource must be related to a sustainable development policy. Focusing geological resources, we have to consider the exploration of different materials as: sand and gravel, oil and gas, sulfides, manganese oxides, hydrates and others.

For a rational exploration we have to consider the needs to have, sustainable without compromising the ability of future generations to meet their own needs. In coastal/oceanic areas, sustainability has to be seen in the interaction of environment, social, and economics.

Impact of urban systems on nutrient fluxes and surface water quality in the São Francisco Catchment

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The Sao Francisco catchment, with a size of 630,000 km², shows strong gradients in geo-physical characteristics like precipitation, topography or soils but also in anthropogenic factors such as population and livestock densities or fertilizer application. Observed water quality parameters like nutrient or oxygen concentrations show critical trends as well as regionally and temporarily drastically elevated values. By applying the model MONERIS (Venohr et al. 2011), hot-spot regions for nitrogen (N) and phosphorus (P) sources, the subsequent in-stream retention and transport as well as resulting loads and concentrations in surface waters were determined for the period from 2000-2010 on a monthly basis.

Within the study period, N and P emissions increased in total by 20% and 35%, respectively, mostly driven by a growing urban population. Nutrient emissions increase significantly during rainy seasons and adjacent to larger cities, although they were in average low. In 2010, emissions from urban systems and point sources, contributed about 47% (N) and 57% (P) of the total emissions. Waste water in urban areas is often only collected but poorly or not treated in treatment plants, whereas in rural areas waste water is usually collected in decentralized systems, finally often discharging via a soil-groundwater passage (inducing high retention rates).

High water temperatures and low oxygen contents lead to increased nitrogen retention, whereas high sorption capacities of aquatic sediments support high phosphorus retention. Nevertheless, despite of high retention rates, the densely populated and wetter upstream part contributes dominant shares to the nutrient loads even in remote downstream areas.

Our scenario calculations suggest, that by 2035, population in the Sao Francisco catchment will grow by 41% (mostly in cities), causing an increase in emissions by 18% (N) and 24% (P). In addition, intensification in agriculture will lead to an increase of emissions by 22% (N) and 2% (P). At the same time, induced by a decline of precipitation and run-off by about 17%, emissions will lower by 15% (N) and 11% (P). Reduced run-off will, despite of reduced emission, cause higher nutrient concentrations in surface waters, locally rising by up to 200% (N) and 50% (P).

Current and future trends in increasing emissions as well as reduced run-off suggest exacerbated and possibly critical chemical and ecological water quality conditions. Without an enhanced treatment capacity and rate for urban waste water together with a controlled usage of fertilizer and surface water for irrigation by agriculture, quantity and quality of freshwater ecosystems and resources are potentially endangered in the Sao Francisco catchment.

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Costal ecosystems and ecosystem services: drivers of change and how to counteract

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Many resources exploited by both local communities and mankind worldwide are acean-based, be they provided by the water column or the seabed. However, when it comes to considering livelihood and well-being of local communities, we have to take into account coastal (eco-)systems and the services they provide, as people live on coasts, and coastal population size and density are ever-increasing, particularly in tropical regions. These ecosystem services are driven by biotic communities that, in turn, are affected by both environmental conditions and land- and seascape-use. Hence, "global change" will drive changes in ecosystem service. For future generations to benefit from coastal ecosystems and their services, we will need to either counteract, or adapt to, these change-driven changes.

Poster Presentations

Analysis of the variety of water quality parameters of Amazon River, in Peru, Colombia and Brazil

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The Amazon River has it's origin in the Peruvian Andes, cross over a small portion of Colombia until it arrives in Brazil. Its tributary's form the biggest hydrographic basin in the world, monitored by water quality stations. On this work parameters of water quality measured only in Amazon River, in the 3 countries where it flows, were compared to analyses if there is any variety of water quality and its possible cause. These parameters are Dissolved Oxygen (DO), Thermotolerant Coliforms (TC), Biochemical Oxygen Demand (BOD), Electric Conductivity (EC) and hydrogenionic potential (pH). In Peru, the Amazon River is called Apurímac and presents the most basic pH. In Brazil, the pH is more acid and this variance is due to the humic acid in the water, that is related with the amount of organic material, that increases as the river flows longer distances. However, Peru presents the highest TC values. Which means that in the monitoring point the water is polluted, probably by domestic sewerage, once the TC indicates the possibility of having pathogenic microorganism that transmit deceases by water. The BOD presents the highest values in Colombia, indicating bigger amount of organic material on the monitoring point, possibly due to the local microflora increase. The EC also presents high values in Colombia, which means higher quantity of ions. The DO displays higher values in Brazil. Thus, we concluded that in this point the water is cleaner, once the low quantity of DO indicates contaminated water due to organic material decomposition. Therefore, it is remarkable the variety of water quality as the Amazon River advances towards the Atlantic Ocean. Many streams that flows through great urban centers, like Manaus city, carry domestic sewerage to bigger rivers. The disarranged and populational growth of cities, without sanitary planning, are the causes of water contamination. The industrial waste, mining and agricultural activities also directly affects water quality. However, public policy and environmental awareness programs are developing the role of alert and amend population's behavior.

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Heavy metals in seawaters of the stuarine region of Itanhaém River Drainage Basin (SP-Brazil)

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Estuaries are basically water bodies along the coast that act like an interface between fresh water and marine environment presenting themselves as shelters, reproduction, nursery and recruiting areas for numerous species (Kennish, 1992). Estuaries are an irreplaceable natural resource that must be managed carefully for the benefit of all who depend on this environment. This management can be extremely hard as the estuaries receive significant anthropogenic inputs from both point and non-point upstream sources and from metropolitan areas, tourism and industries located along the estuaries edges (Caeiro et al., 2005).

One of the most serious pollutants in aquatic systems is the high concentration of heavy metals. Due their toxicity, persistence and bioaccumulation problems, trace metals in natural waters have become a significant topic of concern for scientists and engineers in various fields associated with water quality, as well as a concern of the general public (Tam & Wong, 2000; Greaney, 2005). Consequently, studies to determine the concentration of heavy metals in estuarine waters are necessary. Concerning this problem, the aim of this work was to start determining the concentration of heavy metals in estuarine water in the Itanhaém River estuary water by ICP-MS analyze.

The Itanhaém River basin is located on the southern coast of the São Paulo State, southeastern Brazil and drains a watershed of about 950 km2, with approximately 50 km length and 15 km width. The principal economic activity is tourism and fishing. The Itanhaém River is the final channel of the hydrographic basin and is located on a coastal plain. This river is formed by the confluence of the Preto and Branco rivers. These two rivers drain well preserved areas of tropical rain forest of the State Park of the Sea Range, preserved areas of restinga vegetation and some areas with banana farms (Camargo *et al.*, 1997).

Here we will be presenting the first results of this work that will be part of a major project that will be including other analytical data.

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Evaluation of the use of Powder Activated Carbon for removal of Emerging Micropollutants from Wastewater

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Emerging micropollutants are being introduced to the environment through anthropogenic activities, but have not yet been included in national and international monitoring programs[1]. Many of these emerging micropollutants are not removed, or are only partially removed, with conventional wastewater treatment processes, and may have a harmful effect on human beings and the environment[1]. Thus, in order to remove these micropollutants from wastewater it is necessary to adopt advanced treatment technologies, one of which is adsorption with powder activated carbon (PAC)[1,2]. This study evaluated the process of adsorption with PAC to remove 18 emerging micropollutants from secondary wastewater effluent in a wastewater treatment plant (WWTP). The sources of the micropollutants assessed are pharmaceuticals and personal care products PPCPs, organophosphate ester flame retardants and plasticizers, and 2-mercaptobenzothiazole and benzothiazole (MTBT and BT). Norit PAC was selected for this study, as previous evaluation (not addressed in this abstract) showed that it had the best results for micropollutant removal. The contact time was 30 minutes and PAC concentrations used were 5, 10, 20 and 40 mg/L. In this configuration, removal efficiency of all pharmaceuticals analysed was higher than 77% with 10 mg/L of PAC, and with 20 mg/L it was greater than 90%. For personal care products, removal efficiency with 10 mg/L of PAC varied from 50% for triethyl citrate and up to 88% for tonalide (AHTN), while 20 mg/L removed more than 83% of each personal care product analyzed. For the flame retardants, removal rates with 10 mg/L of PAC varied from 49% for tris-(2-chloroethyl)phosphate (TCEP) and 91% for tris-(2-chloro-, 1-chloromethyl-ethyl)phosphate (TDCP), and 20 mg/L attained removal rates of 86% for TCEP and 99% for TDCP. Finally, MTBT and BT obtained removal levels equal to or higher than 60% with initial addition of 5 mg/L of PAC. The results demonstrated that the treatment of adsorption with PAC is an efficient solution for the removal of the emerging micropollutants evaluated, indicating that this treatment process can contribute to achieving the sustainability of the environment, especially of the water resources and the aquatic ecosystem.
We would like to acknowledge the financial support of the DAAD and Dr. Bertram Kuch for all the support during the research.

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Extreme Climate Events in the Estuary of Santos (SP, Brazil)

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The Santos Estuary consists of a system of channels, rivers and small continental drains influenced by the hydrological system of coastal springs, by hydroelectric operations and a flood prevention system from the upland Metropolitan Region of São Paulo. The port activities and anthropogenic interferences cause physical-chemical and geomorphological changes in the estuary, which may impair the uptake of water supply, compromise artisanal fishing and recreational activities and promote environmental changes. The port access channel is the most important region, with relatively high depths (20 m), which is maintained by periodic dredging operations. The aim of this study is to analyze measurements and modeling results for temperature and salinity profiles in the port channel, featuring the main estuary behavior on their major timescales, accordingly to the meteorological and oceanographic conditions. A set of thermohaline measurements was taken in a fixed point of the mixing zone, during the seasonal transition from to winter of 2012 to summer of 2013. Secondary data as precipitation and weather reports were applied as well as tidal predictions. The measurements enabled high-resolution descriptions of the vertical temperature and salinity profiles used for properly model calibration of viscosity and diffusivity. The seasonal variability of the halocline in the main estuary is as much as is the precipitation regime for this subtropical system. It is poor defined and deeper during the winter and through longer periods of drought, when compared to the summer, the rainy season. In biweekly scale, the semidiurnal tide has some modulation in stratification at semidiurnal and fortnightly scales. During the summer, temperature ranged between 22.25 and 26.55 °C and salinity, between 24.20 and 33.80. Temperatures were between 21.25 and 22.85 °C during the winter, while salinity ranged between 30.30 and 31.25. The dataset was used to implement and calibrate the Delft3D-FLOW hydrodynamic model in order to evaluate the seasonal transition in the estuarine system. So far, the abnormal drought perceived in the SE Brazil during the past two years has no significant influence on the estuarine stratification regime.

Urban water reuse, benefits and linkages with environmental services

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The large global proportion of people living in urban areas has created the necessity for more liveable cities, where water reuse could provide opportunity to conserve resources and use them more sustainably. Traditionally, in an urban water cycle the treated effluent from any wastewater treatment plant is usually discharged into a surface water body or into the soil, but with a circular metabolism, treated water can be seen as a potential resource. The feasibility and acceptability of using reclaimed water (treated wastewater) is being evaluated mostly through technical and economical assessments, with secondary importance given to environmental aspects because they are difficult to measure, especially if they do not possess a market value. The importance of considering environmental benefits in water reuse projects relies on the fact that promoting a secondary source of water could lead to an increase in the urban water budget and in the resilience of a particular area. Moreover, the inclusion of environmental benefits in the decision process, clearly communicated to decision makers, stakeholders and politicians, could facilitate the acceptance and understanding of the environmental values. There are still few studies analysing environmental benefits, such as fresh water saving, energy savings or CO_2 emissions reductions provided by water infrastructure. However, the same benefits given by natural ecosystems have been more studied in the ecosystem services framework. Ecosystem services refer to theories that attempt to attach value to the different functions that nature and environment provide to human societies. If wastewater treatment plants and water reuse infrastructure apply different ecological processes to provide wellbeing similar to natural ecosystems, then ecosystem services framework could be used to analyse the benefits obtained by these type of infrastructure. As there is not an established methodology to organise, classify and select the most important environmental benefits of water reuse projects, a systematic analysis is needed, specifically, in relation to the use of treated wastewater for urban purposes. Therefore, this research will examine the challenges of using the ecosystem framework to represent the benefits of processes and outcomes of water reuse infrastructure, even if they do not have an economic value.

The Importance of Improved Water Treatment Technologies Applied in Produced Water

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Brazil is the ninth largest oil producing country in the world where more than 95% of its production is located offshore. In this industry the produced water, or connate water, from oil exploration is in fact the highest volume of liquid discharged from this activity, so the water treatment of this type of influent must have great attention to environmental concerns. In 2013 the volume of produced water discharged in Brazil was equal to 89% of volume of oil produced in that year.
Although there have been scientific studies, there are no final conclusions on the environmental impacts generated by heavy metals, oil, polycyclic aromatic hydrocarbon, benzene, toluene, ethylbenzene, xylenes and microorganisms present in the discharged water. Worldwide the regulations require the concentration of oil in water be in range from 15 to 40 mg/L. According to the most recent report of the International Association of Oil and Gas Producers, an average of 14.1 mg of oil per liter of produced water was being discharged into oceans around the world. Some recommendations from organizations such as OSPAR (Oslo-Paris, Regional Convention to protect the Norht-East Atlantic) have a goal of diminishing the hazardous chemicals destined to the oceans and also started the zero discharge idea.
The poster will give an overview of water treatment challenges where the offshore activity is more complex because of remote operations, more difficultly with logistics, non-stop production, high operating costs, small foot print required, and the lack of final conclusion on environmental impacts from the pollutants discharged with the produced water. This poster will also show a case history of oil production and percentage of water discharged related to the oil production in Brazil as well an overview of its characteristics and regulation provided by the Brazilian government in comparison with proposed best recommendations.

Phosphorus and fluorine removal from an acidic effluent of mining by chemical precipitation using calcium sources.

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The generation of effluents containing in its composition high amounts of phosphorus and fluoride is typical of the mining and processing of phosphate rock, phosphoric acid production and purification and fertilizer production, which relates mostly to the composition of the apatite. The fluorine pollution potential is associated with the occurrence of fluorosis in humans and animals, affecting the teeth and bones of organisms that will consume water with a higher content of this compound. An excessive amount of phosphorus in natural aquatic environments can cause an imbalance of the aquatic ecosystem, with the progressive deterioration of water quality in lentic bodies a phenomenon called eutrophication. The majority of wastewater treatment plants of this sector are designed to remove only the fluorine. However, with the recognition of eutrophication problems, many countries in Europe, such as Germany, have adopted more stringent environmental policies for phosphorus in wastewater disposal, requiring these stations are adapted also to phosphorus removal. In Brazil, the eutrophication process is still an aggravating, since sanitation and established environmental policies are more precarious, and the units are still trying to adapt to the future imposition of limits for phosphorus. This work is designed to study physical and chemical methods for removing phosphorus and fluorine in an industrial effluent treatment plant of the mineral sector designed to fluoride removal, by chemical precipitation of these compounds with calcium sources, in order to suit concomitant treatment unit for phosphorus and fluorine. To meet the objectives proposed in this research project the first step was to compare the potentiometric titration curves obtained from a sample of typical industrial effluent and synthetic samples containing fluorine and phosphorus, obtaining the typical behavior that free fluorine and phosphorous contaminants present when neutralized. In a second step was determined phosphorus and fluorine removal capacity in pH due to the precipitation with lime milk, and various input sources such as calcium, showing that the most appropriate ranges for fluoride removal occurs close to pH 4 and phosphorus are close to pH 9. The use of limestone in combination with the lime milk has been shown to be more viable economically achieving good efficiency in removing contaminants. From the results it was proposed an early stage of agglutination of the crystals, and the change of the final pH unit range of the unit to 10, with final pH adjustment with sulfuric acid to neutralize this effluent for final disposal. The application of the results obtained in the continuous industrial effluent treatment plant, made possible to increase the phosphate and fluorine removal efficiency to values that are consistent with the discharge standards established in international law, such as the German legislation.

Comparing Drinking Water Reservation Systems between Brazil and Germany

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The growing concern about the water crisis in Brazil, in which the losses in the drinkable water system reach 37% [2], has increased studies related to reducing the losses, simplifying the maintenance and rising the effectiveness rehabilitation of the supply system. Based on two drinkable water reservoirs, one built in Germany and the other in Brazil, it was made a comparison between the constructions methodologies used in both countries. It was discovered that in Brazil doesn't exist a specific standard to build a reinforced concrete treated water reservoir; usually, after a few years of use, on the concrete surface can be observed problems such as: small cracks, carbonation attack and detachment of the waterproofing layer. In Germany, the main concern to build a treated water tank made of reinforced concrete is to follow the recommended of the standard: equivalent water/cement value $(w/c)_{eq} \leq 0.50$; total porosity after water storage $P_{28d} \leq 12$ vol.% or $P_{90d} \leq 10$ vol.% and design value for prism tensile strength $ß_{D28d} \geq 45$ N/mm^2 [3]. As a consequence, the structure achieves greater watertightness and higher durability, because it has the lowest porosity and best finish surface as possible. For this reason is not necessary the use of waterproofing systems on the surface, only if failed to attain a waterproof concrete [4]. Since different treatment processes to obtain potable water is used in the state of Baden-Württemberg Germany (BW) ozonization with the addition of residual chlorine into the pipelines distribution in the end and in the state of Paraná Brazil (PR) only chlorination, a comparative analysis between the water stored in each drinkable water concrete reservoir was made. Some elements value showed a significant differences, such as: chloride (BW: 7.2 mg/L and PR: 16.8 mg/L), pH (BW: 7.96 and PR: 6.70) and calcium carbonate (BW: 1.61 mmol/L and PR: 0.52 mmol/L) [1;5]. It was concluded that the treated water storage inside a Brazilian is more aggressive to the structure then the storage inside a German. Thus Brazil has more maintenance and rehabilitations problems linked to the concrete attack compared to Germany. It would be interesting to improve the Brazilian standard used for build potable drinking water reservoir to avoid structure pathologies problems.
We would like to acknowledge the financial support of the DAAD.

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Water quality conflicts: The arid Huasco Valley – Chile during the last 25 years

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Northern Chile is facing one of the most severe droughts in its history and, at the same time, a rapid change in land use with increasing threats to the environment and human health. A large reason for this change lies in the national governments goal to make Chile a globally important food exporter, primarily through investments in irrigation techniques. The growing global demand for fruit has led to a vast expansion in agricultural schemes; this trend has led to increasing pressures on limited water resources. Not only water scarcity but also water contamination can have negative effects on farming in northern Chile. This scenario increases the potential for water use conflicts, which is further compounded by the demand for potable water provided by rivers and groundwater.

Using the case study of the Rio Huasco watershed the above mentioned changes in land use and water quality are examined. This region was chosen as an exemplary case for the development of Chiles arid regions: the valley is located at the southern edge of the Atacama Desert where water scarcity is a major problem. At present the watershed is predominantly used for agriculture. Many small farmers still practice strip cultivation but are pressured to shift towards an international export-orientated future with monocultures. Whilst the problem of scarce water is complicated by the privatization of water rights in Chile. Within the watershed the amount of sold water rights already exceeds the real water availability by far.

The aim of this research is to trace historical changes in stream water quality from the year 1990 until today. The data used was provided by the national water authority and was measured three times a year at their control stations throughout the catchment area. Additionally, interviews with experts and authorities provide insights in changes of crop patterns and field size.

Session 04: Energy, Minerals, Ore deposits, Mining

Convener:

Prof. Dr. K. Madruga, Prof. Dr. M. Hiete, Prof. Dr. B. G. Peregovich

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2: Centre for Environmental Research, University Kassel
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Energy and Minerals are resources supplied by the natural environment and are used intensively by the human society. The need for elements and metals and the shortness of some of important elements (e.g. Rare Earth Elements) shed a light of the sustainable development of natural mineral resources. In addition, all societies provide financial support for research in the field of sustainable generation and use of energy. This research is driven by the future shortness in Oil deposits; the CO_2 generation by using conventional energy sources, and the rising awareness in the human societies that radioactive decay takes a very long time to produce safe nuclear waste. The talks should describe these resources, their use in human societies and provide information on the sustainable use in the future. If possible all talks should include a short historical overview.

Keynote Lecture:

Dr. Carsten Tschamber, Solar Cluster Baden-Württemberg e. V., Germany
Prof. Dr. K. Madruga, Federal University of Santa Catarina, Brazil
Prof. Dr. Bernhard G. Peregovich, UFOPA – IEG, Brazil
Prof. Dr. M. Hiete, University Kassel, Kassel, Germany

Oral Presentations

Photovoltaics in Brazil - Feasibility of Vertically Integrated Module Production

Carsten Tschamber

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As electricity generation in Brazil is to a large extent based on hydro power, the country is a worldwide leader in sustainable electricity generation. However, due to the most severe drought in recent history, the levels of rivers and water reservoirs have become seriously low leading to both the rationing of water as well as local blackouts. Also, fossil backup power plants that are meant to only cover the peak load are running at full capacity, significantly increasing the cost of electricity generation. This has already resulted in substantial increases in end-user power prices. In March 2015, for example, the average electricity price rose by 23 %.

In order to diversify the power supply and meet the growing demand, Brazil has already with some success turned to wind power and currently has more than 5 gigawatts of installed capacity. Also, due to its geographical location, solar energy is perfectly suited to supply a significant portion of the ever growing electricity needs. With a solar irradiation somewhere between 1300 and 2400 kWh/m2 per year, the conditions in the least suitable region of Brazil exceed the best sites in Germany.

While the market for solar energy in general and photovoltaics (PV) in particular is still small, there is a huge potential in the years to come. As the PV-only auction of 120 MW generation power in Pernambuco at the end of 2013 as well as a Brazilian federal A-3 auction for roughly 900 MW of PV electricity in October 2014 have shown, local and federal authorities in Brazil are willing to create such a market for PV systems and components. Also, since 2012 a net metering scheme allows small and medium PV systems to feed their electricity into the grid. Furthermore, the Brazilian Development Bank BNDES offers discount financing of PV systems, as long as a certain fraction of the system comes from local suppliers (local content regulation). This measure, combined with import restrictions and consequently higher system prices makes local production of PV modules become interesting. Consequently, in the past year numerous companies have announced their intent to open PV module factories in Brazil. Module factories alone, however, do not constitute a significant portion of the value of a PV module (10-20 %). The remaining components such as cells have to be procured on the international market. And the module itself presents only about 40 % (depending on the size) of the cost of a PV system. So in order to increase local value creation, a larger part of the module value chain has to be established in South America.

This contribution and the underlying “Green Silicon” study investigate the technological, economic and social feasibility of establishing a Silicon-based and fully vertically integrated photovoltaics value chain in Southern Brazil (Paraná) and Paraguay. It is focused on two core concepts:

1. Local-to-local: Rely as much as possible on local resources and raw materials (such as electricity, quartz as basis for silicon solar cells, charcoal for metallurgical silicon production etc.)., promote local value and job creation and cover mostly local (Brazil, Paraguay) and regional (South America) market requirements.
2. Green-to-green: Use renewable energies from the ITAIPU hydroelectric plant in order to manufacture modules which itself contribute to even more sustainable energy.

Industrial energy efficiency management in Brazil: public policies, regulations standards and actors

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Industrial energy efficiency management is becoming increasingly significant. Some drivers include increasing energy consumptions and costs, stringent environmental and emission standards and shortage of natural resources. The external environment of firms plays an important role in increasing energy efficiency. In this context, public policies, regulations, standards, regulatory bodies and agencies are important to promote or give support to industrial energy efficiency. The purpose of this work is to show an overview of public policies, regulations, standards and actors which can motivate industrial energy efficiency improvements in Brazil. The qualitative descriptive study was carried out through a literature review. The review included public policy documents and research on the legal framework, standards and agencies oriented to energy efficiency. Among the results it was observed that there has been developed policies, regulations and financial incentives to promote energy efficiency in recent years. Nevertheless the regulations and financial possibilities are still limited and have to be improved. The legal framework presents generic guidelines. Thus, there is no specific regulations for the different industrial sectors. The study also showed that engineering programs and technical courses are increasing in the country. However, the challenge is to meet the needs of industry. In other words, to develop programs which consider both technical and managerial aspects to improve productivity and efficiency. Standards are related to quality management and there is still room in the national industry for further development. Currently there are ten certified companies by the ISO 50001 – Energy Management System. Important agencies include Brazilian Electricity Regulatory Agency – ANEEL and Brazilian Association of Energy Conservation Service Companies – ABESCO: The review was conducted within the framework of the project “Study of environmental factors influence on strategic industrial energy efficiency in Germany and transferability possibilities to Brazil”

Solar energy for social housing program in Brazil: advantages, limitations and challenges.

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About 70% of the electricity produced in Brazil comes from hydropower. The unfavorable rainfall occurred in 2014 caused several disorders, including the risk of a collapse in the electric energy supply. In addition to the necessary investments, diversification of the matrix is a demand that cannot be postponed. Brazil is a large country with different average rates of solar radiation. In spite of most of these rates are significantly favorable for energy production, solar energy source represents less than 0.5% on the Brazilian energy matrix. This paper discusses the potentialities, limitations and challenges to make solar energy an important alternative in the Brazilian context. The four most significant solar radiation averages were used to calculate how many solar panels would be necessary to supply the energy demand of social housing programs (SHP). The SHP is a program subsidized with public funds intended to provide housing for low-income people. In Brazil, the most common social home unit has 62 m^2 of roof surface, costs approximately US$ 19,360.00, and is responsible for consuming, on average, 150 kWh per month (COHAB, 2015; COPEL, 2013). According to data (COHAB, 2015), about 73,000 of this houses are expected to be constructed in 2015. The results from the scenario approach used indicate that solar energy is an interesting alternative. On average, six 210 W photovoltaic solar panels could be deployed in order to achieve optimal results throughout different solar radiations (NEOSOLAR, 2013; ENERGY TEAM BRASIL, 2013). If all the costs for the solar panels project would be included in the usually adopted houses financing plan, it would, on average, make the monthly installment US$ 13.29 more expensive, but would enable cheaper or zero energy bills. For the program be implemented in a meaningful way, some limitations must be overcome. Among them, the mentality of thinking in the short term and in a traditional way, rooted in the population. Additionally, feed-in tariff policies are necessary in order to stimulate the use of solar energy in social housing programs as part of feasible, strategic and environmentally friend policies.

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The social inclusion and access to renewable energy for low income population, through the reference project “Qualification of the population to install and use the low-cost solar hot water heater”

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The prototype of the low cost solar hot water heater (*Aquecedor Solar de Baixo Custo* – ASBC) was presented on the United Nations Conference on Environment and Development (UNCE)[1] in 1992. In 2001, the Brazilian NGO *Sociedade do Sol*[2] was founded and aims to provoke a paradigm shift to overcome the idea of renewable energy systems as cost intensive, high-tech technologies and inaccessible. The ASBC is made of PVC plastic, a low cost material that is commonly available in Brazilian hardware stores and known by the population. The functionality is based on the physical thermosiphon effect, e.g. works without electricity, which integrates itself in the common Brazilian residential electric water heating system and is therefore non-invasive to the electricity grid. The ASBC is introduced to the target population through community meetings, organized by local established entities in a determined region through partnerships with companies and the public sector. Consisting of a theoretical and practical part, the whole community is offered a technical workshop of the ASBC and environmental topics, to finally install together ASBC´s in several households in a community action “Mutirão Solar”. By transferring the holistic background knowledge and know-how directly, this approach utilizes the already widely available knowledge in electricity, water supply and construction engineering to train local experts, which enable the self-sufficient installation, correct use, maintenance and expansion of the equipment. Besides the positive, direct impact on the families through the reduction of electricity and water costs, the ASBC is offering opportunities for the creation of small businesses through groups of experienced workers. Through the ASBC training sessions, awareness on environmental impacts of energy generation, usage and sustainable practices are promoted in the Brazilian low income communities, which are included as a part of the solution for global challenges like climate change, greenhouse gas emissions, water shortage and the usage of natural resources. As the first large scale implementation project in the federal state of São Paulo, the communities Tatetos and Santa Cruz in the city São Bernardo do Campo, are receiving 109 ASBC´s. From the initially delivered 26 Kits, are already 8 installed after three weeks by the residents. After the first monitored usage in the summer months between January and March 2015, the registered average reduction of the monthly energy bill against the previous five month was of circa 25%. Two individuals, which received their ASBC through the initial community action, are acting as technical support and promoting the expansion of the remaining systems in the neighborhood. Known from empirical values, the prospected savings in the forthcoming winter period will rise to between 35-50%. Apart from the social and economic benefits for the community, a large-scale installation contributes to the “peak-shaving” in heavy-duty hours in the grid between 17.00 and 22.00 and prevents, 0,43 tons of annual CO^2-Emissions per ASBC.

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The implementation of renewable energies in Brazil and the European Union: diagnosis and general perspectives - oral presentation.

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The objective is to present a general diagnosis and future perspectives on the implementation of renewable energy in Brazil and the European Union (EU). Renewable energies represent a strategic resource and one of the main solutions to the current global energy and ecological crisis. The EU has powers and instruments to establish an energy policy aimed at protecting the environment, especially with respect to climate change. Its objectives are: security of energy supply; energy efficiency; the development of renewable energy etc. Member States experience today a complex situation facing the challenge of securing access to energy import sources; to provide energy at the best possible price; and to preserve the environment, aiming to become a low-carbon society by 2050. In Brazil, 41% of energy sources are renewable. About 83% of its electricity comes from hydroelectric plants. A process of diversification and deployment of renewable energy sources reflect the generation of employment and income. Moreover, the current Brazilian model is considered limited with respect to isolated and dispersed consumers, especially in the North and Northeast. Resistance in the use of renewable energy, or the underutilization happens due to technical and economic uncertainties. However, renewable energies have less economical and political risk compared to many forms of conventional supplies, like oil, which costs are far less predictable.

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Premium efficiency motors sustainably contribute to climate protection – Normative and legal requirements of Brazil and Germany in comparison.

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Worldwide, great efforts are made to limit the climate change that results from the extensive green house gas emission. The use of regenerative energy sources is of high significance in this matter. A second, just as significant aspect is the efficient energy use. More than 60% of the energy employed in the industrial sector is used for motors. Energy efficient drive controllers that utilize power electronics, as well as the increased energy efficiency of the motors per se, considerably aid to reduce the energy demand without reducing performance or production numbers.
As new investments and operation are often financed from different budgets, additional incentives or regulations are required to successfully establish energy efficient drive technology in the market. Therefore, the various normative and legal requirements of Brazil and Germany are being compared. SEW-EURODRIVE produces premium efficiency motors in both Brazil and Germany. Those motors were developed and industrialized in a close cooperation of the plants in Indaiatuba and Bruchsal. The type testings show identical results for both locations.

The Brazilian Electricity Market - Specifics, Risks and Chances

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The basis of Brazilians power generation matrix is called hydrothermal. Thanks to its vast river systems, Brazil is making use mainly of its large hydropower potential, complemented by thermal power plants driven by fossil fuels and biomass. With the second largest hydropower capacity installed worldwide (84 GW) around 65% of Brazil's power demand is covered by hydro. The remainder is covered by natural gas (13%), biomass (7.3%), oil products (6.9%) and coal (3.2%) nuclear (2.5%) and wind (2%)[1]. Brazil's power supply profile is quite unique in the world considering the size of the country. It is predominantly renewable (even important environmental issues have to be considered related to hydropower) and, provided it rains enough, shows lower generation costs when compared to countries with higher fossil fuel shares.

Aiming for an efficient and cheap power generation also in the future, the Brazilian electricity sector has been widely privatized in 2004. Larger projects use to be tailored as Public Private Partnerships and all others as Independent Power Projects. The introduced reverse auction system to contract new capacity is considered a successful strategy to meet the challenges of increasing energy demand and the need for diversification of the energy mix. Amongst others, about 4.5 GW of wind energy were recently incorporated to the power system. Additionally almost 1 GW of solar photovoltaic power was contracted in a first auction in October 2014.

As it is the case in many countries, also in Brazil politics interfere in the electricity market. The tariff reduction by provisional measure 579 in 2012 is such an example. Even of a partly liberalized electricity market, there is a regulated commercialization environment (ACR) where such interferences are possible. Besides the regulatory risk for market agents in the Brazilian electricity market, there is an increasing risk due to fluctuating hydro resource (and future uncertainty in light of climate change). For example in the last three years the hydro power generation declined by 12%-points (basis from 2012)[2] due to the lack of rainfall, which had to be compensated by running comparably expensive thermal power plants (a supply risk mitigation measure adopted by the National Council for Energy Politics in 2013 - CNPE).

On the other hand the Brazilian electricity market offers considerable chances. The recent auctions dedicated to solar photovoltaic and wind power offer new business opportunities, towards a more diverse and sustainable power supply in Brazil. Such diversity also leads to a potential complementarity between the intermittent sources, solar photovoltaic and wind power, and the controllable dispatch of hydropower.

The presentation intends to mention the key facts of the power generation market in Brazil and to call attention to likely changes in future energy supply policies towards solar and wind power. The apparent increasing hydrological risk wouldn't justify going further with the traditional approach of expanding mainly large hydropower supply.

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2: https://ben.epe.gov.br/downloads/Relatorio_Final_BEN_2013.pdf, base year 2012

Gold and Diamond Mining in the Amazon Rain Forest - Ecologic, Economic, Social and Environmental Challenges

BP Peregovich

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Mining activities in the Amazon Rain Forest date back to the early 20th century comprising exploration projects for metallic, non-metallic and energetic recourses, when international and national mining companies began to prospect, explore and exploit in particular ore-bodies bearing metals like iron, tin, manganese, copper, nickel, aluminium, and in lesser quantity even uranium, niobium and tantalum. Kaolin predominates amongst non-metallic mineral resources, besides carbonates, phosphates, sulfates and halides, as well as building materials, like gravel, sand and clay. In the Amazon Basin significant amounts of petrol and gas were detected in 50th.

Mining of surface deposits of gold and diamond began in the Amazon region as early as the 16th century in more easily accessible locations close to the coasts and major rivers. However, difficulties resulting from access, location, climate, and political instability kept the region from full exploration of these resources until recently.

Gold and diamond extraction takes place mainly in small-scale-mining, carried out by artisanal miners, so-called “garimpeiros”, although recent national and international exploration companies show interest to explore in the region in a systematic manner.

Any kind of mining activities, as there are mineral prospecting, exploration, exploitation and beneficiation of mineral resources, always will cause social and environmental impacts, as there are benefits and damage in like manner.

Aside from giving a general introduction to the gold and diamond mining activities and the environment where they occur, this talk will focus on pointing out ecological, economic, social and environmental challenges, in order to find solutions for a well balanced and sustainable development of future gold and diamond mining activities in the entire region.

Standard setting for mineral raw materials – a chance for more sustainability in newly industrialized countries?

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Extraction and beneficiation of mineral raw materials are associated with numerous environmental and social impacts. Furthermore, an important share of mines is located in developing- and newly industrialized countries, some of them having poor labor conditions and in some regions revenues from mineral resources are directly linked to the financing of armed conflicts (conflict minerals). Like other commodities mineral raw materials are traded on the apparent quality of the commodity alone, which means information about the circumstances of the extraction and beneficiation are not accounted for. Consequently, companies producing with high environmental and social standards will not be rewarded for their efforts when selling their products. Also buyers interested in more environmentally and socially produced raw materials and products lack information and cannot source the way they would like to. Decommodisation makes (selected) circumstances of the production and further processing of a commodity transparent (Pagell & Wu 2009) and thus can help overcoming this type of market failure. In fact, decommodisation may provide buyers with information they need for making their intended buying decisions and it may help producers for entering markets being more sensitive for environmental or social concerns or even to achieve a price prime compared to their competitors, not to mention a facilitated financing by more conscious investors.
Whether the mentioned advantages can be realized in practice depends on the type of standards, e.g. whether it focuses on performance, implemented processes or country of origin, and the way it is realized (e.g., Stetter & Zangl 2012). Major positive impacts can only be achieved if the requirements are neither too ambitious nor too loosened as in the former case only few companies will join and in the latter case there might be no real improvement except for greenwashing. Equally important for the overall success are costs and the avoidance of negative side-effects of such a system, e.g. if it hinders free trade or provokes disadvantages for artisanal and small-scale mining or mining in whole regions. These aspects are particularly important for newly industrialized countries in which traditional and high-technology mining practices coexist and where environmental and social laws are often not as strict as in industrialized countries. Accordingly, such a system must balance between the different interests to achieve a wide acceptance.

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The NamiRo project (www.namiro-projekt.org) is funded by German Federal Ministry of Education and Research (BMBF).

Perspectives of the Sustainable Use of Biochar from Hydrothermal Carbonization Process (HTC) in Agriculture.

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Hydrothermal carbonization (HTC) is a chemical process which converts hydrolysable substances in an aqueous environment and under moderate temperature and pressure conditions into biochar (Hu et al. 2010). Besides substituting fossil coal for energy generation by burning, biochar from HTC can be used both as fertilizer and as soil amendment. It is very similar to an artificial soil amendment from the Amazon region in Brazil derived from compost, food residues and fecal matter. The Indians used this "Terra Preta do Índio" type of soil amendment which is characterized by high carbon contents of up to 60% (Lehmann et al. 2003). The high specific surface area of the biochar positively affects important soil parameters such as water holding capacity, cation exchange capacity, soil pH, soil porosity, total carbon and loss of nutrients by leaching (Bradl 2013). In respect to a sustainable material flow management, a wide range of agricultural waste materials can be used as raw material of the HTC process.

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No good answer to a wrong question: tracking the source of Hg in the Amazon

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BACKGROUND AND METHODS: following the Amazon gold rush in the 1980s, high mercury (Hg) levels were found in fish and human hair in riparian regions and their villagers, and causal links with gold mining activity were suggested but never proved. The CARUSO Project - http://www.unites.uqam.ca/gmf/caruso/caruso.htm - was carried out by a Brazil-Canada team, starting in 1994 on the Tapajós River Basin, and among other things tested this supposed causal link. Hg was measured in different environmental matrices (fish, sediment, soil, water and suspended particles, vegetation and litter) along a 300 km river stretch downstream a main gold mining area. In sediment cores, Fe, Al, lignin biomarkers and sedimentation rates were measured.

MAIN RESULTS: no gradients were found in Hg concentrations in riverside soils, vegetation or litter. The same goes for dissolved and particulate Hg, that were higher in small non-mined Tapajós tributaries and in the Amazon river than in the Tapajós river. However, dated sediment cores showed a clear Hg enrichment and increase in sedimentation rates, coinciding with the intensification of human colonization in the watershed over the 1950s, long before the gold mining rush. The same pattern was found for iron, aluminium, and lignin biomarkers, clearly indicating that Hg enrichment was related to soil erosion following deforestation due to the unsustainable slash and burn agriculture.

CONCLUSIONS: this set of evidences has deep implications for watershed management and suggests a virtuous circle: less Hg in fish requires a more sustainable agricultural development model. Despite efforts of the Brazilian Government to reduce and control deforestation rates in the Amazon, the current scenario of exploitation of natural resources in this region, particularly driven by the expansion of large soybean crops, cattle, huge hydroelectric development, and increased human colonization, will lead to even higher Hg levels in fish, threatening the lifestyle of indigenous communities and riparian populations, in addition to its impact on fish stocks and soil fertility. Like gold mining, logging, ranching, and hydroelectric development in the Amazon generate high short-term benefits to a minority, while threatening the sustainable use of the region resources by future generations.

Mercury emissions in artisanal gold mining in the Amazonas region and the problem of considering Social Life Cycle Assessments

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Artisanal gold mining, especially in the rainforest of the Amazonas region, has been a target of public criticism for many years now. Extremely simple, almost medieval extraction technologies lead to major environmental impact. Protest repeatedly revolves above all around the amalgamation with mercury and resultant mercury contamination of river water. Other aspects criticised include deforestation and use conflicts between the garimpeiros and the indigenous population.

Life Cycle Assessments (LCA) in accordance with the ISO standard 14040 represent a tool for assessing the environmental consequences of extracting primary gold. A comparison between common generic data sets from the LCA and the emissions in artisanal gold mining shows that the mercury emissions are distinctly underestimated. However, there are also technical approaches aiming to reduce the emissions substantially. These include, for instance, retorts or distillation apparatus that the gold miners can use very easily on site.

However, the marginal social frameworks of the gold miners are often neglected. The miners come from the weakest groups in society, are frequently illiterate and often have to concentrate on sheer survival. The public image of greedy prospectors or even desperados is misguided. Consequently this situation calls for a combination of environmental and social LCAs. The latter are currently being encouraged strongly in international academic circles in order to achieve a holistic assessment of sustainability.

Even so, the example also shows the limits of such an assessment approach. The environmental LCA conducts a quantitative comparison of the products and aims to assess the environmental impacts along the complete product life cycle. The consequence would be that a product with a poor environmental result would not be bought or produced, thus relieving the burden on the environment.

In the case of a social LCA, the poor result of a product (e.g. due to child labour, use conflicts, etc.) would lead straight to disadvantages for those affected, as they would be deprived of their economic base. Accordingly the LCA presupposes a market design and a solution created by supply and demand that no longer function in the social context. The answer here could only lie in a case-by-case consideration and specific proposals for action on site, but not in boycotting the products. Accordingly social LCAs need to be deployed and communicated quite differently from environmental LCAs.

Geothermal energy exploration using helium isotopes in shallow aquifers of the Upper Rhine Graben

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Large-scale geothermal energy production relies on extensive characterization of the target fault systems: their spatial orientations as well as the hydraulic permeability. Current geophysical methods (e.g. 3D reflection seismics) offer only limited information on hydraulic permeability. In an approach to solve this problem, a noble gas study of shallow groundwater, focusing on $^{3}He/^{4}He$ ratios, was executed in three areas in the Upper Rhine Graben (Germany), covering both the eastern and western main faults of the rift system. While helium isotopes have been applied to search for imprints of mantle-derived fluids in thermal spring water [1], we investigated the mostly young water of meteoric origin in the shallow aquifers. In combination with other tracers – hydrogeochemistry, Sr and Li isotopes, REEs, ^{14}C, ^{222}Rn, SF_6 and ^{3}H – the dataset is used to locate and characterise hydraulically active parts of the fault system with the goal to develop a toolset for cost-effective preliminary investigations in geothermal energy exploration.
Samples from a shallow aquifer at Groß-Gerau (western main fault) show an impact of mantle-derived fluids revealed by $^{3}He/^{4}He$ isotope analyses, correlating with Sr and Li isotope data [2] and an increase in salinity. The amount of ^{3}He suggests a mixing fraction of mantle-derived fluids of approximately 5% within the aquifer, restricted to distinct locations along the fault line. In contrast, the investigation of two other sites at Heidelberg and Freiburg, both located close to the eastern main fault, could not identify any influence of mantle-derived fluids in the uppermost aquifers, indicating either a well sealed aquitard or an absence of hydraulically active sections of the faults within these sampling areas.
Our data supports the applicability of the selected set of tracers for geothermal exploration and fault characterisation, in order to narrow down the size of the field area for the application of further geophysical exploration methods.

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Poster Presentations

Energy and Climate Changes: The Social and Environmental Impacts of the Hydroeletrics.

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The climate changes are nowadays one of the most concerning themes, which show also the energy crisis. The climate changes are a certain reality brought by the IPCC reports, which presents options to mitigation, such as reducing the greenhouse gases – GHG. Brazil is one of the ten biggest GHG emitters, whose main cause is the destruction of natural vegetation, mainly the Amazon Forest. Thus, compromises are necessary to reduce the emissions and to promote the development of sustainable energy and energetic efficiency plans. The production and the consumption of energy play an important role on the States politic, whose strategy includes the choice about energy source. Brazil produces most of its energy from big hydroelectric, which causes tremendous social and environmental impacts, although it is considered a renewable source. There are many social and environmental impacts of the hydroelectric, however three can be considered crucial. The first one is the population displacement to build the flooded area, which changes significantly their lives and the loss of their identities, mostly when related to traditional and indigenous communities. The "Belo Monte" hydroelectric, designed to be the third biggest one in the world, is a good example of this social impact, because of the indigenous aspect, with more than twenty ethnicities living on the Xingu River, who have not participated on the process. The second major problem is the loss of water quality generated by the artificial lakes, the deforestation, the loss of fauna and flora and erosive process. The Itaipu's dam – the biggest hydroelectric in Brazil – flooded a conjunct of waterfalls known as "Sete Quedas", with incomparable natural beauty. Nevertheless, the most emblematic example is the "Barra Grande" hydroelectric, which flooded a protected primary forest on the Atlantic Forest. In order to build a hydroelectric, the licensing and the preliminary environmental impact study are necessary, according to the Brazilian Constitution of 1988 and the Law of Environmental Politic (Law nº 6.938/1981). Lastly, the third problem is the possibility of the reservoirs also contribute to GHG emissions, due to biomass decomposing. That being said, the energy must be consumed in a wise way and the search for renewable alternative sources is a need in Brazil. Energy sources are also an important subject in Germany. According to the official German representation in Brazil, about 74% of its energy demand is generated by renewable sources, like wind and solar. The country also expects to abandon nuclear energy until 2022 and predict that until 2050, all Germany energy sources will be renewable. In conclusion, the hydroelectric, although considered a clean source, causes tremendous social and environmental impacts, which evidence the importance of the dialogue between Brazil and Germany, in order to change its energy source to a sustainable one.

Use of Seaweed and Macroalgae by means of Hydrothermal Carbonization (HTC) in Respect to their Energetic and Adsorptive Potentials

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Seaweed and algae populations are increasingly growing worldwide due to global warming and climate change. Hydrothermal Carbonization (HTC) utilizes wet biomass, produces biochar and offers a sustainable possibility of integrating wet biomass into different material flows (Hu et al. 2010). Our research focused on estimating the energetic and adsorptive potentials. By evaluating the design of experiment a significant increase in calorific value could be achieved. Seaweed and macroalgae have been carbonized and the biochar produced has been added to garden soil. Plant tests with different biochar-soil mixtures showed that the optimum value for biochar addition to increase biomass production is around 5%. Analyses of nitrate concentrations showed that biochar addition to soil decreased nitrate leaching of soil. Adsorptive potential estimation was done by Langmiur isotherms and surface characterization by REM. HTC biochar from seaweed showed a water adsorption capacity similar to conventional activated charcoal.

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Hu, B., Wang, K., Wu, L., Yu, S.-H., Antonietti, M. & Titirici, M.M. (2010): Engineering carbon materials from the hydrothermal carbonization process of biomass. *Adv. Mat*. 22: 813-828

Hydrothermal Synthesis and Characterisation of Crystalline Layered Lithium Manganese Oxide from Mn ores as Natural Source.

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This work presents experimental results dealing with the possibility of converting Mn ores from Azul mine (Carajás Mineral Province, Nothern Brazil) into crystalline layered lithium manganese oxide by hydrothermal synthesis. The synthetic route has been evaluated at different conditions of temperature and reaction time in order to optimize the synthesis. Products have been identified by X-ray diffraction, Thermal Analysis (TG-DTA), Fourier Transform Infrared and Raman Spectroscopy. The results have shown that Mn ores were mainly composed of amorphous phase and crystalline phases as such pyrolusite, birnessite, lithiophorite, todorokite and cryptomelane. The Mn oxides were converted into a single phase by thermal treatment, and could be transformed into crystalline $LiMnO_2$ material having ortorrombic system and thermal stability of crystals up to 420 ºC. FTIR spectra of the lamellar phase exhibited two distinct bands at 673 and 425 cm^{-1} corresponding to Mn-O lattice vibrations, as well as Raman sprectroscopy bands at 210, 413, 506, 613 and 654 cm^{-1}.

Study of Brazilian Environmental Law Regulating Coal Mining Industry in Santa Catarina State

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Brazil has a significant environmental legal framework that regulates the potentially polluting economic activities and among them is the coal sector. Nevertheless, despite of this legal framework, several studies pointed out the significant negative environmental impacts caused by coal mining and processing. The Southern state of Santa Catarina in Brazil is one of the main affected regions. The region is considered as one of the 14 "Critical National Areas for Pollution Control and Environmental Conservation" according to Decree No. 85206 of September 25, 1980. Thus, this investigation aimed at studying the Brazilian legal framework related to the coal mining industry and its environmental impacts with focus on the Santa Catarina State. The investigation seeked to assess the possible regulatory omissions referring to environmental protection and recovery of areas where this economic activity is developed. The systematic review methodology included the study of laws that regulate the coal activity at the federal, state and municipal level. It was also carried out a literature review on the negative environmental impacts of coal mining activities in this region. Among the observed results, we found that there is a general environmental protection legislation for the mining sector, but there are no specific guidelines for extraction, processing, transportation and use of coal. It should be also noted that more than fifty percent of the cities that make up the coal region of Southern Santa Catarina do not show environmental regulation for the coal industry. The studies on environmental impacts from coal industry pointed out water, soil and air contamination as well as impacts on flora and fauna. These impacts could be associated to the environmental legislation omissions of the mining sector. Based on obtained results, it can be concluded that the omissions in the regulation of the coal sector can create difficulties in law enforcement and monitoring by environmental agencies with consequent environmental impairment of this region. Thus, there is the need to improve the Brazilian environmental legislation to regulate the coal industry.

A brief study on the legal system history of the Brazilian energy sector

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Brazil stands out for energy production since its colonial times due to its wide availability of energy resources. In order to regulate the way to adequately explore these resources, it has been created a legal framework for the regulation of the energy sector in the country. This study aimed at carrying out a research on history of energy regulation and legislation in Brazil. Thus, it was researched the advancement of the legal system and the contribution of each government. It was also investigated the regulation and control of the conflict between economic development and environmental protection and its impact on energy production processes. Studies indicate that energy production while protecting natural resources are relevant issues in Brazilian constitutions. This happens because energy sector is one of the drivers of economic growth. With the passage of time, new bodies were created to stimulate the energy research and production from different sources as well as to oversee this economic segment. It was also observed that, currently, there is a greater concern about the environmental damage caused by this economic activity. This results from inadequate exploitation of natural resources for power generation. Therefore, it has increased the amount of environmental protection laws related to the sector. Finally, it was found that the current Brazilian Constitution does not regulate all energy sectors like, for example, the renewable energy sector. Brazil has a matrix of power generation that is predominantly based on renewable energy. The electricity generation comes mainly from hydropower. At same time the investments and interest in renewable sources (wind, biomass, solar) has been increasing. Therefore, it is necessary a proper regulation for this sector to minimize environmental impacts. This will allow the country to create conditions for sustainable growth.

Using of the sesame biomass (*Sesamum indicum*) as raw material for the production of biolubricants.

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This aim of the work is to obtain polyesters biolubricants by the use of sesame biomass, through the homogeneous basic catalysis. The seeds used in this work were grown in the irrigated perimeter of São Gonçalo, located in the Northeast of Brazil. Despite the region not be the native region of the botanical specie, the place was propitious for the culture. The polyalcohol selected was the trimethylolpropane (TMP) which have characteristics as a moderate market price and low melting point in comparison with others polyalcohols. The sesame oil was obtained by mechanical extraction in press filter of the raw seeds. The methyl and ethyl sesame biodiesel were transesterified under the reaction conditions: 2wt% of sodium methoxide as catalyst and 1:3 molar ratio between biodiesel and alcohol. The system was kept under stirring, temperature of 110°C and constant pressure of -1mmbar for 6 h. The bioproducts were characterized by infrared and ^{1}H and ^{13}C NMR analysis and physic-chemical properties like iodine and acid value, viscosity at 40°C and density at 20°C were determined. The TG analysis was performed and the bioproduct obtained from ethyl biodiesel showed a slightly better stability than the bioproduct obtained from methyl biodiesel. The obtained results showed that the long chain ester obtained from sesame brute oil can be exploited for lubricants formulations on several areas.

Climate Change and Renewable Energies:

A Legal Approach of the Case of Biofuels Production and use in Brazil

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This research seeks to analyse the legal and environmental aspects related to biofuels production and use in Brazil, focusing on biodiesel and ethanol produced from sugar cane. The research has as background the anthropogenic-driven climate change, which demands a constant search for new energy sources and models to replace the largely used non-renewable sources, which contribute to the increase in the emissions of greenhouse gasses to the atmosphere. Therefore, the poster firstly looks deep into the environmental risks related to the production and use of biofuels, energy sources that are encouraged by Brazil's Government as an alternative to the utilization of petrol. Thus, it is important to keep in mind that although biofuels might represent an important tool in the fight against the 21st Century's environmental crisis, their production and use demand the realization of a full economic and political analysis that comprehends not only its immediate financial benefits, but also the risks that arise from them. These risks include the implementation of monocultures, which threatens the biological diversity of species, and the sugar cane field burning, which takes place by the sugar and alcohol industry to reduce the harvest costs of this good. Besides, the poster further analyses the economic, social and environmental impacts caused by the production of biodiesel and ethanol, such as the competition for farming land, between those farmers who produce sugar-cane for biodiesel production and those who produce food for direct consumption, causing raising prices; and the poor work conditions of sugarcane cutters, who often do not have access to safety equipment and are submitted to conditions analogous to slavery. Amongst the environmental impacts, water contamination, deforestation, the large utilization of pesticides, air pollution and soil impoverishment caused by the cane field burning are also highlighted. Moreover, the research investigates the Brazilian public policies that incentive biofuels, having as reference environmental justice and environmental law rules and principles, reaching the conclusion that their implementation must be done with caution. This approach is used once that the political discourse, in order to demonstrate the benefits of the utilization of biofuels, often uses only the argument of their great economic profitably, omitting the already mentioned social and environmental impacts. At last, the poster highlights decisions of the Brazil's Superior Court of Justice about this matter, such as the decision of the Special Appeal No 200702548118 in 2009, in which the Judge Herman Benjamin stated that "[…] *specially in times of climate change, any activity that might be polluting must be interpreted restrictively by the decision making agent*". In this case, the Court understood that fires occasioned by the agroindustry, such as the sugar cane field burning, are incompatible with the objectives of environmental protection stablished by Brazil's Federal Constitution and environmental legislation.

Energy efficiency and management: some examples of German organizations

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The resources shortage, global warming and energy raising costs as well as a bigger environmental awareness of the citizens have pushed energy efficiency to the top of agenda of organizations and countries. The International Energy Efficiency Scorecard published by the American Council for an Energy Efficient Economy in July 2014 pointed out that a country that uses less energy to achieve the same or better results reduces its cost and pollution, creating a stronger, more competitive economy. The scorecard has analyzed the world's 16 largest economies covering more than 81% of global gross domestic product and about 71% of global electricity consumption. The study metrics have been distributed across the three primary sectors responsible for energy consumption in an economically developed country: buildings, industry and transportation. Germany has the highest overall score with 65 out of 100 possible points. The country has shown a strong commitment to energy efficiency in the industrial sector. Nevertheless, Brazil scored the lowest of any country analyzed in the industrial sector which is its largest energy consumer. Within this context, this qualitative study aims at identifying the main political, normative and managerial aspects related to energy efficiency in Germany and how these are integrated to the strategy of German manufacturing companies. In addition, the study aims at verifying if and how these aspects could be applied in Brazil. This work presents the first results of this project. Data came from six non-directive interviews with a sample of German organizations. These included four manufacturing companies, a company of the energy sector and a laboratory for energy efficiency in a university. Organizations were visited in two phases, May 2013 and March 2014. The manufacturing companies offer products and services to the global market. Among the results it was observed that all organizations are motivated by the European Union and German policy which establish that greenhouse gas emissions have to be reduced by 20% until 2020. This drives to investments in energy efficiency and renewable energy. Moreover, manufacturing firms pointed out the importance of management systems based on standards like ISO 14000 for environmental quality and ISO 50001 for energy management. These firms are encouraged to invest in management systems due to the governmental incentives and cost reductions of the production. It was also verified in these organizations that energy efficiency is related to innovation opportunity. In other words, the possibility of developing energy saving technologies, products and services. Another interesting aspect observed is that innovation in many cases results from collaborative joint projects which are developed by firms, research institutes, universities and sectorial associations.

Performance evaluation of an LED reflector solar-powered in Belém, Pará

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The current energy model certain times shown lagged the increase in the power consumption. In the face of growing demand, the use of solar resource is inserted as a viable alternative and could be one of the diversification options of our energy mix. The present paper an analysis of the technologies with LED (LED) and photovoltaic conversion of solar energy by means of a prototype applied to lighting. The work seeks to compare the current street lighting scenario with the proposed alternative system and by the obtained data are presented comparative results as: energy conditions, bright patterns, costs and environmental context. The comparison made to costs indicates a certain equivalence for systems, but it is considered that the current technology has advantages in investment, considered temporary because of the advance and investment in LED technology; The environmental context stressed variables not considered before laying the system proposed ahead of current, these variables directly influence the process quality and indirectly the costs involved. Another rationale of this article is that the suggested system can replace the light pattern found, it fits the legal requirements and has a lower consumption of conventional values, a fact that still influences the cost and energy potential; This latter is analyzed by using a micro controllers monitoring system developed specifically for this prototype, capable of obtaining current and voltage data showing that the proposed system is the opposite of conventional street lamps, a reduction of 224, 4 kWh at the end of a year for a single system..

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Sizing and Installation of Micro Photovoltaic System isolated for sustainable development in São Círiaco do Urucurituba community the city of Santarém - Pará

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The Amazon region, in particular the city of Santarém, has a lot of small, medium and large islands or communities along the Amazon River, which are not connected to the conventional power grid, without assistance of development policies and access to sanitation environmental, promoting an archaic family farming, devoid of the use of production technologies and requires an unhealthy physical effort that makes the life prospects decrease and stimulate the rural exodus. In studies conducted in São Círiaco do Urucurituba the community, a typical community of Santarém lowland region, it was found that the basic sanitation infrastructure in the community is lacking. Health risks have been identified that undergo change according to seasonal floods and drought, and in the full period the sanitation situation gets more precarious due to the mixing of the waters of the river, which is the source of consumption, waste generated by own community. The community also has potential for the implementation of a micro photovoltaic system of sufficient power generation to promote local development through the implementation of collection and treatment of water systems, irrigation systems for family farms, in addition to improving processes production locations in order to promote sustainable economic and community development. Thus, this work shows the resulting from a university research project in order to provide a synergy between traditional and scientific knowledge seeking, simultaneously: the community socio-economic development in order to ensure the fulfillment of their current and future needs in power generation through the design and implementation of a micro photovoltaic system.

Isolated Scaling Photovoltaic Systems in the Amazon

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This essay presents a project of photovoltaic power generation in isolated communities in the Amazon Region, using the study based on a home deprived of electric supply emanated by the concessionaire of the region, in Itacuminy community on the banks of the Amazon River, far 6 hours from Santarém by boat in the State of Pará. Studies were developed on the current situation and the challenges to generate electricity in the region, as well as the classification and history of photovoltaic autonomous systems, power required studies, technical aspects related to the system , scaling of equipment and comments about the economic viability of the project.

Transesterification of oleic acid using methanol and mesoporous silica catalyst

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Global warming, high-energy demand and availability of new technologies are among the factors catalyzing the search for alternative sources of energy. Biodiesel has emerged as one of the best potential renewable energy sources to replace current petroleum-based diesel. The most common process for biodiesel production consists in a transesterification reaction in which a triglycerides source reacts to a short chain alcohol. However, production costs are still rather high, compared to petroleum-based diesel fuel. The introduction of a solid heterogeneous catalyst in biodiesel production could reduce its price, becoming competitive with diesel also from a financialpoint of view. A sílica molecular sieve containing zirconium and sulfonic acid functionalized catalysts has been reported to display an excellent catalytic activity in acid-driven reactions, good stability and easy regeneration through calcination. The reaction was performed using the molar ratio metanol:oil of 20:1 at inert atmosphere (N_2) at 339 K with 5% of catalyst mass relative to total oil mass added to the reaction mixture. The reaction was evaluated for ethyl ester conversion after 8 h. The methyl esters content was measured using ^{1}H próton NMR spectroscopy. The mesoporous sílica heterogeneous catalysts presented approximately 56% conversion after the reaction time. The activities of the catalysts were related to their acidic strength.

Synthetic esters with lubricating properties from modified Castor Oil -

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Due to increasing scarcity of oil and environmental problems, the use of renewable raw materials is the basis of a market in rapid worldwide rise. Modified vegetable oils are excellent substitutes for mineral lubricating oils because they are environmentally friendly base stocks and show properties such as excellent lubricity and biodegradability. From this perspective the present study aimed to synthesize and characterize ester derivatives of castor oil change (Rininus comunis). The synthesis was performed in three consecutive steps: transesterification of vegetable oil to methyl esters, epoxidation of the unsaturated and ring-opening reaction with isoamyl alcohol and 2-ethylhexanol. The products were characterized by ^{1}H NMR, FTIR, TGA and physico-chemical tests. The results showed excellent cold flow values -44ºC and -48ºC, minimum thermal stability of 230 °C and viscosity index greater than 100. The lubricating esters derived from castor oil showed different degrees of viscosity and potential applicability as a base oil formulations industrial and fuel additives.

Session 05: Biodiversity

Convener:

Prof. Dr. V. L.I. Fonseca[1], Prof. Dr. M. Koch[2], Prof. Dr. W. Vale[3],

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The change in biodiversity is an evolutionary process of life on planet Earth. Key examples from the past to the present will be shown. It is also expected that the causes for changes will be provided.

Keynote **Lecture**:

Prof. Dr. Vera Lúcia Imperatriz Fonseca, USP, Brazil
Prof. Dr. J.F. Rego Matos, UFOPA, Santarem, Brazil
Prof. Dr. William Vale, UFOPA, Santarem, Brazil

Oral Presentations

What is next for sustainable use and conservation of ecosystem services in Brazil?

Vera Lucia Imperatriz Fonseca

As a megadiverse country, Brazil still have many natural environments where ecosystem services are maintained . Nevertheless, many drivers of change are detected in the country, mainly global change and habitat destruction. Using the data from IPCC we verified that effects of the global change in large part of our country surpass the safe limit of 2 degrees Celsius, many times with projections of 4 degrees in next 50 years. We will analyze this scenario considering bees and their services as examples, and the Amazon case of habitat destruction for development. An study case of mining in Para State will be discussed, a successful enterprise for forest and ecosystem services conservation between a private company and the Government.

The Brazilian Law of Use and Biodiversity Access and Associated Traditional Knowledge and its incompatibility with the Treaties About the theme.

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Law 13.123 / 2015 established the rules for access, use and sharing of benefits arising from genetic resources of biodiversity and associated traditional knowledge.

The Act establishes as one of the conditions for carrying out research activities and economic exploitation to obtain the prior informed consent of indigenous peoples, traditional communities and family farmers in the event of activities involving traditional knowledge, differentiating the traditional knowledge associated source identifiable; traditional knowledge associated unidentifiable (consent waiver); and traditional knowledge to agricultural activities when referring to the traditional local variety or Creole or locally adapted or Creole race (consent waiver). Attempting to relieve agricultural activities faced with the dictates of the Treaty on Plant Genetic Resources for Food and Agriculture FAO and ILO Convention 169 which establish the right to prior consultation whenever any activity affects people and traditional communities, in addition to Convention on Biological Diversity requires the participation in the events of access, which is why such forecast is incompatible with international agreements in force on the subject. It should be noted that the legislation does not make clear who is responsible for obtaining prior consent, although the Inter-American Court of Human Rights has already stated that the obligation to carry out prior consultation and obtain consent is State (Case Kichwa Indigenous People Sarayaku vs. Ecuador).

The law considers as a means of proof for prior informed consent , among others an opinion of the competent official body adopting a practice of protecting nature by removing the right to self-determination of peoples and traditional communities and once again clashes with the Convention 169 ILO .

The benefit sharing is established quite narrowly and only take place in the event of commercial exploitation which goes against the provisions of the CBD, the FAO Agreement and the Convention 169 of the ILO .

The law establishes an exemption from the obligation of benefit sharing for the benefit of micro , small companies , individual micro-entrepreneurs ; and traditional farmers and their cooperatives , a fact which also contrasts with the current international scenario.

A Heritage of Biodiversity in Heidelberg Botanic Garden: Werner Rauh's Collections from Brazil.

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Heidelberg Botanic Garden built up important living collections with more than 10,000 taxa during the short time period between the 1950s and the 1990s. These living collections are focused on orchids and bromeliads as well as xerophytes from Madagascar, but also numerous other plant species primarily from Africa and South and Central America are cultivated, with Brazil being one of the "hot spots" of biodiversity. At Heidelberg Botanic Garden this is perceptible from the large number of accessions originating from Brazil: There are nearly 700 accessions cultivated in the living collections and thousands of specimens in the Herbarium HEID. The herbarium collection helds by its own more than 70 Holotypes from Brazil, either as dried plants or plants fixed in alcohol which were taken for describing a new species for the very first time.

This is mostly down to the tireless efforts of Professor Dr. Werner Rauh, who was the director of the garden from 1960 to 1982. Rauh collected approximately 43,000 living and dead plants, especially Bromeliaceae (~7,000), Orchidaceae (~1,600), Cactaceae (~1,500), Euphorbiaceae (~1,100) and succulent plants from Madagascar (~1.500). Within the years 1938 to 1994 Rauh undertook more than 60 expeditions in at least 44 countries. He travelled to Brazil five times and brought nearly 2,000 plants from there to Heidelberg. The collection resources comprise not only plants and specimens, but a lot of note-books with about 18,000 hand written pages.

Since 2009 this material has gradually been made accessible within the "Werner Rauh Heritage Project", funded by the Klaus Tschira Foundation, available free for everyone and linked to international taxonomic databases (Koch et al. 2013). At the moment more than 33,000 datasets with original Rauh numbers are stored in the database, and an additional 27,000 accessions brought or sent to the Botanic Garden Heidelberg by others.

Currently more than 3,000 accessions nowadays found in other Botanical Gardens (e.g. Berlin, Torino, Utrecht, Zurich) are stored in the database, and recently the project focuses on Rauh's herbarium collections housed around the world, a lot of them in Herbarium Bradeanum Rio de Janeiro (and e.g. in B, DPU, HUH, K, M, MO, MPU, NY, P, PRE, SEL, TAN, USM, W, ZSS). A 'Virtual Rauh Herbarium' has technically been built up and filled with more than 7,700 datasets with the particular objective of completing datasets for type collections. The database is available at scriptorium.cos.uni-heidelberg.de

Koch, M.A., Schröder, C.N., Kiefer, M., Sack, P. (2013). A treasure trove of plant biodiversity from the 20th century: the Werner Rauh Heritage Project at Heidelberg Botanical Garden and Herbarium. Plant Syst. Evol. 299: 1793–1800. DOI 10.1007/s00606-013-0835-5

Ethnobiodiversity, Sustainability and Traditional Knowledge: Cultural Practices in the Region of the Alter do Chão Aquifer, Focusing on the Conservation of the Amazon Rainforest.

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Brazil, one of the seventeen mega-diverse countries, has the largest continental biodiversity grants shelter for 15 - 20% of all the planet's biodiversity. However, Amazonia, the largest rainforest in the world, is a biome that despite combining a high rate of endemic species, is facing to a considerable degree of threats, primarily by human activity and elaborating of infrastructure projects from the outside to inside and from top to bottom, which has perpetuated the exclusion of populations, communities and traditional knowledge. Currently, there are many economic crises and catastrophes of global scope, requiring pragmatic solutions in large and small scales, with the planning of socio-environmental and cultural issues, the integrative centre that can set the survival of thousands of species, habitats, populations and ecosystems, which are the material basis for human evolution. Pointing out ways for the conservation and development from tools, techniques, policies, processes and programs that generate more inclusion, income, local and global benefits, are fundamentals that require cooperation and partnerships that provide real options for creating sustainable environments and cities, Amazonia being the place where tradition still finds place because their belief persuasion, myths, legends and knowledge. The region of the Tapajós valley takes advantage of a dense water network, aquifers and an incomparable biodiversity. Being a border region between the south and the north of the country, where large operating procedures due to the enhancement of the BR 163 highway and hydroelectric power plant projects, we must be aware of o the need necessity and urgency of further research and implementation of innovative models of territorial management, resources and knowledge to conscientious use of these resources in order to ensure no degradation, and thus future generations can enjoy this environment in a healthy way. In this way, work, describes about the conflicts between the different global and local interests and analyzes the light of traditional thinking, based on both, in authors like Goethe, Benjamin, Viveiros de Castro, Milton Santos, Edgar Morin, and the existing ritualistic practices elements that keep the Amazon tradition, as there are the Ritual of Çairé, Shamanic rituals and Indigenous Amerindians experienced by the author, from ethno-disciplinary methodologies of integrating differences, in order to discuss policies to harmonize, through dialogue, pointing to new relationships between man / nature, society / production.

Brazil - Germany and the cooperation for dissemination and practices of sustainable development in the Amazon

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This article is part of an exploratory research under the Project: Mediation and discourses of international cooperation agencies: Analysis of communication for biodiversity knowledge of environmental projects in the State of Pará, funded by the National Council for Scientific and Technological Development - CNPq (Notice MCTI/ CNPq / MEC / CAPES No. 18/2012) which aims to identify how environmental projects funded and advised by international cooperation agencies are spreading the biodiversity in the Amazon.

The research identified important actions of international cooperation in the Amazon, pointing out some challenges of Institutional Communication of organizations working in the environmental field and development. After the Pilot Program for the Protection of Tropical Forests of Brazil (PPG7) in 2009, the International cooperation agencies maintained much of the environmental projects, promoting various events in the Amazon. In this sense, these organizations still operating in the region through international technical and scientific cooperation.

In this article we discuss the role of cooperation Brazil - Germany and for this we chose two projects and two events in the environmental area post (PPG7). The first project, the Amazon Region Protected Areas Program - (ARPA) was launched in 2002 to run in three independent and solid phases . It is coordinated by the Ministry of Environment (MMA), managed financially by FUNBIO (Brazilian Biodiversity Fund) and financed with funds from the Global Environment Facility (GEF) - through the World Bank - the German government - through the Bank Germany's Development (KfW) - WWF - through the WWF- Brazil and the Amazon Fund, through BNDES . It is considered by (MMA, 2014) "the largest tropical forest conservation program in the world and the most significant on the theme of protected areas in Brazil" (ARPA, 2014).

The second, the Amazon Fund is one of the most important projects created in 2008 and maintained with donations and actions of international cooperation agencies. This aims to raise donations for non-reimbursable investments in prevention, monitoring and combating deforestation, promoting conservation and sustainable use of forests in the Amazon Biome, pursuant to Decree No. 6527, August 1, 2008 (BRAZIL, MMA). Since2009, through the Norwegian Agency for Development Cooperation (NORAD), the Norwegian government supports the Amazon Fund, with projects developed for environmental preservation. With this partnership, the Norwegian government has donated US $ 1.5 billion in stocks that are concentrated in the region referred to as the Amazon Portal. Germany is providing around 21 million euros by KfW Bankengruppe. It is the second country that provides financial and technical support to activities, second only to Norway (Germany, 2014).

In addition to these two projects the article describes and analyzes two events in the environmental area made during the year 2013 in the state of Pará, the 6th Brazil - Germany Symposium on Sustainable Development in the city of Santarém and the Ecogerma in Belém city. Finally, actions of international cooperation agencies, particularly withi the Brazil - Germany international cooperation in the dissemination and sustainable development practices resulted in new environmental outlook for the Amazon region .

Cattle in the Brazilian Amazon: the Importance of a Systemic View

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How to reconcile the development of productive activities in accordance with the environmental protection measures that promote ecological balance, social justice and economic viability? It is the central question of this paper which analyzes the process changes in livestock activity in the Brazilian Amazon. Among the many changes to highlight the analysis arising from environmental legislation and land regularization and those resulting from technological innovations in crop / livestock integration and use of reproductive biotechnologies such as artificial insemination (AI) and artificial insemination in fixed time (IATF) as well as embryo transfer (ET).. The explanatory arguments are based on direct observations and researches performed in recent years, especially in rural farming areas in the state of Pará state, Brazil.

Carbon sequestration, biodiversity and social structures in Southern Amazonia: models and implementation of carbon-optimized land management strategies (carbiocial)

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The globally relevant land use frontier of Southern Amazonia is extremely dynamic. Mato Grosso experienced an increase of 87% in cropland and 40% of deforestation from 2001-2004.This development is accelerating along the Cuiabá-Santarém highway and is associated with further major C losses and GHG releases. Model calculations of C and GHG fluxes from the respective ecosystems for different land use scenarios are still highly uncertain because (a) dynamic land use patterns with future land use development are not fully captured yet and (b) GHG models need precise in-situ calibration. Consequently, regionally specified models are essential and the key target of this project.
The main goals of this multi- and interdisciplinary approach for Brazilian-German cooperation are viable C-optimized land management strategies mitigating GHG emissions and maintaining ecosystem services (ESS) under changing climate conditions. They are utterly needed to meet the goals set by Brazilian national plans (ABC) and international treaties such as REDD and the Kyoto protocol. Three regions along the land use frontier of Southern Amazonia were selected: Novo Progresso (Southern Pará): most active deforestation; Sinop (Northern Mato Grosso): young soy bean production; Cuiabá (Central Mato Grosso): established cultivation (>20 years) and adapted mechanised cropping (e.g. no till). Analyses focus on soil carbon (C) turnover, climate, ecosystem functions and socio-economic processes triggering land use change (LUC).
Within the project climate and socio-economic drivers of land use development are analysed to produce science-based and feasible recommendations for sustainable “Land management strategies”. For the modelling of land use change (LUC) and the development of land use strategies a cluster of internationally recognized model tools was used with regionalization for Southern Amazon. The model software developed by different groups of this project (ZALF, UFZ, CESR, University of Hohenheim) are either deterministic (agroecosystem model MONICA, GHG-modeling with CENTURY, CANDY and DNDC; soil erosion risk with EROSION-3D, SWAT for water balance; integrated regional land-use change with LandSHIFT) or multi-agent-based agroeconomic modeling (MP-MAS), and allow simulation and assessment of scenarios for future land use practices under the conditions of climate change and GHG reducing land use strategies. Preliminary results how to set up regional adapted scenarios for modeling (4 “Carbiocial scenarios”) and simulation results of LUC for Southern Amazonia will be presented. Also consequences of LUC for ecosystem services as water balance in macro-catchments, soil-C-stock and erosion risk will be pointed out.
With biographic (life stories) and institutional research (p.e. actor constellation) socio-economic and socio-political subprojects gain insights in the complex land tenure and land use decisions by farmers, which were used for the development of realistic future LUC-scenarios. Moreover joint activities were the preparation and realization of Dissemination activities, such as Dia do Campo, Institution workshop, stakeholder conference Manaus 2014 to discuss carbiocial results with multiple Brazilian stakeholders.

Winnenden site landscaped close to nature

Andreas Mayer

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At its new company site in Winnenden, Kärcher has landscaped a total of 6,000 square metres in a design that is in harmony with nature, paying close attention to ecological aspects and, especially, to preserving biodiversity. The area was planted almost exclusively with typical wild plants from the Upper Zipfelbach Valley and Lower Rems-Murr Valley region.
The lecture explores the motivation for and the implementation and results of designing the area in harmony with nature.

Poster Presentations

Genetics of sex determination in *Melipona* stingless bees and its relation to conservation and management of native pollinators

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Stingless bees belong to the most diverse group within the highly eusocial bees, comprising of 33 genera. These bees stand as most important pollinators of plants in tropical and subtropical regions and also contribute significantly to the pollination of crops. Among the stingless bees, the genus *Melipona* (74 valid species) represents its greatest diversity in the Amazon basin. Deforestation and nests destruction by inadequate extrativism of bee resources (especially honey) belong to the main factors negatively impacting these native bees. Population fitness of *Melipona* bees is particularly affected by habitat fragmentation due to their mode of reproduction, which follows the principle of complementary of sex determination (CSD). In most species under CSD system, a multiallelic locus initiates a sex determination pathway. Individuals that are hemizygous (haploid) for this locus became males; heterozygous (diploid), females; and homozygous individuals give rise to diploid males, which are either inviable or effectively sterile. Consequently, inbreeding results in low genetic diversity at sex locus, which, in turn, reduces drastically the effective population size due to diploid male production. We are currently investigating sex determination related genes in *Melipona* species to follow their evolutionary history, population dynamic and molecular function. From closely related honey bees (*Apis*) and bumble bees (*Bombus*), it is known that a key regulator of sex determination, the gene *feminizer* (*fem*), has a duplicated copy. This gene copy in *Apis*, the *complementary sex determiner* (*csd*) gene, acts as the primary signal of the pathway. Interestingly, by studying *fem* in *Melipona interrupta*, we found no evidence for a gene duplicate. Further molecular analysis show various number of sex-specific splice forms of *fem* and gene expression differences among castes. We further obtained first genome sequence data of *M. interrupta,* providing valuable resources to additional comparative evolutionary analysis among eusocial bees. As a future perspective, we expect that these studies will have application to conservation and management programs as tools for monitoring genetic variability in endangered species and improvement of local bee breeding programs.

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Biological assays of extracts from industrial residues of “priprioca” (*Cyperus articulatus* var. *nodosus*) in Amazon rainforest

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“Priprioca” (*Cyperus articulatus* var. *nodosus* Lin.; Cyperaceae) is a root that exhales a pleasant perfume and it is used in Amazonian ethnobotany to prepare aromatic baths and handmade perfumes (Nicoli et al., 2006). “Priprioca” essential oil (EO) is used by the main Brazilian factory of cosmetics (Natura S/A) to produce fine perfumes, due to its wet wood, green and spicy notes (Potiguara e Zoghbi, 2008). The species is extensively used in ethnomedicine and many pharmacological activities were already reported as antimalarial, sedative, hepatoprotector, contraceptive, Central Nervous System action and even insecticide. In our Laboratory P&DBIO “priprioca” has been target of a multidisciplinary study. The plant was cultivated in 1 hectare in West region of Pará State (Santarém-Brazil), and the EO was extracted in laboratorial, pilot and industrial scales with yield ca.0.5%. GC-MS analysis showed sesquiterpenes as major compounds. Solid residue of extraction (ca. 99.5%) and hydrolate (liquid residue) is discharged till this moment. Aiming to find alternatives for the use of these residues, chemical, biological and pharmaceutical studies and formulation of cosmetics were carried out in our lab. EO showed acute and chronic toxicity against *Artemia salina* nauplii in concentrations of 10, 100 and 1000 µL. Dermic toxicity assay showed that EO is skin irritant when applied in rabbits with a concentration of 0.5 mL. Hydrolate showed larvicidal action against *Aedes aegypti* larvae (3th and 4th instars) when diluted in a concentration 1:1; larvae showed lesser survival rate when compared to larvae treated with other concentrations (1:0.5 and 1:0.025) and control. GC-MS analysis of hydrolate presented verbenone (ca. 29%) as the major compound. Ethanolic extract of solid residue of “priprioca” in concentrations higher than 10^2 µg/mL inhibited cell growth of tumor cells of glioma U251, breast MCF-7 and lung NCI-H460. Moreover, value of Total Growth Inhibition (TGI) in antiproliferative activity for the extract was lower than 100 µg/mL for glioma U251 cells, while to other tumor cells TGI value of extract was higher than value for glioma cells. GC-MS analysis of ethanolic extract showed substances with molecular mass higher than m/e 200. Moreover, in *in vivo* toxicity assay using mice it was noted a reduced activity of the animals, showing a possibly larvicidal activity in oral dose of 2 g/kg of extract from “priprioca” residue. GC-MS analysis shown as main compound a diterpene of m/e 234 (ca. 20%). The results show that is possible to use the industrial residues of Amazon Rainforest, stablishing a sustainable protocol.

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Acknowledgments: UNICAMP, FIOCRUZ; UENF; CAPES, CNPq.

From data to knowledge - A metadata portal on scientific studies in the southern Mata Atlântica of Brazil

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Thousands of scientific projects all over the world produce a huge amount of information. However, beside the published results, most of the gathered data are often not retained or managed on the long term and many aspects (results) of a study remain unknown. Therefore there is strong need for the development of infrastructure to facilitate discovery of and access to this "hidden" information.
Although an increasing number of scientific data is published via internet portals (like for example GBIF) the underlying source data sets are often widely distributed and very individually structured. Metadata therefore hold the key to provide the information necessary (1) to discover these datasets, (2) offer (technical) information on the data content, (3) to contact the data-owner. Thus the idea of a public metadata portal to permit access to biodiversity related studies[1] via the internet arose in the frame of the InBioVeritas consortium.
InBioVeritas (www.inbioveritas.net) is an international web of institutions around the Brazilian Society for Wildlife Research and Environmental Education (SPVS) dedicated to the sustainable protection of biodiversity in the southern Atlantic forest region of Brazil. One of its main goals is the improvement and dissemination of knowledge on biodiversity in a planned and coordinated way to be applied for conservation issues. On behalf of this aim an internet metadata portal was developed to first assess meta-information on studies in the region, e.g. who funded, which institutions realized the studies. Second interest was to unhide existing data sets and thereby prevent the precious data from loss. To assure this, metadata had to be well standardized prior to the inclusion in the database which supplies the internet portal. We used widely accepted standards and internationally used ontologies or taxonomic backbones to guarantee searchability and comparability.
In a third step and the future the direct access to source data within the portal should be enabled. This task comes along with the need of an even intensified standardization process. Only careful standardization and data curation procedures can lead to meaningful linked data and a real "web of knowledge" instead of solitary information scattered around the internet.

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Chemical Study of *Coffea arabica* Leaves: Angiotensin Converting Enzyme and Antioxidant Potential

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Tea and coffee, the most popular beverages in the world, have been consumed for thousands of years. *Coffea arabica* L. and *Coffea canephora* Pierre ex A. Froehner are the two species used in coffee production. Many studies have shown the relation between the consumption of tea and coffee and their potential disease prevention properties, which may be due to their polyphenol contents. Mangiferin, one of many examples of phenolic compounds, appears to have considerable promise as a natural chemopreventive. Mangiferin is a *C*-glycosylated xanthone with high pharmacological potential, and is widely distributed in the plant kingdom. However, most plants where one can detect mangiferin, are not a viable source for convenient oral consumption. Mangiferin has been recently identified in leaves of seven species of African coffee plants, which represents an excellent natural source of this compound. In this study determined mangiferin concentration in the leaves of *C. arabica* collected in Minas Gerais (Brazil), as well as the presence of flavonoids. In addition, antihypertensive and antioxidant capacity were investigated in methanol extracts of leaves. Chemical studies of methanol extracts of the leaves of *C. arabica* with the use of HPLC-DAD and HPLC-ESI-MSD techniques allowed the identification of 18 substances, seven of them being identified in the genus *Coffea* for the first time. Quantitation of the compounds neochlorogenic acid, chlorogenic acid, cryptoclorogenic acid, caffeine and mangiferin in leaves of *C. arabica* has shown that secondary metabolite production in leaves is influenced by exposure to mechanical factors, soil fertilization and leaf age. The presence of mangiferin and other phenolic compounds identified in leaves of *Coffea arabica* indicate that the leaves of commercially cultivated *C. arabica* species are an useful natural source of mangiferin, and consumption of Coffee leaf tea brews, may contribute significantly to an elevated intake of these potentially health-promoting substances. The methanol extracts of leaves of *C. arabica* show antioxidant activity in the DPPH, FRAP and ORAC assays. In the HX/XO test, the sample MGP1 showed potential to inhibit xanthine oxidase enzyme but no potential to scavenge reactive oxygen species. The MGP4 sample has shows minimal inhibition activity against angiontensin-1 converting enzyme.

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Funcap, Capes, CNPq, DAAD, Fundação Hans Neumann

Session 06: Bioeconomy

Convener:

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The following description of Bioeconomy is provided by the European Commission in the field of Research and Innovation at Horizon 2020 (http://ec.europa.eu/research/bioeconomy/):
"Bioeconomy encompasses the sustainable production of renewable resources from land, fisheries and aquaculture environments and their conversion into food, feed, fibre, bio-based products and bio-energy as well as the related public goods. The Bioeconomy includes primary production, such as agriculture, forestry, fisheries and aquaculture, and industries using/processing biological resources, such as the food and pulp and paper industries and parts of the chemical, biotechnological and energy industries."
The session seeks for presentations that combine sustainable production of renewable resources and their industrial using/processing.

Keynote **Lecture**:

Prof. Dr. Carlos Alberto Aragão de Carvalho Filho, Universide Federal Rio de Janeiro, Rio de Janeiro, Brazil
Prof. Dr. Liselotte Schebek, Technische Universität Darmstadt, Institute IWAR, Material Flow Management and Resource Economy, Darmstadt, Germany

Oral Presentations

BioEconomy in Baden-Württemberg - A systems approach

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Modern societies are currently facing global challenges due to climate change and population growth. Among these challenges water scarcity, availability of energy, sustainable food production, protection of the environment and efficient use of resources are identified as most urgent topics.
BioEconomy is seen as the most efficient driver for a sustainable use of renewable resources to provide food, feed and industrial products with enhanced properties
More than 30 countries in the world have therefore included BioEconomy in their policy strategies most of them focusing only on some aspects and objectives.
Baden-Württemberg, as one of the most innovative regions in Europe, has chosen a systems approach for making the transition from a fossil-based to a bio based economy where science and research as well as industry together with politics and society jointly are driving forces.
This holistic approach considers BioEconomy in value creation chains and as a systems approach by including all necessary stakeholders and research disciplines right from the start. To foster this ambitious approach and at the same time establish the required new mind set Baden-Württemberg is also aiming at networking with excellent partners in the field including international co-operation. Relying on long term relationships, Baden-Württemberg together with Brazilian partners are expected to bring forward the innovative approach not only by crossing country borders and borders of research disciplines but also by joining forces in research and development by active exchange programs.

The role of Brazil in the global bioeconomy

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In 1977, the Romenian economist Nicholas Georgescu-Roegen was the first to use the term "bioeconomy". Inspired by the concept of entropy, Georgescu argued that the energy demanded by economic processes had to be explicitly considered in economic analyses, because there was less and less usable energy to supply irreversible processes. For Georgescu, a technology would only be viable if it did not reduce the stock of non-renewable resources.

In the last four decades, the perception of the role of a bioeconomy has greatly changed, thanks to many biotechnological innovations directly related to the use of biological products, processes, and services in the areas of human health, agriculture and livestock. Due to scientific advances, we are now capable of understanding how life is encoded (genome, DNA) and, especially, how to copy and edit this code. Besides pharmaceuticals products, several crops have benefited from this knowledge, and so have cosmetics, animal feed, fuel, storage and processing of information, leather, vaccines, vitamins, dyes, plastics, and a variety of other products.

Thus, the genetic code should be, in the coming decades, a basis for creating economic wealth for nations. The diversity and natural genetic variability, a result of numerous possibilities of recombining genes, together with modern techniques of molecular biology used in gene programming, offer the world a virtually inexhaustible source for the engineering and manufacturing of new biological products.

The global growth of the bioeconomy can be associated the challenges brought about by population increase and aging, by the rise in per capita income, by health needs, by the need to increase the supply of food, energy, and drinking water, as well as by issues related of climate change. Brazil, thanks to agro-industrial processes related to bioenergy, coupled to modern scientific and technological progress in tropical agriculture, and to a huge territorial extension, is bound to be one of the main players in this new scenario.

Brazil has a host of opportunities thanks to a number of characteristics: i) its great biodiversity; ii) its lower costs of biomass production, especially sugarcane; and iii) its advanced tropical agriculture, based on the application of science and technology.

Biofuels and Land Use Change: Mitigation options from Regional “Good Governance”

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The EU policy sets target for renewable energies, fostering also the market use of biofuels. During the last years, this policy has been discussed controversy due to the possible impact of the EU biofuel demand on indirect Land Use Change (iLUC), carbon stocks and greenhouse gas (GHG) emissions mitigation. Against this background, the research project "GoViLa - Governance for the reduction of indirect land use change" investigates by which measures and to what extent land use change (LUC) can be reduced as a result of region-specific governance improvements under different architectures of EU biofuel mandate. The project is based on the notions that, first, drivers and consequences of LUC can only be analyzed on a regional basis, and second, that the role of (good) governance is crucial as to possible consequences from biomass supply, covering demand for all uses from food to material use, and possibly also future bioeconomy. The research is based on field investigations in regions which are relevant for today’s but also tomorrow’s biofuel supply for Europe: Brazil; Indonesia and Ukraine. Investigations cover a comprehensive review of literature and statistics, but notably expert interviews. Based on these field investigations, governance scenarios for the year 2020 have been developed which were used to drive a modelling toolset. By use of modelling approaches, comprising the CGE model MIRAGE-Biof, provided by the project partner IFPRI, and the spatial LUC model LandSHIFT, provided by the project partner Universität Kassel, land use change and the resulting carbon fluxes were quantified and thus the contribution of different governance options for mitigation of greenhouse gas emissions were analysed Project results confirm that Regional Governance influences the nature and extent of LUC significantly. "Good Governance" - combining efficiency increases in the agricultural sector with effective protection of sensitive areas - leads to the decoupling of LUC and carbon emissions.

Innovative processing of oil seeds for simultaneous recovery of edible oil, solid fuel, antioxidants, and protein-rich food ingredients

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Beside the production of oil sunflowers, canola, flax, and other protein rich oilseeds show a huge potential for bioeconomy. Up to now oilseeds have been cultivated almost exclusively for the production of plant oil. Residual materials from the plant oil production such as proteins, seed husks, carbohydrates and secondary plant metabolites have remained unutilized up to now. To reach a high level of sustainability and to fulfill the goals of bioeconomy an integrated use of all fractions of the oilseeds has to be achieved.

The presentation will provide an overview on new and sustainable fractionation technologies which enables full utilization of the residual fractions from oil seed processing. Based on adequate processing husks and carbohydrates can be used for heat and fuel generation. Oil, proteins, and secondary plant materials can be isolated using gentle processing steps in order to produce ingredients suitable for foods. These can be used as value-adding ingredients in almost all application of highly accepted vegan ingredients or just for substitution of egg, milk and meat proteins. A zero-waste strategy is being pursued for the processing.

A project example with a huge economic and ecologic impact is the cultivation of sunflowers as intercrop in Brazil and their fractionation to high valuable fractions. Brazil offers excellent conditions for large-scale sunflower cultivation as they can be used by farmers as an intermediate crop on soy or sugar cane fields and can provide farmers with an additional source of income. This can increase crop diversity and hence improve soil fertility. In addition, planting on hitherto uncultivated land could protect the land against erosion. In the mentioned project 17 partners from Germany and Brazil are involved along the entire value chain such as primary crop production, manufacture of food ingredients, energy and technical ingredients. The industry is responsible for application of the products and for the demonstration of their commercial value. The process and product developments are being appraised by undertaking a socio-economic study of the entire value-added-chain to implement also the social pillar of sustainability into the whole innovation process.

Studies of lignin powder as reinforcement for plastics composites

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We focus on the recent advances on the physical chemistry of lignin and its potential applications. Emerging trends of incorporating lignin in promising applications such as reinforcing agent for plastics composites and carbon fibers. Lignin is the only large volume renewable feedstock that contains aromatics compounds. Today, the aromatics compounds are almost exclusively derived from petroleum. This feature can provide improvement in performance of composites. Moreover, it is important to find an economical way to convert lignin to value-added materials. Efforts are being made to introduce the lignin in plastic composites such as polypropylene, with the aim of producing environmentally friendly products and with good mechanical characteristic. In this study blends of lignin powder and polypropylene were compounded in a Thermokynetic mixer (DREISS) and later on extruded and testing samples were produced by injection molding process. The produced samples were tested for physical, mechanical and thermal properties. In addition were evaluated the importance of introducing coupling agents to improve its mechanical performance. The results showed that the incorporation of the lignin powder in PP matrix resulted in a composite with suitable property application for various industrial fields, especially those were mechanical features are crucial, such as the replacement of engineering plastics.

Feasibility study to implement anaerobic digesters for agricultural and manure wastes: Guanajuato, Mexico case study

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Anaerobic reactors transform biological material into biogas and fertilizer in absence of oxygen and it is believed that this technology could be an efficient way of utilising sorghum residue that would otherwise be burnt in open field in Central Mexico, causing environmental pollution. Therefore, the aim of this research was to test the technical and economic feasibility of implementing anaerobic digesters in Guanajuato to convert agricultural residues in valuable products. A laboratory experiment was designed to calculate biogas production from samples of sorghum steam mixed either with pig or cattle manure. Comparisons were made between 7.5% and 10.5% Volatile Solids (VS) concentration at 25° and 38°C (temperatures in Guanajuato). The volume of biogas was calculated by displacement in a eudiometer as DIN-38-414-8. Each experiment was carried out over 40 days by duplication. Socio-economic feasibility was assessed by estimating the rate of return on investment and by doing surveys with local producers to estimate production and operational costs, as well as likely acceptance of technology. Results indicated that sorghum-pig manure yielded the highest biogas at 38°C (2.5 $m^{3*}kgVS^{-1}$), regardless of whether they had more VS concentration. At room temperature, pig samples with 10.5%VS produced 1.7 $m^{3*}kgVS^{-1}$, while both cattle and pig manure samples 7.5%VS generated 1 $m^{3*}kgVS^{-1}$ of biogas. Digestates (remaining solid phase) can be used to substitute synthetic fertilizers, pig mixtures demonstrated to have enough nutrients while cattle samples would require adjustment to nitrogen content to reach the same quality. Regarding socio-economic issues, it was found that 62% of farmers and ranchers were familiar with the technology, 87% of the owners were interested in installing one biodigester and the main market segment to purchase a biodigester directly were landowners with >10 ha. This represent a potential of installing 3,000 in the area. However, the internal rate of return was found to be at the limit of economic feasibility (4.2), so, investment strategies are needed that could make this an attractive option for farmers. The main benefits found were savings on gas and synthetic fertilizer purchases, which suggest that these products should be used mainly for self-consumption. Overall, implementation of anaerobic digesters in Guanajuato has a great potential as an option to decrease bio-wastes and to produce renewable fuel and fertilizers.

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Use of Seaweed and Macroalgae by means of Hydrothermal Carbonization (HTC) in Respect to their Energetic and Adsorptive Potentials.

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Seaweed and algae populations are increasingly growing worldwide due to global warming and climate change. Hydrothermal Carbonization (HTC) utilizes wet biomass, produces biochar and offers a sustainable possibility of integrating wet biomass into different material flows (Hu et al. 2010). Our research focused on estimating the energetic and adsorptive potentials. By evaluating the design of experiment a significant increase in calorific value could be achieved. Seaweed and macroalgae have been carbonized and the biochar produced has been added to garden soil. Plant tests with different biochar-soil mixtures showed that the optimum value for biochar addition to increase biomass production is around 5%. Analyses of nitrate concentrations showed that biochar addition to soil decreased nitrate leaching of soil. Adsorptive potential estimation was done by Langmiur isotherms and surface characterization by REM. HTC biochar from seaweed showed a water adsorption capacity similar to conventional activated charcoal.

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Poster Presentations

Ashes – Recovery of Nutrients from Ashes Produced by Thermochemical Processes Based on Bagasse or Bagasse

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Annually, bioethanol production in Brazil gives rise to about 250 million tons of bagasse[1]. Most of the residues produced are subjected to thermal utilization. Some of the plants used for this purpose were built as early as in the 1960s. Hence, their energy balance is far from being optimum. Intensive cultivation of soils and application of untreated residues, such as vinasse, results in an insufficient supply of the soils with nutrients. Soils are increasingly acidified or salinized[2,3]. The international project is aimed at developing concepts for an integrated use of nutrients based on highly efficient co-generation plants in cooperation with the Brazilian partners.

Within the framework of the project, it is planned to use the residues of bioethanol production for the generation of energy by gasification and combustion. The process conditions are to be chosen such that ashes are produced, which are suited for use as fertilizers or fillers in composites. It is envisaged to develop process optimizations for the production of low-pollutant ashes that can then be processed to full-fledged and competitive recycled fertilizers[4]. Moreover, it is to be studied to what an extent ashes, from which the nutrients have been separated, can be used as functional fillers of biopolymer compounds[5].

The joint project will be carried out by four Brazilian and eight German partners. It may represent an important contribution to reducing the consumption of raw phosphate[6,7]. Imports of phosphate contain traces of uranium. These traces can also be found in drinking water. Hence, recycled ashes may contribute indirectly to improving soil and drinking water quality. Moreover, the project contributes to the global reduction of CO_2 emission.

The economic potential for Brazil is high. In Brazil sugar cane lies in second place of the energy mix[8]. Optimization of existing plants and more efficient thermal utilization also result in an enormous commercial potential. Recycling markets have a higher economic stability and are less dependent on regional markets. The recycling scheme envisaged will make the regional nutrient cycles independent of the regional markets in the long term. This will not only secure availability, but also create an economic advantage.

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Comparative Study of Kraft Lignin from Different Sources for Composites Applications

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Lignin is one of the most abundant renewable aromatic biopolymer, which is separated from biomass via pulping process on the commercial scale [1]. Among all the chemical pulping process, the most used is the kraft process in which the waste produced is known as black liquor [2]. Worldwide efforts are being made to use the energy potential present in the lignin for the production of high value-added products such as chemicals feedstock, carbon fiber and plastic composites. In order to use lignin as a reinforcing agent in composite were evaluated their thermal and chemical characteristics. Two industrial kraft lignins (softwood lignin Indulin AT from MeadWestvaco and hardwood lignin from Lwarcel, Brazil) were subjected to FTIR analysis to identify functional groups. Thermogravimetric Analysis (TGA) were carried out to determine the thermal stability, composition, presence of impurities of lignin from different sources. This study demonstrated that the hardwood lignin has a higher thermal stability than the softwood lignin. Furthermore, the hardwood lignin has a higher presence of reactive groups such as hydroxyl and carbonyl and lower rate of guaiacyl/syringyl compared with softwood lignin. In polymeric blends, the presence of reactive groups increases the degree of affinity between the plastic matrix and lignin [3] due to the formation of crosslink between phases [4]. In conclusion, the hardwood lignin will result in a better interphase and bondability between lignin and the thermoplastic matrix.

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Simulated Future Soybean Productivity throughout Mato Grosso and Pará, Brazil

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Introduction

Future crop productivity will be affected by multiple factors including climate, breeding and management. While crop models are a powerful tool to assess the impact of climate change and increased CO_2 concentration on crop yields, there are still many uncertainties in relation to technological development. Although technology development has been identified as the most important driver of productivity gains, relative yield increases are unlikely to maintain a constant trend. This study puts forth a new approach to forecast technology driven productivity gains and to apply this approach to production systems in the Southern Amazon.

Methodology

We assume that long-term crop productivity trends can be described by a sigmoid function with initial low yield increases that accelerate over time and slow down as they approach an upper yield limit, as: $Y(t_i)=K/[1+e^(-r*(t_i-t_m))]$ where, $Y(t_i)$= yield at year t_i, K=biological yield maximum, r= slope and t_m=year of sigmoid inflection point. According to a theoretical biological yield maximum, farmers who have not yet reached the sigmoid inflection point will experience increasing yield gains, while farmers who have passed it will experience decreasing rates of yield gains and finally yield stagnation. The location of a farmer on the sigmoid curve can be estimated by solving the sigmoid function for t_i, which gives the following equation: $t_i=t_m+[\ln(K/Y(t_i)-1)]*1/-r$. This methodology was applied to high resolution (0.9x0.9km) yield maps for soybean, simulated with the Model for Nitrogen and Carbon dynamics in Agro-ecosystems (MONICA), a process-based simulation model.

Results

Our results show that genetic progress and improved crop management could lead to average soybean yield increases of around 43% between 2010 and 2030. While the southern municipalities of Mato Grosso could experience relatively modest yield increases of 28.4%, soybean productivity in North Pará could increase by up to 66.3%.

Discussion

This study provides a new approach to estimating future crop productivity as affected by technological development. Our approach can be used for different crops and different time periods and can also be applied to other regions where data on historical yield trends is available. Although these values provide a good estimate of what is biophysically possible, there is still scope for change in the future. Increasing ambient CO_2 concentration, harvest index and planting density are factors that may shift the biological yield maximum further upward.

Piteira and Banana Fibers as Reinforcement in Lignin Based Polypropylene Composites

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The world plastic consumption has been increasing progressively in recent years. The concern for the environmental pollution and the mitigation of the use of non-renewable resources has attracted researchers looking for the development of new eco-friendly materials and products based on sustainability principles. The natural fibers provide indisputable advantages over synthetic reinforcement materials, such as low cost, low density, non-toxicity, higher specific modulus, and minimum waste disposal problems [1]. Moreover, there are the emerging trends of incorporating lignin in promising applications such as reinforcement agent for thermoplastics composites [2]. In the present study, banana and piteira fibers together with lignin were blended and the mechanical properties of these composites were evaluated. The natural fibers were washed, dried and then milled. Blends of lignin powder, natural fiber and polypropylene were extruded and later the samples were produced by injection molding process. The specimens were subjected to tensile, surface hardness, flexural and impact tests. The results showed a significant difference between the composites studied. In general, the piteira fiber interacted more efficiently with lignin observed by the increase of the tensile and impact strength of composites. Furthermore, the composite demonstrated suitable property applications for industrial various fields, such as the replacement of engineering plastics and light weight materials.

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Carbohydrate-based polymers for the encapsulation by spray-drying as a substitute for microplastics

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The release of non-degradable polymeric particles into our environment has drawn the attention of the public. One issue is the fragmentation of plastic debris by mechanical and photochemical impact, so called secondary micro particles. [1] In addition, sewage water contains primary micro particles originating from industry and consumer products e.g. cosmetic products. The main problem is the application of non-degradable polymers such as polyethylene and polypropylene. [2] The organisms in the aquatic environment are able to ingest and incorporate those non-degradable particles. Tanaka et al. proved recently that those plastic particles contain high concentrations of heavy metals adsorbed on their surface, which accumulates in the food chain. [3] However, not only particles are stressing the ecological system, but also pharmaceutical substances and their metabolites often harm our environment. Therefore, new methods of drug applications and formulations are required to lower the required concentrations. [4] Beside the continuous release of the drug, the particles should be degradable to prevent the described accumulations. [5]
In this work we investigate a general approach for the usage of carbohydrates from renewable resources as encapsulation material for the spray-drying technology. We develop applications based on renewable and degradable biopolymers as a substitute material for the usage in e.g. agriculture, cosmetic and food industry. The main focus of our study is the investigation of encapsulating representative low molecular substances like ascorbic acid or limonene with carbohydrate-based polymers using the spray-drying process. Therefor we apply technically available and well known carbohydrates such as inulin, xanthan, cellulose and derivatives. The process parameters for the spray-drying method are investigated and optimized by using design of experiment. After the spray-drying process, the particles are analyzed via scanning electron microscope and by light scattering methods. The release behavior of the encapsulated substances is determined in different solutions via high-performance liquid chromatography.

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Session 07: Law

Convener:

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Money and law are most effective means to reach political goals. The question is how these means are used and if they can be used in a better way to forward sustainable development. To answer this question a comparison between the approaches of different legal systems shall take place. Special attention may be given to the use and usefulness of financial instruments like subsidies (for example to promote wind and solar energy as in Germany) or market mechanism (for example emission trading system, water market). The theme invites for contributions on all parts of environmental law encompassing climate, air, water, soil, nature, and landscape protection. The focus is on the impact of stirring instruments.

Keynote **Lecture**

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Prof. Dr. José Rubens Morato Leite, Federal University of Santa Catarina, *CCJ*, Departamento de Direito- UFSC, Campus Universitário, Trindade – Florianópolis, Brazil
Prof. Dr. Ute Mager, Institute for German and European Administrative, Heidelberg University, Institut für deutsches und europäisches Verwaltungsrecht, University Heidelberg, Heidelberg Center for the Environment, Heidelberg, Germany

Oral Presentations

European Environmental Law and Sustainability – an Introduction

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This contribution gives an overview of European environmental law, an area, which in Europe has become far more important than national environmental law. Development, main structures and principles of the environmental law of the European Union, especially the integration principle and the principle of sustainability, will be outlined.
Furthermore, the speech will present the legal competences of the EU with relevance to the protection of the environment. Actors, instruments, law-making procedures, but also the possibility of Member States to derogate from the European level of protection will be some of the issues dealt with. Finally, the speaker will address the question whether EU law has been substantially "greened" over the last 30 years, or not and in which areas the need for more, or a better environmental legislation persists.

Making states and international organizations extra-compliant to social and environmental safeguards: human rights and sustainable development as guiding principles for multilateral and bilateral financing projects (PAINEL)

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The paper seeks to offer a critical analysis of the current debate on responsibility of states and international organizations in the context of bilateral and multilateral financing activities of governmental projects with environmental linkages and the main roots of compliance patters focused on social and environmental safeguards in accordance with domestic and international laws. It is submitted that the roles of states and international organizations, such as multilateral and bilateral financing agencies, in international loan transactions should be guided to ensure compliance, transparency and accountability – both taken as components of global governance. The recent discussion of a potential weakening of World Bank environmental and social safeguards in July 2014 paved the way for reassessment of how these safeguards are indisputably connected with human rights and sustainable development and how states and international institutions shall increase environmental and social quality of financing, lending and project monitoring instead of simply formulating flexible donation or loan approval policies. The proposed talk by the occasion of the will select particular cases in developing countries (including Brazil) where existing international legal instruments and financing projects have been challenged because they allegedly contravene national and international human rights and environmental rules. The conclusion is devoted to articulate recommendations for core actors, such as states, subnational entities, international organizations, PPPs and NGOs in tackling the main issues arising from responsibility. One of the assumptions is to return to the foundations of sustainable development as an ethos for the international economics and the global society.

Environmental Law in north-south commercial relations.

Derani, C.

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The rules governing international trade relations are based on the principle of equality of parties in trade practice and freedom of trade. However, this assumption is opposed to a reality made of parties that have seen social, environmental, cultural and economic inequalities deepen over the years. Environmental issues arise within productive relationships. In a globalised world, the economic process is comprised by an interdependence in trade and investment between countries. From a North-South perspective, this economic interdependence is asymmetrical when concerning the division of costs and benefits, which is especially marked in the depreciation of natural resources. The circulation of goods and services usually sets a distance between causes and effects in terms of environmental damages, which local norms and policies can do little about. When the matter is environmental, causes and effects are distant in space and time.

Addressing this issue requires necessarily an effective presence of international law capable of reaching the negative causes and effects on the localized environment in different countries. The objective of sustainability can only be achieved with the coordinated participation of several countries, which should be concerted by international law. Fair practices in trade are beyond fictitious liberalism, which does not mean protectionism. Reinvention of the economy beyond dualism is a international legal process. Even within WTO ways have already been opened which will lead to trade relations based on more realistic principles, aware of human health and environment.

The international society has common values, identified and respected by States which should be stimulated to construct North-South economic relations that are positive towards environment and human beings. False necessities and false contingencies (Koskenniemi) should not inhibit the identification of universal international law, committed to cultural diversity, the peculiarities of the products and process of every environment, culture or national economic conditions. International law should unite peoples without exerting cultural, political or economic dominance. The proposal of this article is to demonstrate how international law is capable of diminishing economic asymmetries and at the same time committing countries towards trade practices which are positive from a global perspective and in this way bringing about better general economic conditions. To this aim, rather then new rules, it is necessary to understand existing legal provisions in a new light. Apart from new tools, a new way must be searched if a new end is sought.

Environmental Refugees: The Brazilian position on Haiti immigration after the 2010 earthquake.

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People that suffer violations on their fundamental rights from something they can't control must have their human rights protected by national and international law. In this context, this talk will argue that there is a group of people unprotected by law called by "environmental refugees". Environmental disasters, natural or caused by man, are increasingly common in the modern day. One of its consequences is the displacement of the affected population, seeking a safe place to live. These people move within their countries or across international borders looking for a place to establish themselves, however, without any legal support they find themselves in an extremely vulnerable situation. Despite the doctrine classifying people that move motivated or forced by environmental causes as "environmental refugees", the governments and international organizations still do not take an effective attitude once there is no support in the international legal system. Having this problem in mind, this exposition aims to situate the "environmental refugees" in the international law context and, after that, critically analyze the ambiguous position of the Brazilian government towards Haitian immigration after the earthquake in 2010. First, the government attitude was to state these people as refugees. Realizing that this recognition could encourage immigration once it would be bind by the Refugee Convention and that this could encourage more immigration, it has decided to adopt the humanitarian visa policy as an alternative. This position led to encouraging not only the earthquake affected people but also the so called "economic migrants" to come to Brazil. This research begins with an international literature review of the emerging "environmental refugees" category and its critics. Then it verifies the international agreements which bind Brazil such as the 1951 Refugee Statute and the following 1967 Protocol, the regional Cartagena Declaration and after their integration into national law as the Law 9.474/97. Overall, it analyzes the factors and reasons that motivated the Brazilian Government to apply the normative rule nº97/12 and nº113/14 which regulated the humanitarian visa for Haiti migration and that has the consequence of letting affected people unprotected, once the visas can be suspended at any time regardless of Haiti situation.

Constitutional Environmental Law in Brazil: Jurisprudence in National High Court (Stj)

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The 21st Century is marked by a complex and multidimensional environmental crisis, which demands new approaches capable of offering adequate solutions for the existent environmental problems. Besides, this period in humanity's history, called "the second modernity", is characterized by the predominance of global risks, which have the characteristics of delocalization, incalculability and non-compensability. Therefore, within this context – in which dangerous climate change, water scarcity and deforestation represent real threats to the environment and to human well-being – States face new challenges in properly addressing these global risks and problems. Concerning more specifically Brazil, many are the cases related to the matter that reach the National High Court (STJ), which thus plays an important role in ensuring environmental protection, a right established by the Constitution. In order to achieve this protection, an adequate legal interpretation for the environmental legislation is needed, which must be based on environmental law principles and the fundamental right to a healthy and balanced environment.

That being said, the lecture aims to analyse how the Brazil's STJ Jurisprudence has been evolving in terms of the interpretation of the environmental rules related to protect areas, highlighting specific cases and their contribution to the consolidation of a more adequate interpretation strategy within the Court. This "new strategy", also known as "environmental hermeneutics", has been developed, mainly since the Constitution of 1988, and also contributes for the development of environmental law, once that the country's environmental legislation is often miscomprehended and unclear and it is up to the Courts to give it the proper interpretation according to the Constitution, preventing the occurrence of major environmental harms.

The search for these responses has led to the inclusion of environmental protection in various national constitutions and international documents on human rights[1]. However, it has also brought about wide-reaching academic discussion on the necessity and legitimacy of the recognition of a right to the environment itself[2]. Therefore, the status that such a right should assume remains controversial.

The debate about is area of is important by exploring the benefits of a rights-based constitutional approach within a 'radical-democratic' constitution. It does not provide an exhaustive analysis of the intersection of human rights theory, constitutional law and environmental protection; other works have scrutinized such theoretical foundations. Instead, it constitutes an attempt to develop a grounded examination of one specific case of constitutionalization of environmental rights. It does so by giving an account of the constitutional design adopted by a Latin American country, Brazil. Brazil has played a leadership role within Latin America by developing progressive domestic environmental law and including the right to a healthy environment in the 1988 Constitution as a fundamental right. With Brazil's rise in global influence, both for its economic performance and for the value of its natural resources, its regulatory environmental choices are under scrutiny.

1: Edith Brown Weiss, *In Fairness to Future Generations* (Transnational Publishers 1989); Ernst Brandl and Hartwin Bungert, 'Constitutional entrenchment of environmental protection: A comparative analysis of experiences abroad' (1992) 16(1) Harv Envtl L Rev 1.

2: Tim Hayward, 'Constitutional Environmental Rights: a Case for Political Analysis' (2000) 48 Political Studies 558.

The regulation of new Technologies as a way to secure a sustainable Future: Labelling of Genetic modified Organisms in Brazil and Germany

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The right to information is a fundamental right on the Brazilian Constitution of 1988, regulated by the Brazilian Consumer Defense Code. The ethics and the risks are intrinsically related to the right to information, which have been always a subject for genetically modified organisms (GMOs). In 1973, a debate between scientists started about the impacts of GMOs. Later, in 1975, occurred the Asilomar Conference on Recombinant DNA, where, despite of the different opinions, the researches discussed about measures and security standards, placed on a document, in which they ask for caution. The debate got intensified in the 80s and 90s because of the advances on biotechnology, therefore several international documents about manipulation of living organisms were elaborated, such as the Convention on Biological Diversity and the Cartagena Protocol on Biosafety. In Brazil, the Law nº 8.974/1995 was the first to regulate genetic engineering technique and genetically modified organisms. The discussion heated on 1998, when the Brazilian Technic Commission of Safety (CTNBio) authorized Monsanto to cultivate genetic modified soy beans. Since this first authorization, several events occurred. In consequence, the first law was revoked by the Law nº 11.105/2005, which regulates the security and inspection mechanisms to the research and the commercial use of GMOs, whose increasing use show the relevance of the right to information as a way to guarantee a choice to the society. The Law nº 11.105/2005 provides that the food and the feeding ingredients for humans and animals with GMOs shall present this information on its label, which were regulated by the Decree nº 4.680-2003 and nº 5591-2005. The first one provides the mandatory need to inform the consumer on the labels when the presence of GMOs is above 1%. Furthermore, it imposes the tracking as a way to guarantee the appropriate right to information, indicating the GMO use by fiscal documents, in order to inform all the steps of the process, such as transportation, storage, manufacturing and selling. That is where the problems begin: the competence of the Brazilian Ministry of Agriculture (Mapa) to inspection is so defected that affects all the other steps causing the lack of the information on the labels of the final products. On the opposite side, the German law provides the possibility of the label indicating that the food was not produced using GMOs (“ohne Gentechnik” label). In advance, it is not allowed to use a logo or a showy symbol on GMO products. In conclusion, the debate about the use of GMOs is very current and still without consent. For that very reason, the guarantee of the right to information by labelling is such a relevant subject on both countries.

Disaster law in Brazil: Challenges in the global climate change era.

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With global climate change the occurrence of extreme weather events and disasters is becoming more common. Having this problematic in mind, this paper aims to critically analyse how, in the field of law, we are addressing in Brazil the question of the so called 'disasters' and what are the main challenges that the new National Policy for Protection and Civil Defence faces. It is well known by the scientific community that human activities are promoting unprecedented changes in the atmosphere and that global climate change is indeed occurring. Amongst the big five reasons for concern about climate change, listed by the Intergovernmental Panel on Climate Change (IPCC), we can find the increased risk of occurrence of extreme weather events, which may cause severe alterations in the functioning of communities and societies. These alterations interact with vulnerable social conditions, leading to adverse effects and disasters that demand adequate policies and prompt emergency response. What will define whether an extreme weather event is going to become a disaster or not is the high exposure and vulnerability levels of the community where it happens, as well as the timing and other determinants. The branch of Law that studies these aspects more specifically is called Disaster Law and is an emerging legal academic field with an interdisciplinary approach. In Brazil, before 2012, when the National Policy for Protection and Civil Defence (Federal Law No 12,608) was released stablishing a new legal structure to disasters in Brazil's Law, two major laws used to regulate the subject: the Decree No. 7,257 (2010) and the Federal Law No. 12,340 (2010), which only focused their attention on the function of responding and attending disastrous events. The new legislation, on the other hand, gave a systemic approach to the problem, focusing on preventative actions for reducing the number of disasters. Nevertheless, this new legal model still needs to be fully achieved and implemented in a country that faces several political and structural problems. This research began with a literature review, investigation of laws and international documents. Overall, it verifies the application of the Critical Theory of World Risk Society, from the sociologist Ulrich Beck, and analyses the international and Brazilian legislation and policies related to disasters, in order to identify the main challenges faced by them and their gaps, which need to be improved in order to secure a better future for present and future generations.

The meaning of sustainable development in water law

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The subject of this contribution is the impact of the principle of sustainable development on water law. It will be shown that and how different water law concepts hinder or promote the implementation of the principle of sustainable development in water law. Differentiating between surface water and groundwater as well as between water quality and water quantity issues more special expressions of the sustainable development principle will be presented and explained: for example the ecological flow requirement concerning surface water or the safe yield requirement concerning groundwater. It will become obvious that sustainable development in water law can only be realized by an integrated water management concept.

Analysis of Governance potentials and constraints for decentralized Rural Sanitation Solutions in Rio de Janeiro.

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The governance of the sanitation sector in Brazil was directed by the Law 11.445/2007, establishing national guidelines for basic sanitation, and the Law 9.433/1997, referring to the national policy of water resources. Both laws contain some requirements to ensure the sustainability of sanitation investments, but there is a predominance of preventative concepts and discursive omissions, besides ambiguous visions within the same legislation[1]. Especially in rural and remote areas with low income population, investment in installation and maintenance of water treatment and reuse facilities becomes challenging[2]. On one hand, to overcome the investment difficulties, non-refundable state investments are necessary for an overall development of wastewater treatment and reuse facilities in rural and remote areas. On the other hand, decentralization measures for water governance within the scope of National Water Resources Policy enforce private sector participation in the water sector. Therefore, new ways of wastewater management are required. However, main challenges in wastewater treatment and reuse management arise due to unclear fragmentation of responsibilities and consistent distribution of federal financial resources, as well as regulatory uncertainties and contractual irregularities, which at last hinder the quality of investments and private equity in the sanitation sector.

The study undertaken within the framework of the INTECRAL[3] and the Rio Rural[4] projects is based on stakeholder analysis in the sanitation sector, legal framework analysis on federal, state (RJ) and municipality (Nova Friburgo) levels as well as on analysis of socio-economic conditions of a specific rural area (Barracão dos Mendes - Nova Friburgo). It aims to find feasible recommendations for sustainable decentralized water treatment and reuse solutions suitable to the socio-economic conditions of rural areas of Rio de Janeiro in order to improve water quality and achieve associated environmental, sanitary and agricultural benefits in the investigation area.

1: Compare: Souza, C.M.N; Freitas, C.M; Morales, L.R.S. (2007): Discursos sobre a relação saneamento-saúde-ambiente na legislação: uma análise de conceitos e diretrizes Engenharia Sanitária e Ambiental, v.12, n. 4, p. 371-379.

2: Prosab (2006): http://www.finep.gov.br/fundos_setoriais/acao_transversal/documentos/Texto_completo_PROSAB.PDF

3: INTECRAL: http://intecral-project.web.fh-koeln.de/about-the-project

4: Rio Rural: http://www.microbacias.rj.gov.br/

Incompatability between the Application of the *Fait Accompli* Theory and the Transgenerational Duty to Preserve Environmental Quality

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In Brazilian law, the *Fait Accompli* Theory originates from the 1960s in Supreme Court decisions involving subjects related to the civil service employment selection process. Over time this extended into other dominions of law reaching the environmental sphere. Currently, a new trend is emerging in Superior Court of Justice decisions to reject the application of this argument on the grounds of diverse constitutional principles and the infra-constitutional legislation. However, although not yet explicit, judgements have been identified in which the magistrates overrule requests for demolitions, restoration and landfill removal – in other words, measures that would mean complete *in situ* recovery from environmental damage – under the most diverse pretexts that, after a thorough analysis, also could be placed under the argument of *fait accompli*. These decisions disrespect the statute of the environmental well-being which is of fundamental importance to the collective, connected with the right to life. They also do not combine with the guiding principles of environmental laws, especially those of maximum protection of environmental quality and the intergenerational equity, both apparently disregarded when damage to the environmental well-being is supported by arguments such as, amongst others: good-faith, legality of the conduct, difficulties to undo harmful interventions, excessive burden for recovery of extreme damage and economic advantages arising from environmental damage which far exceed its negative impacts. More recently, the influence of the *Fait Accompli* Theory in the legislative plan has been verified. The precursor was Resolution n.º 369/06 of CONAMA (National Environment Council) when appraising "consolidated occupation" to make the so called "sustainable urban regularization" possible in urban areas. This normative act whose infra-legal matrix inspired the Provisional Measure n.º 459/09, later converted into Federal Law n.º 11.977/09, creating the "My House, My Life" program. After this came a "new" Forest Code (Federal Law nº 12.651/12), when the concepts of "consolidated rural area" and "consolidated legal reserve area" were created to allow ambient damages perpetrated up until the 22 of July, 2008 to remain untouched, thus violating the main principles of environmental law mentioned above, placing at risk the ecological functions of the areas of permanent preservation and the legal reserve, detrimental to the quality of life of present and future generations. This set of laws that convert illicit actions, and even environmental damage, into "Consolidated situations" are nothing more than a legislative expression of the *Fait Accompli* Theory, whose ideals, as we intend to demonstrate in this paper, are not compatible with the Brazilian constitutional framework and legal guardianship of the environment.

Transition of dumpsites to sanitary landfill – Analysis of Brazilian situation

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The law n° 12.305 of 2nd of August 2010 establishes the Brazilian National Policy of Solid Waste. It determines principles, objectives, instruments, as well as guidelines concerning the integrated and environmentally sound solid waste management system. In its article 54, it is stated that adequate final disposal of solid waste must be implemented in all municipalities within a period of four years after the publication of the law (BRASIL, 2010). However, upon reaching the required deadline of the 2nd of August 2014, 59 % of the municipalities did not manage to accomplish the requirements of the law, and have not developed an adequate destination to their municipal solid waste (MMA, 2014).
In this sense, it is urgent to understand and discuss the reasons for the high non- compliance of the National Policy of Solid Waste. An overview of the 5 Brazilian political-administrative regions is presented. The situation of their solid waste management system concerning quantity and quality of waste, collection, transportation, treatment, final disposal and related administrative and financial issues are given. The difficulties and challenges faced by the municipalities during the transition from dumpsites to sanitary landfills is explored in environmental, social, political, technical and financial aspects. An analysis of how this transition is supported by the law and its instruments was carried out. Regional alternatives to improve the solid waste disposal system are also suggested in the study.

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Rural Waste Dilemma in China: Law, Policies and its effect

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Rural area consists 60% of Chinese territory and lives half of Chinese population. The rural population has comparative low personal income. The vast area and limited financial capability brings challenge to rural waste treatment. Rural waste in China mainly consists of biodegradable, recyclable solid and liquid waste. Now most of them are still processed by open dumping and burning. Chinese environmental law and financial resources are focus on urban area. This is and will cause serious environmental and hygeian problems.

On rural waste treatment, Chinese national legislation sets reduce, recycle, environmental sound treatment (3R) and polluter pays principles. But there are no national laws and implementation measures specific focus on it. Provincial congresses are delegated the power to draft their own regulation, which is seldom done. Current central responsible administrative system is fragmented. Hazardous, E-waste, recyclable waste are under different jurisdictions, which is hard to conduct unified and effective movement. Without clear responsibilities and funding, local administrative authorities do not have motivation to solve the problem. Rural communities lack public service and economic capacity to deal with it.

Using empirical data in Hubei Province, the author will work on possible legal and fiscal measures on waste treatment regulation system, such as fees, punitive measures and incentives, subsidy and public investment on collection, separation, recycling and biomass industry. And the author will bring practical legislation suggestions to national and local legislation authorities.

Environmental justice and waste management: a transboundary and transdisciplinary analysis.

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The material reproduction of humanity has two fundamental aspects: sources and waste production. Sources are the terrestrial stocks of matter and energy, which are limited, and the solar flux. Waste, on the other hand, is the outcome of the economic process that causes several forms of environmental damage. The current economic model of growth sets high standards of consumption and production, disregarding that the production process is an open subsystem working within a closed system: the biosphere. As a consequence of that, matter and energy lost in this process are received and accumulated in the biosphere. Therefore, such patterns of consumption and production can be considered an important cause of the environmental crises, composed, among others, for the waste crises.

However, it is clear that as well as the environmental crisis itself, the waste crisis affects people and countries differently. Factors such as economic power, race and "level" of development influence on how the waste problem impact different populations. An example of this are the cases of illegal export of waste from northern countries to southern countries, causing serious social and environmental problems in host countries. Furthermore, within countries, among other consequences, usually the final disposal of waste occurs in areas of poor, black and marginalized populations. This is precisely the perspective adopted by the environmental justice theory, which verifies the mainstreaming of social problems and environmental issues, their mutual interference and interconnections.

Thereby, the main objective of this research is to analyze comparatively the impact of the waste policy and its legislation in a developed country in the north, and do the same review in a developing southern country (Brazil) from the environmental justice point of view. The study intends to perform this analysis between the countries and inside each country, verifying how waste policies and legislation affect people in different ways. For this purpose, will be used Brazilian and foreign literature, international documents, national policies, standards and regulations. Furthermore, it will have an interdisciplinary approach, as this subject needs to be analyzed by different perspectives, as the economic, social and legal, always considering the biophysical limits of the Earth and the concept of environmental justice, which takes into account the interaction between environment and human societies.

Poster Presentations

Comparative evaluation between Brazilian and German procedures regarding permission to discharge wastewaters in rivers

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The permission to use water resources is one of the management tools provided in the Brazilian legislation that aims to ensure the quantitative and qualitative control of water use and the effective exercise of rights of access to water (BRASIL, 1997) and, thus contribute to the rational and integrated use of water resources for sustainable development. The permission to discharge wastewaters is the mode that is intended to prevent water shortages in quality and possible conflicts for many different uses, especially in the context of surface water (rivers), which are so vulnerable to pollution and contamination, due to specific wastewater discharges or diffuse. In the Brazilian state called Paraná the application of this permission is still challenging, even this kind of permission regulated for 14 years, it is an emerging area in practice and occurs, actually, with some limitations and flexibilities. For this reason, known cases that have achieved good results as its implementation, reflecting on the prevention of pollution, preservation and restoration of natural river waters, it is a possible reference to the Paraná enhance your technical analysis and making decisions concerning with this management tool. Thus, the Paraná was compared with Landkreis Ludwigsburg's (situated in the state of Baden-Württemberg, Germany) procedures for permission to discharge wastewaters until March 2011, through extensive research of Brazilian and German laws of water resources, professional experience stage and the permission authorities of these local. The practice of permission to discharge wastewaters occurs at this location for over 50 years and controls all releases of specific and direct wastewaters in existing rivers in this region. In this region the rivers' water quality ranks from moderately polluted to clean (LANDKREIS LUDWIGSBURG, 2015), which may be the result of an efficient practice of this permission associated with other actions related to the management occurring in this region. So this German experience can be a reference to improve the technical analysis and decisions regarding permission to discharge wastewaters in Paraná and be seen as one way to improve and preserve the Paraná rivers' water quality. That will only be possible if more active participation at the political level/state government, technically and physically restructuring the management body of Paraná water resources, in order to meet more thoroughly and satisfactorily the great demand for permission of administrative procedures for discharge wastewaters. Some examples of this German experience and what kind of effects in Paraná's permission will be presented in poster. We would like to acknowledge the financial support of the DAAD for realization of these studies.

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LANDKREIS LUDWIGSBURG. Übersichtskarte Gewässergüte. Disponível em: <http://www.landkreis-ludwigsburg.de>. Acess in: 09 fev. 2015.

Session 08: Economy

Convener:

M. Weichert[1], Prof. Dr. U. A.Glasmacher[2]

1: German House of Science and Innovation – São Paulo (DWIH-SP), Sao Paulo, Brazil
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The session seeks for contributions that cover the sustainability in economy in the sense of the description of the business directory (www.businessdictionary.com/definition/ economic-sustainability.html):
"The use of various strategies for employing existing resources optimally so that a responsible and beneficial balance can be achieved over the longer term. Within a business context, economic sustainability involves using the assorted assets of the company efficiently to allow it to continue functioning profitability over time". Sustainable Economy is often called New Economy. Another description is provided by the web page www.sustainable.org: "The goal of community sustainability is to establish local economies that are economically viable, environmentally sound and socially responsible. Achieving this goal requires participation from all sectors of the community, both to determine community needs and to identify and implement innovative and appropriate solutions. This section presents information from a variety of sources on approaches and techniques used successfully in different communities to develop key aspects of their local economies on a sustainable basis".

Keynote Lecture:

Prof. Dr. Anthony SF Chiu, Industrial System Engineering, De La Salle University, Manila, Philippines
Prof. Dr. Sita Vanka, School of Management, University of Hyderabad, Hyderabad, India

Oral Presentations

Green Industry Initiatives in Asia Pacific through Eco-Industrial Development and RECP

Anthony SF Chiu

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Forty-five (45) Asia Pacific (AP) economies jointly requested the United Nations Industrial Development Organization (UNIDO) to organize a platform for greening the industry in 2009. The Philippine government hosted this ministerial summit in Manila on September 9-11, 2009; and led to the signing of the *Manila Declaration on Green Industry*. Some forty (40) experts in this Summit stayed on to participate in a back-to-back UNEP-UN ESCAP Sustainable Development expert meeting at Yuchengco Hall, De La Salle University on September 12, 2009, chaired by the author. The Green Industry Declaration aims to attain green industry initiatives and greening existing industries through various high impact sustainable production strategies, among these are eco-industrial development (EID), resource efficient and cleaner production (RECP), and greening of supply chain (GSC). Technological programs cannot happen in vacuum; the programs need enabling factors, especially the green industry policies at both national and local levels.

This presentation will review some current policy updates in selected Asia Pacific and ASEAN economies. This presentation also attempts to describe how successful EID initiatives in certain AP economies can be benchmarked in other developing ASEAN economies, and what are the up-scaling options through proximity parameter and value chain criteria. Furthermore, as Green Industry has evolved to Inclusive and Sustainable Industrialization (ISI) scheme at the *2013 Lima Declaration*; various elements introduced earlier present strong evidence to leapfrog current industrial performance towards a triple-bottom-line oriented Sustainable Development Goal (SDG).

Capacity Building– A Sustainable Approach for Continuing Education of Women in Indian Businesses

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It has been established in the recent past that capacity building is central to the quest for sustainable development. If the society plans to realize the goals of Agenda 21, which were strongly reaffirmed at the World Summit on Sustainable Development (WSSD), the ability of regional organizations, national governments and civil society to address the principal challenges of sustainable development must be reinforced. Capacity building has therefore become a key aim of technical assistance provided by the United Nations system. There has been a clear shift in the concept – from a mere component or by-product of development programs to a principal and explicit priority of all UN activities. Chapter 37 of Agenda 21 clearly focusses on the nature and importance of capacity building. It is the key to the Agenda's successful implementation. Without the necessary capacity, it would be difficult for the developing countries to identify and solve their own development problems. These countries need assistance to acquire the necessary skills and institutional infrastructure. It is here that the need is felt for agencies at both the national and international level to offer capacity building to the men and women across the world. This is all the more true with women, who because of many cultural factors, need skill development and capacity building of a different kind compared to men. More specifically, capacity building to run and sustain businesses by women in a developing context, figure in this for a variety of reasons. India is no exception to this fact. Against this background, an attempt would be made to highlight the impact of capacity building on women in running businesses towards a sustainable future. More specifically, the nature, mode and method, duration of capacity building along with the opinions and perceptions of 200 women would be analyzed and discussed in an empirical design in the Indian context. Overall, it has been agreed by women that capacity building leads to sharpening of the skill sets and educating them on the nuances of business, thus, ensuring a sustainable future for both their business in particular and the society in general.

Interaction between social and natural capital stocks in the State of Sao Paulo, Brazil.

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Brazil made huge investments in physical capital when interest rates were low in the international market (in the 1960's and 1970's) and gave little attention to other kinds of capital investments. The situation was aggravated because Brazil had a non-democratic government at the time. Putnam (1993) and Sen (2000) indicated that this kind of government diminishes social capital and reduces the rate of development. Despite heavy investments in physical capital, some regions, even in the State of Sao Paulo, did not develop as expected. Literature about development has enlarged since it have emphasized social capital and sustainability of the natural capital. Different dimension of social capital was included in the discussion (LI et al, 2003; SABATINI, 2009), and interactions between social and financial capitals. The present work analyzes interactions between capital stocks, in the State of Sao Paulo, Brazil. By hypothesis, in this exploratory empirical study, interactions between capital stocks would explain the per capita income. The specific goal was to analyze the significance between social and natural capitals to explain income. There are different income groups in São Paulo State, statistically speaking. It was analyzed the group (425 municipalities) that had presented, according to São Paulo (1999), income index lower than 0.93. A previous analysis have used Factor Analysis by the Principal Components Method. Results displayed differences in the composition of the stocks of capital between income groups of counties. From resulted factors, obtained in such previous analysis – in which original variables represent stocks – interactions among factors were calculated. The variables more strongly correlated to each factor multiplies the factor score coefficient. The sum of each product is a new variable that multiplies each one of the new variables. Such interactions were explanatory variables of the income index in the multiple linear regression analysis. Results corroborated the hypothesis. Interactions between these two capitals are significant for explaining the per capita income.

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Science and Business: How does the DWIH-SP bring them together?

Marcio Weichert

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To bring researchers and businessmen together is one of the aims of our work at the German House of Science and Innovation in São Paulo (DWIH-SP). This is necessary in order to promote collaborative research projects or transfer knowledge and technology to companies, thus contributing for innovation.
This lecture will show examples of the DWIH-SP or other supported initiatives with the above-mentioned aim. One of them has become a success story: a joint-venture between a company from Rio de Janeiro and a research institution from Bavaria.
The presentation will finish with information about the new Brazilian program "Innovate in Brasil", which aims to encourage the installation of R&D centers in the country. This is a new opportunity for German researchers to work with industry in Brazil, in order to transfer knowledge and technology.

Poster Presentations

Comparison between the German's and the Brazilian's laws for renewable energy and the possibilities of improvements in Brazil

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In recent years, many countries have tried to increase the share of renewable energy in their electric matrix, including Germany and Brazil [(2)]. In one hand, the share of renewable energies increased substantially in Germany from 3,4% in 1990 to 25,4% in 2013 [(1)], mainly due to supportive policies, such as the Law of Renewable Energy Supply (*Stromeinspeisegesetz*) and later the Renewable Energy Law (*Erneuerbare Energien-Gesetz* or *EEG*) [(3)]. In the other, the electricity in Brazil is already provided predominantly for renewable sources, however the consumption of non-renewable fuels has increased gradually [(4)]. In order to maintain the share of renewable energy in its energy matrix, Brazil is trying to promote renewable sources, with the creation of laws to encourage energy production from these sources [(5)], an example is the Federal Law 10.438/2002. In this context, the aim of this paper was to compare the German's and Brazilian's laws regarding to the use of renewable energy and to suggest improvements to the Brazilian system. The comparison showed that even though the Brazilian law had been inspired in the German law, the results obtained for both countries with their policies are not comparable, probably due to the great social, economic and cultural differences. Thus, the Brazilian legislation needs to be revised, contemplating new variables, for example, the integration of its targets to the current reality of the country, the creation of incentives for cleaner production and it is also necessary a political support to make the legislation successful.

We would like to acknowledge the financial support of the DAAD.

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Economic and environmental sustainability of small municipalities aided by the Federal University of Mato Grosso do Sul using geotechnologies

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The Federal University of Mato Grosso do Sul (UFMS) through its technological and intellectual framework has contributed to the environmental, economic and social planning of some small municipalities in the state of Mato Grosso do Sul, assisting them in obtaining detailed information which is essential to their sustainable development. The GIS Laboratory for Environmental Applications of UFMS assists municipalities through technical cooperation agreements – without the involvement of financial resources for any of the parties involved. The project aimed to contribute to economic and environmental management of municipalities of São Gabriel do Oeste and Paraíso das Águas, State of Mato Grosso do Sul, Brazil, assisting them in their territorial, environmental and economic planning. The project lasted five years, ending in 2014. During this period was performed several visits to the field, where there were gathered community needs of each locality. It was used satellite images of high and medium spatial resolution as well as free Geographic Information Systems (GIS). The generated products were: maps of land use and occupation, agricultural land, permanent preservation areas, legal reserves, biodiversity corridors, aquifer vulnerability, erosion and soil loss, sites for the sewage treatment plant facility and sanitary landfills. All information generated have been made available to the managers and the technical people of the municipalities with suggestions for possible economic, environmental and social improvements. In addition, the university has trained municipal technicians for the management and expansion of the developed GIS bases. With this, both municipalities have saved resources to obtain such information. This is a way of UFMS to return to the society the values invested and better enable their students, experiencing applied situations. At the end of the survey, there was an event in each location to inform the public about the results. Tracking the development of these municipalities by the local community demonstrates the importance of this work has been carried out.

Comparative Analysis of Reward Sanction Instruments and their Application in Brazil and Germany

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The present work focus on the rewarding sanction, where the clean development is stimulated, and conducts studies about the fiscal-economic incentives and compensation, resulting from the environmental service provision, carried by the secondary and tertiary sectors of the economy. The reward sanction is characterized by stimulating the economic agents to take environmentally correct behavior in order to attain a high level in the environmental policy of the country (AMARAL, 2008). How reward sanction instruments have environmental premial penalty, tax incentives, tax and extrafiscal nature and payment for environmental services. Environmental reward sanction stimulates not aggressive activities to the environment, rewarding the agents and the community (AMARAL, 2008). Through taxation and taxes, there obtaining financial resources to fund state activities. By extrafiscality incentives are determined by immunities, exemptions or tax disincentives (RIBEIRO, 2006), with the objective of achieve sustainable development and social welfare. Payment for environmental services is characterized by economic compensation for those making ecosystem management actions that will improve the environmental services they provide. The companies analyzed have interest in environmental protection by reducing emissions, saving water or performing environmental services. In Brazil's environmental policy is still modest compared to Germany. There is a great demand for Brazilian companies as the need to apply the sanction premial instruments, while German companies are already using these demonstrated benefits for the environment. The German experience shows that it is possible to apply reward sanction instruments to change the paradigms and the company's revenues, but it is even more necessary investment of public power, as companies cannot afford alone with the responsability of maintaining a balanced environment.

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Session 09: Politics, Social Action

Convener:

Prof. Dr. J. Tosun Prof. Dr. M. Vieira Lisboa

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How do political actors address the issue of sustainable development? What is the role of supranational and international actors in sustainability politics? These are two exemplary questions, which will be addressed in this session.

Keynote **Lecture**:

Prof. Marijane Vieira Lisboa, Faculdade de Ciências Sociais, Pontifícia Universidade Católica de São Paulo, São Paulo, Brazil

Oral Presentations

Extraordinary events, policy change and citizens' trust

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How do extraordinary events exert an influence on parties and their policy preferences? How do instances of radical policy change influence the trust of citizens in political institutions? These are the research questions I will address in this talk that brings together theoretical considerations with empirical illustrations. Theoretically, I will draw on the literature on causes and consequences of policy change. While we have a sufficiently good understanding of what drives instances of policy change, less is known about how radical changes in policy-makers' positions on issues affects citizens' trust. Therefore, this second aspect will lie at the heart of the talk. Empirically, I will illustrate the causes and consequences of energy policy change by drawing on the example of the German state of Hesse. Immediately after the Fukushima incident the Prime Minister of Hesse, Volker Bouffier, gathered an energy summit in an attempt to prepare a U-turn in the state's energy policy. While previously opposing the phase-out of nuclear power and the promotion of renewable energy, the exogenous shock of the Fukushima incident induced the state government to become an ardent supporter of renewable energy production. This decision had important consequences for party competition in the state of Hesse and can be seen as a decisive factor for the formation of a coalition government of the Christian Democrats and the Greens in 2013 – the first ever government coalition of this kind in Germany at the state level. However, with the new green agenda of the Christian Democrats some voters feel alienated from this party and engage in local protests against wind power projects. While the empirical illustration primarily draws on Germany, the consequences of radical policy change for citizens' trust in political institutions will also be discussed for the Latin American case.

Changing Climates: debate around climate change in Brazilian and German news media

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This paper examines how society and media coverage interact within the climate change context in Brazil and Germany. Recent survey evidence shows that Brazilians and Germans are fairly sensitive to environmental issues, with a high level of concern about climate change (PEW 2010). Despite significant measures to curb emissions, Brazil and Germany still figure as major emitters of greenhouse gases. The key issue here is that society is central to high carbon lives; moving from a high- to a low-energy economy involves changing social practices (Urry 2011:3-4). As discourse interacts with social practices, it may potentially enable – or impede – the changes of social practices that would be necessary to deal with the problem. This study examines how climate change has been framed and responded to in Brazil and Germany, as expressed by major newspapers within each society between 2003 and 2013. Our purpose is to investigate to what extent, and in what ways, public opinion is consistent with media debate, paying special attention to discourses around conflicting positions. To this end, we combine critical discourse analysis with corpus linguistics methods, addressing data on an unprecedented scale in this research field. The Brazilian dataset contains 19,135 (10.8 million words) texts making reference to climate change/global warming. The German corpus contains about 40 million words. Overall Brazilian mainstream media adopted and mobilised a 'gradualist' discourse (Urry 2011), as best represented by the Intergovernmental Panel on Climate Change (IPCC) Reports. Strikingly high are mentions of key social actors such as Yvo de Boer, Rajendra Pachauri, Al Gore, Marina Silva and Carlos Minc as well as the various Brazilian scientists who are members of the IPCC (in the Brazilian dataset). In German media discourse much more (critical) attention is paid to climate change sceptics like e.g. Richard Lintzen. By contrast, much media debate in Brazil is organised explicitly or implicitly around how to deal with the 'reality' of climate change while climate scepticism was almost non-existent. In our investigation we focus on the cultural differences in organizing media discourse around the key social actors. This study will provide us with a better understanding of society's perception of climate change issues and will hopefully contribute to the development of effective policies.

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How National Institutional Settings can foster Sustainable Development and a Climate Protection Scenario: Insights from Brazil.

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Bioethanol sector in Brazil is seen as a path towards reduction of CO_2 emissions and energy security in the country. This has led Brazil to increase investments in biofuels and in flex-fuel vehicles (FFV). The study is based on the assumption that FFVs in Brazil have an important role in the country's sustainable development and decarbonisation strategies as a result, among other factors, of the national institutional setting sustainability politics. Defenders of biofuels support the industry as an option for the transportation sector to mitigate within the wider climate change agenda (UNEP, 2009) but before these debates about GHG emissions and its influence on climate disorders have emerged, Brazil had already started using its potential for developing a biofuel sector. Regardless of the fact that in Brazil energy security and alternatives to the national sugar industry were the most important triggers for the development of a biofuel market, mitigating climate change is in fact the major driver behind biofuel support worldwide (UNEP, 2009). Taking the energy system in Brazil as an example, the sub-sectors that contribute the most to emissions are transport (45% in 2011, despite large consumption of biofuels) and industry (31%) (IEA, 2013). This substantial share of emissions from transportation within the energy sector justifies and reinforces the country's mitigation initiatives in the transport segment. This figure proves that the increased use of private cars, congestion in most and large urban centres, and lack of infrastructure in mass transportation systems have a significant impact on the country's transportation emissions profile. However, the growing use of flex-fuel vehicles by consumers which permits the exchange of gasoline for bioethanol are already having a positive impact on these figures, and are "expected to stabilize GHG emissions from light-duty vehicles oven the next 25 years" (ESMAP, 2010: 14). Debates among environmentalists, policy makers, scientists and society at large raise the necessity of a sustainable car but the big concern is that "while there are many substitutes for oil in the heating and power sectors, this is not the case in the transportation sector" (Lee *at al.,* 2008: 3). Although the internal single fuel combustion engine is the dominating motor found in vehicles all over the world (conventional fossil-fuelled combustion engines and gasoline powered vehicles dominate the global car market), the Brazilian bioethanol-gasoline mix FFV technology, that dominates the automobile industry in Brazil, is the only current significant alternative to that. In light of the above context, what the national influences behind the development of the flex-fuel vehicle technology in Brazil are stands out as an interesting question.

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Biofuels: insights from Brazil and Germany

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Biofuels have gained importance as an energy source by the end of the XXI century. This holds especially true for Brazil and the United States, not only due to its use as a renewable energy source but also from the prospects of energy security and its alleged environmental benefits. In the European Union, where Germany is institutionally inserted, biofuel policies have openly stressed the strict perception of an environmental action to counter-balance air pollution and ultimately to address climate change. This paper provides a brief overview of both countries biofuel policies, followed by some insights with general data, projections and institutional accounts of these experiences, drawing lessons from their similarities, disparities, advantages and drawbacks. The topic is then brought to the international arena, that is, inserted within international norms, governance processes and countries' contemporary dilemma to assure energy sources while protecting common goods. This is exemplified through the paradox of energy vs. food security in the Brazilian case and fossil fuel vs. renewable energy in the German one. It is finally concluded that both countries provide pragmatic policy examples with their experiences and foster debates worldwide. Nevertheless, literature points out to a great need of governance instances to address issues of accountability, equability, legitimacy and sustainability.

Renewable energies and improvement of living standards in rural areas of Ceará - Brazil: challenges and opportunities

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A productive use of energy may provide direct and indirect benefits on living standards and poverty mitigation in rural areas. Direct benefits are related to the use of energy to create goods and increase income generation, whereas the indirect benefits are associated with impacts that energy services may have on education, health care, gender equality and environment (Cabraal et al. 2005).
Considering that each region has specific characteristics regarding cultural, political, social, economic and environmental aspects, there are challenges that should be addressed case by case, so that energy may enhance living standards. Therefore, in technology assessment, energy planning is a complex task that goes beyond the selection of a technology to be trusted and should integrate particular aspects and the local profile of a region analysed (Cherni et al. 2007).
In this study, we will present challenges and opportunities for renewable energies to improve living standards and mitigate poverty in rural areas of the Brazilian state of Ceará, which has a large potential for energy production based on solar and wind, while most of its rural population lives in poverty.
The data collection was comprised of literature research and a fieldwork campaign that took place in Ceará from March to April 2015. During the campaign, semi-structured interviews with open-ended questions were conducted with stakeholders involved in the energy and rural-development sectors. Additionally, some related projects in rural communities were visited and a round table was carried out with stakeholders to promote a debate regarding renewable energy technologies and their contribution to enhance living standards and mitigate poverty in rural areas.
Initial results indicated that electricity access to attend basic needs is not a problem in rural areas of Ceará, since the state has universalized electricity access. Currently, an open question is to understand how this energy is being used. In addition, it was identified that the use of unhealthy means of cooking – traditional cook stoves based on biomass without chimney and kitchens less ventilated – is common in these areas. Regarding this aspect, the challenge is not just to analyse how to deliver a better technology or fuel, but also to consider traditional and cultural aspects, since they are additional and important factors that contribute to the use of cook stoves based on biomass in the region.
Further analyses of the collected data and research desk will provide a better understanding of the reality of rural areas of Ceará as well as sound information for the development of context energy scenarios that may provide orientation with respect to how renewable energies may enhance living standards and mitigate poverty in rural areas, in a sustainable and long-term planning.

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Social conflicts over the environment: Indigenous peoples, traditional populations, and developmentalist policies in Brazil

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Despite the past governments' leftist orientation, social conflicts over the environment have intensified in Brazil over the last decades, something which can be understood as one of the many consequences of economic globalization. The growing global demand for raw materials, commodities, and energy has made it profitable to explore remote regions such as Amazonia, yet poses a threat to indigenous peoples and traditional populations and their ways of life. Cattle, soybean farming, and mining have expanded into fragile rainforests and gigantic dams have been built to produce energy for energy intensive activities like mining, metallurgy, and the pulp and paper industry.

Responding to these threats, indigenous peoples and traditional populations have attempted to organize themselves in regional and national networks, such as the Rede Brasileira de Justiça Ambiental founded 2001. Moreover, these vulnerable groups have sought support from environmental and human rights organizations at the national and international level.

Lula's and Dilma Roussef's developmentalist policies and their strong political alliances with agribusiness and big construction companies have served to intensify the conflicts between government and indigenous and traditional peoples. These conflicts have reached their breaking point and demonstrate the environmental and social limits of a development model based on exploiting natural resources and ignoring more sustainable and alternative ways of production and life.

Socio-environmental conflicts related to hydropower development in Brazil

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Hydropower is the most significant renewable source for electricity production worldwide. Unlike other renewable sources it is a well-developed technology and promises high economic profitability. Its highly flexible operation is a strong asset for electric systems and pumped storage plants are by now the only available way to store large amounts of electricity from intermittent sources such as wind and sun. Additionally, hydropower reservoirs can contribute to regulate water flows for fresh water supply, flood control, irrigation and navigation.
However, large scale hydropower has also in some cases been subject to severe criticism for not holding its promises. On a local and regional scale hydropower projects can lead to considerable negative socio-economic and environmental impacts. It is therefore crucial, in addition to the assessment of environmental impacts, to take the different stakeholders into account and spread benefits and costs equally. Stakeholder participation can help to integrate the needs of different groups into the project at an early stage and also to increase public acceptance of a project.
In this study the conflict potential of the planned hydropower plant *São Luiz do Tapajós* in Brazil was analysed. An interview scheme was developed with the aim to include the views of different groups and to develop common goals. A systemic view of interactions and conflicts based on the works of Ballreich and Glasl (2011) and Little (2001) was used to find suitable questions. In order to compare answers of different groups, a standardized interview form was applied, using the same or similar questions for all stakeholders. This turns it necessary to take the cultural, socioeconomic and educational background of all groups into consideration. The questions have to address needs at different levels of the Maslow's hierarchy (Maslow 1987) for all involved parties.
On the basis of the interviews and further internet research a synthetic analysis of the conflict at its current state was carried out, in order to be able to propose further stakeholder participation measures and conflict management strategies.

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Environmental Justice and the issue of sustainable development in Brazil: are they possible?

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A question that has always vexed the organizations involved in the Brazilian environmental debate is how they can commit to campaigning for environmental protection without ignoring the obvious priorities of combating poverty and underdevelopment. In other words, how can the environment be put forward as a legitimate issue when all too often environmental concerns are seen as obstacles to tackling unemployment and overcoming poverty? How can environmental organizations deal logically and in a socially acceptable manner with the environmental implications of fighting social inequalities and promoting economic development? The 1970s was a prolific decade for the economic development in Brazil. During the military dictatorship (1964-1985) the dominant development model was ignoring the issues of the environmental and sustainable development. The environmentalist movement was beginner. The environmentalist movement in Brazil began with actions to protect endangered fauna and flora, them moved on to exert pressure against the perceived overuse of mechanical and chemical agriculture, water pollution, the destruction of ecosystem until the began to engage in the Amazon question, transformed in the symbol of the fight against the kind of development blamed for the growing environmental degradation in the country. The 1988 Constitution start a new level of influence by the movement. The movement had gained some influence with the incorporation of one chapter about environmental at the new Constitution, that restarted the democracy in the country. However the question remains the same: how can fight against social inequalities and promoting economic development? Despite the democracy period the number of environmental conflicts in Brazil has increased. Several conflicts are associated with agricultural expansion, construction of hydroelectric, oil exploration and other development projects that impact the natural environment and traditional populations, greater victims of human rights violations. Indigenous people, quilombolas, traditional fishermen and rural communities are at the heart of disputes over land and natural resources. The objective of this paper are first, investigate the relationship between democratization of Latin American countries after the 1980s, particularly Brazil, where had an increase of cases of environmental conflicts, which show that the dominant logic remains the exploitation of environmental resources without considering parameters of environmental protection and respect for humans rights. Second, investigate the role of political actors, principally the issue of environmental justice.

Territorial Planning and Dynamics of Wide Space in Central Amazônia

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This lecture analyses the asymmetries of protagonism from economic sectors and governmental planning at the advance of large infrastructure constructions at the Xingu and Tapajós watershed and its effects at the rural and urban dynamics in regional scale. These recent phenomenon at the policies of spatial planning and the relation between State and local society at Amazon, has intensified at the beginning of 2000s. What are the political and economic forces that affect the competition for resources and spaces? What are the strategies with greater politic mobilization force? What is the incidence of traditional, family farmers and indigenous population? Is there a space to multicultural coexistence scenery after the big hydroelectric power stations and the conclusion of interconnection logistics with global markets (ports, waterways, etc.)? These questions will be analyzed based on a discussion methodology of actors rationality and its interests about resources and territories. The results of a new relation between government, business sectors and society are analyzed, mediated by government actions, which innovate in planning methodologies with broad regional participation in conflicts of use of natural resources (forests, water to produce energy, minerals etc.). The analysis concludes that there are positive changes in the State's stance in the search for regulation and governance, with better participation of social groups with relative incidence in the territorial mosaic and democratization of access in the case of forests, happening the same with energy policy transport logistics. It concludes that territorial gains of local populations are important, but at a long time frame they will be under threat due the difficulty of there achievements to be accompanied by compatible economic and social gains with competitive rules which comes with economy modernization in this context.

Post Treatment of Hospital Sewage by moving bed Biofilm Reactor

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Moving bed biofilm reactors (MBBR) were developed in the end of last century in Norway. It has excelled over other processes, and incorporates some features of the best technologies for biological wastewater treatment. In this process, the microorganisms grow attached to moving carriers, forming a biofilm that is used for treat the effluents. In this work was studied the efficiencies of MBBR in the hospital sewage treatment, with the aim of removing organic load, Total Kjeldahl Nitrogen (TKN) and total phosphorus. Initially, the effluent of University Hospital of Santa Maria-Brazil studied is treated in a system conjugated by septic tank and anaerobic filter. In the Environmental Control Laboratory (LabCAmb/UFSM), the MBBR was operated as post treatment for hospital sewage under aerobic conditions, with useful volume of 4.099L, using a 60% ratio of moving carriers, flow rate of 1L/h, and time hydraulic detention of 4.099h. The volumetric organic load (VOC) of the influent varied widely, were obtained values of between 0.703 and 2.752 kgBOD_5/m^3.d (1.02 a 7.53 kg COD/m^3.d), resulting in an average to VOC of 1.55 kg BOD_5/m^3.d (2.99 kg COD/m^3.d). The MBBR showed good performance, with average to removal efficiencies of VOCs in BOD_5 and COD of 76.36 and 69.54%, respectively. The average TKN removal efficiency was 46.85%, removal due to biological synthesis and probably reactions of simultaneous nitrification/denitrification. For total phosphorus was obtained an average to removal efficiency of 46.45%, due to cell accumulation. With the results obtained, the technology of MBBR showed good perspective for treat sewages of hospitals.

Poster Presentations

The Environmental Accounting of Impacts Generated by Family Establishment Process in Rorainopolis (RR) – Brazil

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The Agrarian Reform has been implemented in Brazil through the National Institute of Colonization and Agrarian Reform - INCRA, since 1970, through the establishments of families in areas of the Union. In specific case of the rural areas which are located in tropical forest, the INCRA has been adopting the same procedure used in other areas of Brazil. It consists of motivating the subsistence agriculture on small scale. However, specifically in the Amazon region, the procedure requests cutting and burning of forest that generates a considerable environmental impact. The evidence is the Report of Deforestation in Amazon region by Brazilian Environmental Institute - IBAMA, October of 2008, which identifies the INCRA as most responsible by the deforestation increasing in Amazon forest. In this case, the research has intended to value, economically, the environmental impacts of productive activities in two rural establishments, which are located in the km 460 on the Federal Highway, BR-174, district of Rorainópolis (RR). Both places have been chosen because they have rainforest characteristics, they are located close to city and the rural establishments began to operate at the same time. The Contingent Valuation Method (CVM) has been used on the research. The CVM is based on the willingness to pay (WTP) and the willingness to accept (WTA) of people on respect to value the environmental assets and liabilities generated by the enterprises. The research has been consisted of 55 questionnaire applications on the family units to value the WTP, which is associated to environmental impacts of their production activities. In accordance with the obtained data, it can identify the subsistence agriculture with corn, rice and cassava; as the main production activities in both rural establishments. The mapping of productive processes of those activities has shown that they request the cutting and the burning of forest. In accordance with the obtained results, it could be concluded that after the inclusion of the costs and environmental benefits in the analysis of the local one presented a monthly WTP of R$ 79.08, and total WTP of R$ 1,977.,00. The local two presented a monthly WTP of R$ 87.84, and total WTP of R$ 2,635,20. Those results are reflex of the low level of income observed in the area, on average of R$ 380,00 associate at a low level of information of the local population regarding the profitability obtained with alternatives of maintainable exploration of the forest in foot. In that sense it suggests that after the establishment of the families in forest areas should be done an information work and should be given a technical and financial support. That could be made possible in the area through a partnership among INCRA, EMBRAPA and BASA. It is a challenge: does not to leave the population alone, but give an idea of the economic value of environmental assets obtained from the rainforest by real actions to build the local environmental citizenship.

Sustainable Development and Challenges to Water Management in the Municipality Cachoeirinha/RS - Brazil

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Cachoeirinha city is located in the metropolitan area of Porto Alegre, in the state of Rio Grande do Sul, Brazil. It belongs to the natural region of the Pampas and is located within two watersheds of high complexity: The watersheds of Gravataí River and Rio dos Sinos, where the most polluted rivers in the country are located. The city is divided by four sub-watersheds: Brigadeiro Stream, Passinhos Stream, Barnabé Stream, and Sapucaia Stream. It has an area of 44,018 km^2 and 125,246 inhabitants, with a population density of 2,687/ km^2 (IBGE, 2015). High Human Development Index ranking (HDI, 2010): 0.757 points, above the state average. The Municipal Secretary of the Environment (SMMA) seeks to implement an environmental management policy based on the principles and guidelines of the Brazilian Agenda 21, the Eight Millennium Goals, based on Environmental, Basic Sanitation, and Director of Urban Development plans. As part of Social-Environmental Education, the SMMA establishes strategies in public policy interrelating the sectors of civil society through which the individual and the community can build social values, knowledge, skills, attitudes, and competency aimed at conservation of the environment, a healthy quality of life, and guarantees of sustainability. In this model, Cachoeirinha participates in the guidelines of the United Nations to meet UN Water's global campaign in the International Decade for Action 2005-2015: "Water for Life", with local public policies such as the consolidation of the Municipal Plan for Basic Sanitation, the renewal of the water resources management contract with Companhia Riograndense de Saneamento- CORSAN to broaden the entire sewage network system in about 73% coverage (currently exceeds 176 km of collection network) and make drinking water universally accessible, the execution of projects to expand the Sewage Treatment Station - ETE Free-Way, the completion of the stormwater drainage system: Conduto Forçado; partnerships with the Local and State Public Ministry in order to regulate the connections to the entire sewage network that currently exceed 46% - the highest rate in the metropolitan region of Porto Alegre, the supply of drinking water with 97% coverage, the activities regulated in the Environmental Licensing governing the uses of water in the city, the promotion of public hearings, and social-environmental campaigns and educational programs in continuing actions to change habits and attitudes that may increase the commitment of all parties to sustainable local environmental management.

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Public policies and indigenous sustainability in the Brazilian Amazon.

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This paper examines the relationship between State and indigenous people in the Amazonia, focusing specifically designed indigenous public policies projected in the national level since 1988 and executed in the state of Pará. The Brazilian Constitution of 1988 provides a legal framework for the new interface established between the State and indigenous people, characterized by respect and recognition of several ethnic, linguistic, historical and sociocultural as well as the rights to their lands and resources within it. This study had aimed to examine how (and if) the indigenous publics policies developed and implemented since 1988 in Pará state guarantee (or not) the autonomy and economic sustainability, environmental and socio-cultural of indigenous peoples involved in them. Was held fieldwork to collect indigenous experiences with ethnicities Tembé, Asurini of Trocará and Gavião Parkatêjê and Kyikatêjê, in the state of Pará. The study showed that indigenous public policies are "sprayed" in several agencies of the federal, state and municipal levels, revealing a complex network of actors and services, which, sometimes, overlap without providing the necessary integration. There is a strong tendency towards outsourcing of indigenous services, with the introduction of companies and NGO in their implementation. This has led it in a certain confusion to the indigenous when trigger the need for public services and have the satisfaction of their rights. The discourse of the construction of indigenous autonomy and sustainability has increased both among government sectors, as in the indigenous, which have, even appropriate to design their perspective of environment. The Indigenous people also have increased their participation in decision making processes involving the construction and operation of public policies. However, the effectiveness of such policies is still very tenuous. The indigenous´s realities studied show that much still needs to be done to ensure a sustainable and autonomous development for indigenous people.

“You can’t teach an old dog new tricks”

The sustainable development education starts with the youth

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The search for sustainable and ecologic development allies must start with the youth. The now a days students are going to forge a definite path for development the energy and transportation areas in the next decades. However, they are still tolerant and adaptable enough to face the inherent challenges of this development field. Environmental education in primary school is the first opportunity of raising awareness among children of the existing problems and lead them to a more conscious use of energy and transportation/mobility. This research study brings as an example of the educational action promoted by the “Climate Alliance” - state of Carinthia, Austria. through the itinerant exposition (Workshop) “Wie funktioniert das mit dem Klima und dem Treibhauseffekt?” the students were persuade to rethink consumption and evaluate the weight of their day by day actions, means of mobility and use of energy, as well as the effects of climate changes. The study, that was accomplished in february of 2014, involved 73 students of the 3rd and 4th years of Köttmannsdorf and Griffen primary school, in the state of Carinthia. Through questionnaires, childrens have expressed a high level of satisfaction regarding the ways of intervention and full comprehension of the subjects taught during the intervention, whose goals coadunate with those of the “Climate Alliance Europe”. This Organisation seeks a global weather protection by partnerships between European cities and Amazon Indigenous people. The intervention, focus of this research study, constitutes one of the many proposals of the Organisation in the scope of education towards Sustainable Development.

Putting environmental discourses into policies: The case study of Bolivia

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In 2006 Evo Morales won presidential election and became Bolivia´s first indigenous president (Stefanoni, 2006). Morales´ political party *Movement Towards Socialism* is a peasant-indigenous coalition that was brought to power under the promise to re-establish Bolivia as the 'twenty first multicultural, pluralist socialist' State (Kohl and Bresnahan, 2010:5). As an attempt to create an alternative to neoliberalism it introduced alternative patterns of development like Vivir Bien (living good) based on the indigenous belief of harmony between humans and nature (Gudynas, 2010). Since then, in and outside Bolivia an intensive debate arouse about the practical implications of Morales' presidential victory, the importance of the induced political processes (Webster and Engberg-Pedersen, 2002). This is particularly true for the environmental sector typically marginalized within the prevailing approaches for rural development primarily grounded on economic growth. Within this context Morale´s administration has adopted highly controversial and challenging discourses related to nature and environmental policies. The focus of this study is to understand how different factors influence the process of environmental relevant policy-making, and identifying what hinders or facilitates the emergence of these policies. In general terms, the challenge of translating political discourses into tangible outcomes and policies is a common problem in the policy-making process. The case of Bolivia, due to its actuality and extremeness is ideal to study the processes and factors influencing the transformation of political statements into action on the ground. It can be expected that such an analysis provide important insights of how to design environmental policy that more effectively achieve their goals. The theoretical framework of the study is based on theories of public policy and discourse analysis. Methodologically, the research will be grounded on the case studies, each of the representing settings in tropical rural contexts that have a high environmental relevance, in particular, agricultural frontiers, protected areas, and indigenous reserves. In each case study, an array of parameters will be described through the application of qualitative research to reconstruct the underlying policy processes and to find empirical evidence that support or deny the key factors influencing the design and implementation of environmental policy.

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Compliance Social and Environmental Guidelines on Environmental Impact Assessment based on the Equator Principles. Case Study: Dam Serro Azul River Basin Una, Pernambuco - Brazil

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Over the past decades, it is observed in various regions of the planet considerable increase investments in large infrastructure projects. In the state of Pernambuco stands out the implementation of five dams in the basin of the Una Rive, with flood control purpose, since the region was hit by floods in 2000, 2005, 2010 and 2011 that caused human and material losses. In this context, the present study aimed to analyze the Environmental Impact Assessment (EIA) and its respective Environmental Impact Report (EIR) of the Serro Azul dam, in Pernambuco, approved during the licensing process for compliance of the guidelines and recommendations of the Ecuador Principles, focusing on the environmental aspect. To Silveira (2010) discussions on environmental conflicts has been a key issue for understanding the several contradictions in the current global development model. The Equator Principles were created in 2002 by the International Finance Corporation (IFC), a financial sector of the World Bank. It is an international tool with focus on the incorporation of values with social responsibility and sustainability to lending negotiations as a way of integrating economy, society and environment. After analysis of the EIA/RIMA there was noncompliance of half of the sixteen (16) required criteria, with the critical points, the identification, mitigation and/or compensation of impacts on communities to be resettled, highlighting the non-participation of such groups in the planning, analysis and implementation of the project. There was no participation of professionals specializing in social assistance in teams of the entrepreneur representatives. Thus, there was the need to guarantee better relationship of the government with local communities affected by the implementation of dams, in a preventive manner to minimize the potential negative impacts on social and environment.

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Session 10: Agriculture, Forestry

Convener:

Prof. Dr. A. Petkau[1], C. H. B. Nauiack[2], M. Vohrer[3], Ing. M. del Carmen Álvarez Enciso[4], Prof. Dr. P. Spathelf[5], Prof. Dr. Afonso Figueirodo[2]

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Bridging examples from the fields of agriculture and forestry provide information on issues already established and studied by research projects of sustainable interaction between natural resources and processes and demands of human societies. The talks shall provide information on analytical tools that help to retrieve necessary information for decision makers that have to implant managing systems, define economic behaviours and formulate and change necessary judicial systems to initiate and provide the legal base for sustainable development.

Keynote **Lecture**:

Moritz Vohrer, The Gold Standard Foundation, Freiburg, Germany
Ing. M. del Carmen Álvarez Enciso, Universidad Nacional de Asunción, Center for Environmental Monitoring Purpose, Luque, Paraguay
Prof. Dr. P. Spathelf, Eberswalde University for Sustainable Development, Faculty of Forest and Environment, Eberswalde, Germany
Carlos Henrique Boscardin Nauiack, Universidade Estadual do Centro Oeste/UNICENTRO, Irati, Brazil

Oral Presentations

Carbon Markets - How can forestry benefit from it?

Moriz Vohrer [1], Florent Kaiser[2]

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In the context of the on-going international climate negotiations, countries have the freedom to develop their own initiatives and provide pledges on how they contribute to climate security through Intended Nationally Determined Contributions (INDCs)[1].
It is assumed that current INDC pledges will not be sufficient to reach the 2 degrees 2050 target[2]. However, more and more companies, organisations and governments are thinking beyond the current UNFCCC-initiated mechanisms and markets for climate protection[3]. To date, 31 regional or national initiatives are being developed with the goal to create their own emission trading system on carbon credits[4].
Besides these initiatives, governments have created large funds where other governments can apply for funds that will be used to reduce existing deforestation. According to the REDDdesk[5], currently 28 countries are profiting from these funds.
But the question remains how will private sector benefit from this? And how much does carbon contribute to the normal cash flow of a forest, where only timber represents a significant income?
In most emission trading systems carbon is measured in unit of 'tons of CO2'. This as a base allows for two different ways to determine how forests can calculate their carbon benefit. First, by changing the forest management from an unsustainable management, which leads to the degradation or deforestation of a forest, to a sustainable management – also known as Reduced Emissions from Degradation and Deforestation (REDD) or Improved Forest Management (IFM). And second, when reforestation or afforestation (A/R) of a 'non-forest' area is undertaken.
Both scenarios can contribute to a significant amount of money from the sale of carbon credits. Here, the benefit can vary from 10 to 5.000 USD per hectare, depending substantially on the activity being implemented and the carbon price[6].
The main challenge forestry is facing in order to benefit from the emerging emission trading schemes is that these trading schemes need to (1) accept forestry credits as part of their schemes and (2) the schemes itself must be well functioning, which means that the demand of credits must be created by ambitious emission reduction targets of the schemes.
To date, forests are still not being paid in for the range of climate benefits they provide. However, the chances that markets are developing in a direction that will do so are better today than ever before.

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Study on the Vulnerability and Impact of Climate Change on the Great American Chaco (Gran Chaco Americano)

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The study aimed at developing a vulnerability and impact of climate change analysis on the Gran Chaco region, focusing primarily on identifying impacts on agriculture and water resources, and based on the results, defining proposals for adaptation based on ecosystems.

The methodology was based on the definition of the IPCC 2001 which mentions that vulnerability is a function of the variation to which a system is exposed, its sensitivity, and its adaptive capacity, thus determining vulnerability, considering the three vulnerability factors that make up a linear function, where the values obtained from exposure and sensitivity are added, and then the adaptive capacity is subtracted, obtaining the final value for vulnerability.

To estimate the adaptation means available for a given society, the concept of capacity is used as a source of capital, where more capital implies greater adaptability. In turn, the capacities are classified as human, social, natural, economic and productive, infrastructure or built, and institutional.

The study identifies for each unit of analysis, the “weaknesses” and the "capabilities". The weaknesses are the sensitivities of agriculture and water resources, considering the changes in the temperature and the precipitation. The capabilities can be seen as potential developers and considered as tools for action and investment. In other cases, they are only "potential", defined as intrinsic strengths for the factors concerned (e.g.: natural, social, human) that can be developed through investments of other external factors to become capabilities.

The information in the study consists of quantitative and qualitative data, which were categorized to relate to each other and finally to achieve a rating or index to help identify the level of vulnerability of the region to climate change.

The study provides homogeneous information for people and governments to develop adaptation actions and plans to prioritize their policies according to the needs for the entire region. On the other hand, provides an integrated vision of the problem of Gran Chaco from a climate perspective, aimed at making public policy decisions.

This study was funded by Regional Gateway for Technology Transfer and Climate Change Action in Latin America and the Caribbean (REGATTA) its objective is to strengthen capacity and knowledge sharing of climate change technologies and experiences for adaptation and mitigation in Latin America and the Caribbean. Its design and development is aligned with the international climate change negotiations in the context of the United Nations Framework Convention on Climate Change (UNFCC), after the Cancun Agreements at COP16, which established a Technology Mechanism.

This study has been developed by institutions of the three countries: Formosa University of Argentina, University and Foundation Cordillera of Bolivia and Development Institute of Paraguay.

Can farmers in Mato Grosso benefit from the adoption of low-carbon agricultural and forestry systems?

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Concerns of balancing agricultural production and environmental protection shifted the focus of Brazilian policies towards sustainable intensification of agricultural land use. Low-carbon agricultural and forestry systems are currently perceived by the Brazilian government as ways of preventing deforestation, improving the productivity of degraded lands and reducing emissions from land use and land use conversions. For instance, in 2010, Brazil established preferential credit lines for financing investments in sustainable agricultural systems (ABC Program). This measure is aimed to promote the adoption of low-carbon production practices such as integrated agroforestry systems, industrial forest plantations and crop-cattle rotations aimed at pasture rehabilitation. Widespread implementation of such practices requires them to be capable of generating economic benefits for the land users adopting them. Moreover, the benefits should outweigh the benefits of the other competing land use alternatives. Yet, little is known about farm-level economic impacts of adopting these low-carbon production systems and the effectiveness of the ABC Program in relaxing farmer investment constraints (Gil et al., 2014). This contribution presents a modeling-based empirical assessment of the systems promoted by the current instruments of the ABC Program (ABC Integration, ABC Forests and ABC Recovery). For the assessment we parameterized MPMAS (Schreinemachers and Berger, 2011), which is a multi-agent software based on the mathematical programming method, for five municipalities in the state of Mato Grosso. The software explicitly simulates the behavior and dynamics of all individual commercial farms in our study area reflecting the farm differences in resources and natural conditions. The whole-farm modeling approach of MPMAS then permits comparison of low-carbon systems with modern soybean–cotton and soybean–maize double-crop systems currently dominant in the study area. The comparison is done considering different aspects of farming: investment requirements, revenue streams, labor and machinery constraints, etc. Based on the assessment, we assess the potentials of sustainable agricultural intensification in Mato Grosso and identify farm types that are likely to adopt low-carbon agriculture. In addition, we test the effectiveness of current instruments of the ABC Program and provide recommendations for possible policy improvement.

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Agent-based assessment of GHG emissions from agricultural land use systems in Mato Grosso, Brazil

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According to the 5th IPCC report there is *robust evidence* and *high agreement* that the AFOLU[1] sector is responsible for almost a quarter of anthropogenic GHG emissions, mainly due to deforestation and livestock, soil and nutrient management, but offers also considerable mitigation potential through enhancement of GHG sequestration, as well as optimized land and livestock management strategies (Smith et al. 2014). Mato Grosso is an important center for agricultural production in Brazil and on global level, especially for soybean, corn and cattle. Brazil achieved to avoid 3.2 GT CO_2 by reducing Amazon deforestation even though soybean production continued to grow (Nepstad et al. 2014). Thus, in addition to preclude deforestation the individual farm level production decision has an important impact on GHG emissions, and should be addressed. With the bio-economic research approach of coupling DNDC (DeNitrification-DeComposition) and MONICA (MOdel of NItrogen and Carbon dynamics in Agro-ecosystems) with the MPMAS model (Mathematical Programming-based Multi Agent Systems) it is possible to quantify GHG emissions subject to the farmers' individual production decisions, considering human-human, as well as human-environment interactions (Berger and Troost 2014). In comparison to a life cycle assessment, the present approach enables to dynamically simulate scenarios and analyze the impact of farm management decisions on GHG emissions and farm economic indicators such as total gross margins. This allows to determine farmers' opportunity costs for adopting GHG saving land management strategies, giving a benchmark for possible compensation payments necessary to offer farmers incentives for adoption.

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1:AFOLU: Agriculture, Forestry, and Other Land Use

Decreasing greenhouse gas emissions of meat products through food waste reduction - Framework for a sustainability impact assessment approach

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The global food production industry is responsible for a high amount of greenhouse gas (GHG) emissions. Along the entire food supply chain (FSC) there are various mitigation potentials. In particular approximately one third of all food being produced globally is wasted, equal to 1.3 billion tons per year (FAO, 2011). On a global scale, inventory emissions from livestock production are about 3460 Tg CO_2-eq/year compared to 4,600 – 7,100 Tg CO_2-eq/year when considering the whole life cycle (FAOSTAT, 2015; Steinfeld et al., 2006). These numbers represent roughly 7%, respectively 9.4 to 14.5% of total global GHG emissions. GHG emissions from livestock production show a high potential for mitigation, especially in the farming and production period. A reduction of food waste in the long-term would directly influence GHG emissions from livestock production. For meat products, there is a potential in food waste reduction of 21.4% in South and Southeast Asia up to 29.7% in Sub- Saharan Africa (FAO, 2011).

As food waste is influenced by several phenomena along the FSC, approaches such as a life cycle assessment (LCA) are only partly sufficient. Traditionally, LCAs only assess environmental impacts, whereas they do not consider social and economic aspects per se. However, those aspects are equally important such as the economic impact of cost savings due to a decrease in GHGs and consequently less use of CO_2 certificates (at least in the European Union). The comparison between conventional and organic livestock farming or between developed and developing countries represent examples for social aspects. This highlights the necessity of integrating all three sustainability dimensions in one assessment tool and therefore, this contribution introduces a framework for a sustainability impact assessment (SIA) in the context of decreasing the amount of food waste.

With such an SIA framework it is possible to analyse and compare food waste reduction potentials leading to GHG mitigation in terms of their social, environmental and economic contribution to the livestock and meat processing sector. In this contribution, the assessment tool is applied only to food waste reduction and GHG emissions of the livestock supply chain, but it might be easily extended to cover more aspects, other food products or food waste valorisation issues.

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Tropical plantation forestry in transition – from uniform 'tree farms' to diverse production systems with added value

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The global area of planted forests has risen from 18 million ha in 1980 to around 250 million ha. Recently, the debates in the media about fast-growing high-yield plantations have become increasingly controversial. Critics argue that plantation forestry:

- is at the expense of natural forests or other natural ecosystems,
- leads to poorly structured stands with low tree species diversity,
- produces low-quality timber,
- negatively affects soil water conditions and the fertility of sites,
- 'occupies' land of small-scale farmers / local communities and contributes little to sustainable development (see Crossalter and Pye-Smith 2003).

If integrated in a sound land-use strategy, and if the various environmental goods and services are taken into account, plantation forestry can still offer considerable comparative advantages over other forest use concepts. In this contribution, I want to highlight some of the recent developments.

Forest plantations can serve a variety of goals, of which the production of wood is still the most important (cf. pulpwood strategy). However, more and more plantations are dedicated to sawn wood production in order to diversify the product spectrum of an enterprise. A further aim of planting trees is to establish agroforestry systems or to provide amenities in densely populated and urbanized areas. Here, the tree component can serve as timber and fuel wood, or for the provision of non-wood forest products (NWFP). Moreover, afforestation or tree planting is a key technique to restore basic ecosystem functions on degraded land. These 'lands of opportunities' make up millions of hectares all over the world.

Tree plantations can be diversified by using the variety of native tree species of a planting region. Mixed stands offer several advantages compared to monocultures, including frequent overyielding due to niche complementarity of the species, risk diversification, and higher ecological resilience (Bauhus et al. 2010). Additionally, recent studies give evidence that mixed species plantations with native tree species in the humid tropics show considerable returns, making them more attractive for entrepreneurs or investors. These economic outcomes could be improved if specific environmental services of (mixed) species plantations with native trees are taken into account (payment of environmental services); a special case study will be given here. Finally, plantations can contribute significantly to the livelihood of small-scale farmers by providing locally usable and marketable products, including non-wood forest products. Stakeholder participation is a key for minimizing potential conflicts in this long-term engagement.

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Pedogeochemical mapping in north-eastern Brazil: a matter of scale

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The enormous development in Brazil, including land-use changes, stands in stark contrast against the fact that rather little of the country has been assessed with modern quality standards of (soil)geochemical mapping, e.g. comparable with the European efforts (Reimann et al. 2014). Especially the vast expanses of the North and Northeast of the country lack a representative database for background concentrations and anomaly assessments. This work reports about representative soil geochemical data for all of north-eastern Brazil (NEB).

Table. Median concentrations in topsoil (0–20 cm mineral soil) in comparison between world soil averages (WSA), northeastern Brazil (BraSol), global (PEGS2), and Europe (GEMAS)

Component	WSA	BraSol	Seridó	PEGS 2	GEMAS Ap
SiO_2 (wt-%)	59.9	82.3	70.7	72.2	66.8
Al_2O_3 (wt-%)	15.1	9.02	10.3	9.3	10.5
Fe_2O_3 (wt-%)	5.0	1.73	3.35	3.4	3.6
CaO (wt-%)	1.96	0.051	0.80	0.8	1.2
MgO (wt-%)	1.49	0.039	1.21	0.7	1.0
K_2O (wt-%)	1.69	0.15	1.71	1.6	1.9
Na_2O (wt-%)	1.35	0.023	1.27	0.55	0.79
P_2O_5 (wt-%)	0.17	0.042	0.074	0.12	0.18
C_{tot} (wt-%)	no data	0.67	0.43	no data	2.20
N_{tot} (wt-%)	no data	0.060	0.044	no data	0.17
S_{tot} (wt-%)	0.08	0.030	0.008	no data	0.035
C:N ratio	no data	11	10	no data	10

WSA: World Soil Average (Koljonen1992), BraSol (Matschullat et al. 2012), PEGS2 (Caritat et al. 2012), GEMAS (Reimann et al. 2014 and new, yet unpublished data by the authors of this abstract)

While first results have been published already (Matschullat et al. 2012), this presentation will show new results for macronutrients (CNS) and selected trace elements. One of the most surprising findings relates to a significant difference between most of NEB and the Seridó, a desertification-prone area of roughly 5,000 km^2 in southern central Rio Grande do Norte and neighboring Paraíba. Our hypothesis explains this unusual anomaly with the colonial and agricultural history of that area.

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Pesticides: German and Brazilian experiences and practices

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The Brazilian environmental protection approach to the use of pesticides is causing no change in the large use of chemicals in the country's agricultural system. The basis of sustainable development to manage environmental hazards find an end in front of the fact that pesticides use in Brazil grew 162% in the last 12 years. Nevertheless Brazil has not showed public interest in diminishing this numbers through a public policy. In the present day, the application of pesticides in Brazil is regulated by the Law 7.802/1989, as well as in other minor acts. However, the current measures aren't enough to prevent known and unknown damages in the human health and environment. Therefore, this study is proposed to analyze foreign experience and practices in agro-industry, and it is based, mostly, in legislation changes made by the European Parliament and the Council of the European Union, in the Directive 128/2009/EC. This act required from the Member States a development of an Action Plan, in which it is needed to set up objectives, targets, measures and timetables to reduce risks and impacts of pesticide use on human health and environment. The German National Action Plan to Sustainable Use of Pesticides synthesizes the country's solutions and problems faced to solve the "over population x production scale" equation. The main goal of this proposal is to reflect about the legislative changes in the EU after the Directive 128/2009, especially in Germany, analyzing consequences of the German Action Plan as an example to Brazil's future. A compared study between current public policies in Brazil and Germany is essential to build a new and sustainable basis regulation to chemicals. The German Action Plan is broad and therefore this study does not intend to examine all of its singularities. The objective is to fulfill an initial analysis of the substantial points of this Action Plan in parallel with the present public policy in Brazil on the matter. This study aspires to discover if any of the measures taken in Germany are suitable in Brazil.

Productivity of fast-growth Forests in the Semiarid Zone of Pernambuco, Brazil

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The Gypsum Pole of Araripe located in the semiarid zone of Pernambuco is responsible for 97% of the Brazilian plaster production. The main energy source to produce plaster is the firewood from the native vegetation, called Caatinga (white forest), mainly as function of the low costs when compared to other energy sources. The annual growth of the plaster industry varies between 10 and 15%, and in 2014, the annual production of plaster was 5.6 million tons, resulting in a consumption of approximately 850,000 m^3 of firewood. The timber stock of the Caatinga in the region is low and the volumetric productivity in terms of mean annual increment (MAI) is around 5 $m^3.ha^{-1}$ which is extremely insufficient to supply the demand of the plaster industry. As the plaster production grows, occurs an increase in the firewood demand for the calcination of gypsum that is dehydrated at higher temperatures to become plaster. As consequence, more areas of Caatinga are devastated, most often, illegally. The objective of this study was to evaluate the volumetric development of three clones of *Eucalyptus* (C39 and C41 hybrids of *Eucalyptus urophylla* and C11 hybrid of *Eucalyptus brassiana*) at five different spacings (2mx1m, 2mx2m, 3mx2m, 3mx3m and 4mx2m) in two forest management systems (high forest and coppice) in the Gypsum Pole of Araripe. The experiment was established at the Experimental Station of the Agronomic Institute of Pernambuco (IPA) in the municipality of Araripina. Total height (H) and circumference at breast height (CBH) of all trees were measured every six months. The strict volume of sample trees were determined at 30, 36 and 42 months. The experimental design used was a multivariate design of repeated measurements. In addition, it was applied the Scott-Knott test that separated the treatments in three volumetric groups (A, B and C). For volumetric modeling were adjusted models based on the classical and symmetrical approaches using the Normal and t-Student distributions. The models of Brody, Chapman-Richard, Schumacher and Hall, Silva-Bailey and Spurr were adjusted to the data set. The final analysis indicated that all clones planted in 2mX1m spacing in the high forest system and the clone C41 in 2mx2m spacing showed higher productivity. Clones handled under high forest system showed higher survival rate. Comparing the clones conducted in both forest management systems the most productive was the clone C39. The adjusted models in the classical approach were the most suitable for the treatments in groups A and B. In the group C the model with best performance was Brody using the symmetrical approach. The financial analysis concluded that the clone C41 in 2mx2m and the clone C39 in 3mX2m spacing showed the highest net present value (NPV) and hence lower average production costs per m^3 of wood. Therefore, it can be concluded that clones of *Eucalyptus* must be used in reforestation projects with energy purposes. In addition, the devastation of Caatinga will be attenuated with the offer in short time of *Eucalyptus* firewood to the plaster industry.

Spatial Occupation of the *Eucalyptus* Plantations and Sustainable Forest Management Plans (Sfmp) of Caatinga in Semiarid Region of Pernambuco-Brazil

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Located in biome Caatinga (white forest), the Araripe region is undergoing a major anthropic pressure over the years by the growing demand for renewable natural resources, especially with the use of firewood for dehydration of gypsum, raw material for production of plaster. The Araripe region produces 97% of plaster consumed in Brazil, and the firewood removed from the Caatinga is the main energy source. The firewood supply from sustainable forest management plans (SFMP) does not reach the 5% of the plaster industry demand. Thus, most of the firewood consumed in the region is illegally removed from Caatinga, increasing significantly the degradation of vegetation and biodiversity of the region. Thus, the introduction of fast-growing species as *Eucalyptus* in degraded areas of the region may constitute as an economically and environmentally viable option for the supply of firewood in a shorter time, reducing the devastation of the Caatinga. The objective of this study was to simulate the spatial occupation of *Eucalyptus* plantations and SFMP of Caatinga to supply the plaster industry demand from the year 2019, when it will be made the first cut of *Eucalyptus* stands planted in 2012 (rotation of 7 years) and the cutting of SFMP started in 2004 (rotation of 14 years), considering the yields of 0.125 and 0.151 m^3 per ton of plaster produced, respectively, for firewood from *Eucalyptus* and SFMP. The mean annual increment (MAI) of Caatinga in fertile areas is around 5.35 $m^3.ha^{-1}$. An experiment with clones of *Eucalyptus* in the region had a MAI of 27.10 $m^3.ha^{-1}$, resulting in 189.70 $m^3.ha^{-1}$ at rotation age. This produces 1517.60 tons of plaster per hectare. Adopting an annual growth of plaster industry around 10%, taking as a basis the year 2012, in 2019, the plaster production will be 12.67 million tons, requiring a 1.58 million of m^3 of the eucalyptus firewood and 1.91 million m^3 of firewood from SFMP, from 8348.70 and 25488.80 hectares, respectively of plantations of *Eucalyptus* and SFMP. Calculating the spatial equivalency, i.e. the ratio of the area cut with *Eucalyptus* and PMFS, implies that 1.00 hectare planted with *Eucalyptus* corresponds to 3.05 hectares of SFMP. Considering a rotation of 14 years for a SFMP and starting a plantation of *Eucalyptus* in the year of the SFMP beginning it will result in two rotations with *Eucalyptus*. Thus the spatial equivalence becomes 6.10, i.e. a plantation of 1.00 ha of *Eucalyptus* corresponds to 6.10 hectares of PMFS. In the region there are available areas, the spatial occupation of *Eucalyptus* plantations in the Araripe region will be made in areas conducive to recovery, without the need to deforest areas covered by native vegetation, on the contrary, the planting of *Eucalyptus* because of its fast growth and high productivity when compared with the Caatinga vegetation will provide firewood in greater quantity and shortest time, which will result in attenuation of the devastation of the Caatinga.

Productivity and Survival Rate of Three Forest Species in Agrestic Southern of Pernambuco, Brazil

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In the Agrestic Southern of Pernambuco, the native vegetation is Caatinga (white forest). The region is going through a critical moment in its energy matrix as function of the low availability of forest resources, even though the wood is the main source of energy in the region whose intensive land use is for agriculture. The expansion of this activity requires more areas for crop plantations and consequently the deforestation of areas with native vegetation. Currently, there is low forest cover able to exploitation because only 20% of original vegetation remains in the region. Also, there are no research or reforestation programs in the region and the exploitation of vegetation occurs unplanned due to the virtual absence of sustainable forest management plans. Even with the approval of the Brazilian Forest Code in 2012, exploration in this region happens most often illegally. Therefore, it is necessary to research on fast-growth forests in that region to supply the demand of wood for industries and population. The objective of this study was to compare the performance of two clones of *Eucalyptus*: C0321(*E. grandis* x *E. urophylla*) and C2361 (hybrid of *E. grandis*)) and the species: *Eucalyptus urophylla, Corymbia citriodora, Mimosa caesalpiniaefolia* and *Azadirachta indica*, through the measurements of the dendrometric variables: diameter at breast height (DBH), total height (H) and volume (V) and its relationship with two different spacings (2mx2m and 3mx2m) to evaluate the survival rate and adaptation of species to local conditions. The experiment was established at the Experimental Station of the Agronomic Institute of Pernambuco (IPA) in the municipality of São Bento do Una. The experimental design adopted was a completely randomized design. Data were collected at the age of five years.The volume of the trees were determined by the Smalian method. *M. caesalpiniifolia* showed survival rate from 94.0% to 98.0% and *A. indica* a survival rate of 96.0% in both spacing. For the clones, *E. urophylla* and *C. citriodora* the survival rates ranged from 45.3% to 85.0%. The highest average DBH values were found for *E. urophylla* in the spacing 3mx2m which showed 10.00 cm and the clone 0321 with 9.23 cm in the spacing 3mx2m. The treatments that showed the highest mean height were *E. urophylla* with 10.92 m in the spacing 3mx2m and 9.62 m in the spacing 2mx2m. Clone 0321 presented 10.87 m in the spacing 3mx2m and 10.23 m for 2mx2m. The clone 2361 presented 10,15m in the spacing 3mx2m. The volumes per hectare was higher in plantations with clones 0321 and 2361 in the spacing 2mx2m with values of 79.195 $m^3.ha^{-1}$ and 63.653 $m^3.ha^{-1}$, respectively. *A. indica* even with a high survival rate showed small values of DBH, H and volume. Therefore, it can be concluded that the clones 0321 and 2361 meets best conditions to develop in areas subject to water restrictions, such as those that occur in soil and climate characteristics of the Agrestic Southern of Pernambuco, Brazil.

Strategies for the sustainable management on private forest in southern Brazil

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The Araucaria Forest, most important forest type in southern Brazil, was heavily exploited in the last century. Originally, the forest covered an area of 175,000 km^2 in southern Brazil (IBGE, 1992). Based on this study and according to the most recent studies, the Araucaria Forest has only 22,5% of the original coverage area (PROBIO, 2007). The reason for the Araucaria Forest large reduction in area is explained by the land need for agriculture and livestock, as well as the use of the forest wood. This predatory form of exploitation changed all the floristic and the forest structure, which resulted in a discontinuous forest distribution. Because of this exploitation model, since 2001 the Araucaria Forest is currently under various restrictions, including several species had their use prohibited. At the present moment, 14 years after the legal restriction, it has been proved the inefficiency of the mechanism used to preserve the Araucaria Forest. Most of the landowner sees the forest as a problem that prevents him from using more space to produce something that can generate income and improve their living conditions. The research project aims to carry out technical and scientific studies to demonstrate a sustainable use for the Araucaria Forests. The knowledge base required to implement the research has been built over the last four years of the project and also through other numerous research carried out by researchers which currently make up the project technical team. The project has developed several activities in 36 small farms (less than 50 ha), starting with land use, socioeconomic and forest resources survey. Among the 36 farms, four of them currently have Araucaria Forest in a condition to receive the forest management experiment. Before defining the treatments a survey of forest resources was conducted, with the inventory at 100% (census). With the inventory data was possible to realize that the forests studied were distinct from each other. Therefore, the forests were stratified into three different strata according to their similarities. The stratification was performed by using multivariate statistics and the variables used in the definition of the strata were: basal area and number of broadleaf trees, basal area and number of *Araucaria angustifolia*. The Araucaria tree is considered the most important specie in economic terms. The three strata generated were classified as follows: dominance of Araucaria (Stratum I), dominance of broadleaf (Stratum II), balance between broadleaf and Araucaria (stratum III). The strata showed great variability among them and for this reason specific treatments have been proposed for each stratum. In 2015 the research started in the stratum I and four treatments were applied. The treatments were defined by the cut of a given percentage of the *Araucaria angustifolia* basal area: 20%, 35% and 50%. The treatments that will be applied in the other strata in the years 2016 and 2017 are under study. Finally, the project aims to develop the sustainable use for the forest, which could be a model to be replicated in many similar forest fragments in southern Brazil.
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What are the impacts of the new Brazilian legislation on forests from 2001 on the behavior of the local forest owners in regard to the forest treatment? Are there any changes visible because of the revision in 2012?

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This bachelor thesis is a preliminary survey for the research project "Institutional Change in the Forest Policy of Brazil and its Impact on the behavior of the land users."
The research was conducted in the south of Brazil, in the state of Paraná. In this region, land ownership is strongly characterized by the possession of only a few acres of land. The Brazilian Forest Act was amended to a large extent in 2001 and then again in 2012. One aim of the new legislation was to improve the situation of small-scale private forest owners. Under the old law there were many legal requirements with regards to forest reserves etc. which the forest owner could not meet. Under the new law, there is a ban on the commercial use of some tree species. Certain protected areas can be merged in order to meet the legal requirements.
The core question of this study concerns the impact of this legislation on forest treatment by the small private forest owners. In order to assess the impact, the laws were studied and a theoretical explanatory framework was developed. On this basis, a hypothesis was derived from the relevant laws and social theories. This hypothesis then constituted the basis of the interview guide. With this interview guide a total of eleven interviews were conducted in the research area. Not only the forest owners were interviewed, but also the observers of forest owners were interviewed on the subject. These observers were the officials of the State Ministry of Natural Resources & Environment.
As a result of the investigations it can be stated that the new Brazilian forest law has only a very limited impact on forest treatment by forest owners in the research region. The effect is limited to preventing larger clear cuts and it has become more acceptable for the landowners to accept certain types of nature reserves. The ban on the use of some tree species even has a counterproductive effect: These tree species have thus become unprofitable for the landowners and are being removed. The fact that the land owners are largely ignorant of the law is also an important reason as to why the law has had such a weak impact.

The rush on the tropical rainforest: strategies of appropriation and reconfiguration of nature and local population at the lower Amazon and Tapajós Rivers in West-Pará, Brazil

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The transformation of public and local population's territories at the lower Amazon and Tapajós Rivers in West-Pará is accompanied by the appropriation of rainforest's bio-resources (land, timber) by migrant farmers and entrepreneurs of extensive agriculture (soybean production, cattle breeding), who substitute local forest gatherer's and smallholders' territories into extractive exploration systems. Through these processes, local people lose their physical and symbolic landscapes of meaning and belonging, as social, economic and environmental decomposition accelerate. Local people sometimes organize collective action in coalition with social and environmental movements; but they often accept their fate to the detriment of their own rights and well-being. Against this background, I explore these processes exemplarily at the environmental conservation unit Floresta Nacional Tapajós (FLONA) and its buffer zone at the Tapajós River in West Pará, Amazon, Brazil. Due to the implementation of mega-infrastructure projects, i. e. maritime harbors at the Tapajós and Amazon River in Santarém and at the town Itaituba (planned), which are navigable for soybean vessels, and the bituminization of the high-way BR-163, which connects the soybean fields of Mato Grosso to Santarém, as well as due to the South-American development program IIRSA, the region is undergoing drastic changes. Nature as well as local people, their ways of living and their social organizations are affected. My concern is to show what processes are underway, how the Brazilian state takes part in this endeavor, and what smallholders' options to these processes are. I argue that a) strategic partnerships exist between the private sector and the state; b) the state constantly transforms territories in dependence of the political and economic power play; c) the state facilitates the transformation of commons and other forms of local peoples' land property regimes into commodities; and d) one important instrument hereby is the re-classification and re-labelling of social and ethnic groups through welfare programs in order to adjust the population to strategic government planning. Base for this paper provide empirical data, which I collected over the last three years at the lower Amazon and Tapajós Rivers in West-Pará in the context of a German Research Foundation (DFG) funded project, in cooperation with Brazilian research entities as well as social movements, which have been working in the region for decades. Methodological tools are environmental oral history and the analysis of property rights systems.

Poor ***L***and ***U***se, ***P***oor ***H***ealth: primary prevention of human health through sound land-use for small-scale farmers of the humid tropic - The **PLUPH** Project

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Deforestation for small-scale agriculture has been associated to health risks for vulnerable populations in the Amazon. For instance, slash-and-burn activities have been (1) favouring the transfer of naturally-occurring mercury (Hg) from soils into aquatic ecosystems and resulting in the contamination of fish resources; (2) increasing the risk of human exposure to *Trypanosoma cruzi* and hence American Trypanosomiasis (Chagas disease), following the proliferation of Attalea palms upon deforestation, Attalea being the main forest ecotope for triatomine insect vectors of the pathogenic protozoan. The PLUPH project - http://www.pluph.uqam.ca - part of the Canadian Global Health Research Initiative, has used these two environmental health emergent problems as exemplary pretexts to address primary prevention of human health through sound land-use for small-scale farmers. It has fully integrated socio-economic and biophysical dimensions and has unfolded in the Tapajós Region watershed, an active pioneer front where both old riparian communities and newly established inland colonies are found. Among other things, we mapped the basic epidemiologic system of the American Trypanosomiasis in the study area, identifying the Attalea palms local species, their infestation by triatomines, the level of *T. cruzi* infection of insects and their dispersion between palm trees. In parallel, we characterised the transfer of Hg from terrestrial to aquatic ecosystems according to different land-use strategies, and assessed the human exposure to this contaminant taking into account both dietary, cultural, and socio-economic features of small agricultural and fishing riparian communities. The scientific results of our project are now being applied to design sustainable agroecosystems and used to promote education, modes of rural development and public policies inland Amazon, combining population health and environmental protection.

Flight Control and Navigation for scalable and arbitrarily dimensioned UAV and manned Multicopters

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The NAVKA navigation technologies at IAF/HSKA were awarded as Baden Württemberg winner and on international level with bronze, among 434 competitors in the European Satellite Navigation Competition (ESNC) 2014 [1].
The NAVKA flight control system (algorithms, software and hardware) is part of the above technologies. It was developed by the authors in the scope of the NAVKA project [2] and the ZIM project [3] at IAF/HSKA. The flight control system can be used for the navigation and control of multicopter UAV and manned multicopters. Hereby the multicopters can be designed scalable in respect to

- Applications
- Size
- Payloads
- Sensor equipments.

The flight navigation and control system is based on redundant GNSS, MEMS, camera and MOEMS sensors. Possible applications and use-cases for the developed NAVKA flight control system on UAV and manned Volocopters are:

- 3D mapping and geosensing
- Film industry
- Search and rescue of people
- Agriculture UAV
- Facility management and monitoring UAV
- Wild-life protection
- Transport UAV
- Fire-Fighting air vehicles
- ABC sensing UAV for emergency event
- Environment-friendly and silent manned air taxis

The above mentioned further sensors, e. g. cameras, laser scanners, radar and others can be geo-referenced by using the state-vector of the UAV navigation. Changes in the payload are detected automatically and considered in the physical properties of the UAV and manned aircraft, respectively.
The mathematical models of the navigation and control algorithms and the complete system design (NAVKArine-FC-4) are presented. The running further developments on the NAVKA flight control system are also part of the presentation. Different UAV and manned volocopters, where the NAVKA flight control already runs are shown.

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[1] ESNC 2015 Website: www.esnc.info/index.php?anzeige=bawue14.html
[2] WebSite NAVKA Project: www.navka.de
[3] Website ZIM Project Volocopter: http://www.navka.de/index.php/de/ueberblick-evolo

Poster Presentations

Economic Income of Reduced Impact Logging (RIL) in the Amazon: the case of the National Forest Jamari

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Since 2010 three private companies, Madeflona, Sakura and Amata, received the award for the commercial exploitation of 96,000 ha of the National Forest Jamari in the Amazon. The forest concession allows the exploitation of timber and non-timber resources, as well as offering ecotouristic services. May be considered non-wood resources: the forestry residues (leaves, bark, stumps and roots), seeds, oils, Brazilian nuts, rubber and *açaí*. The Forest Concession of a Forest Management Unit requires a management system in rotation for a period of 30 years. The principles of the Forest Concession system are: Sustainable Forest Management and Reduced Impact Logging. Only commercially valuable trees over 50 cm in diameter can be removed and their branches, so the number of trees per hectare is low. The main criteria for the selection of concessionaires logging companies are: the creation of jobs for the surrounding communities and the proportion of jobs created for women compared to men. In the first 3 years of Reduced Impact Logging in Jamari tropical forest, from 2010 to 2012, there were managed 86,520 m^3. For this production, the concessionaires companies have paid US$ 2,081,737.00 to the Brazilian Forest Service. The result of these good management practices is a more sustainably managed forest that is harvested at an appropriate level and in such a way that minimizes collateral damage to streams, soil, wildlife, and non-harvest trees and also reduces wood waste.

Evaluation of flow in watershed in Villa Malea Spain

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The objective was to evaluate the potential for water production through the flow of watershed in Villa Malea - Spain. The watershed is located in Cuenca, Castilla La Mancha region – Spain, which is limited between the following coordinates: latitude: 39º 21' 54.57 (N); 1º 30' 23.83 longitude (W) and altitude: 625 meters. The determination of the river flow was held in April 2015, through the direct method "volume (ml) per time (s)" in a spillway, with known volume disposed at an unknown time, which is the collection of water in graduate container for a specified time in seconds, recorded with timer, to obtain the timely flow in ($L.s^{-1}$). The point measurements were performed on a spillway at the end of River watershed to estimate the water flow or instantaneous flow rate (Q). The average data resulted in a volume of 5 liters (L) by the average time of 42.15 seconds (s) obtained from 6 replicates, resulting in production of 0.118 ($L.s^{-1}$), 10195.2 ($L.dia^{-1}$), the average flow rate of Q = 10.2 $m^3.día^{-1}$. The runoff is a hydrological process of interaction between rainfall and the physiographic conditions of the watershed and the flow is the result of this process. The water production can be variable in time and space specific to each region (RODRIGUES, 2014), and depend on regular rainfall, physiographic conditions and the management plan and management adopted in the watershed. It was concluded that this watershed is in recovery process, with conservation practices and the possibility of increasing the daily flow of water.

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Innovative biomass production from root and stump wood of *Eucalyptus Grandis* for energy generation in Brazil

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The wood production in Brazil is mainly provided by planted forests of with 72,0% is predominant species the Eucalyptus tree. It spans mainly over the Brazilian states of MG, SP, PR, SC, BA and MS[1]. From the 283,4 million cubic meters of wood extracted in 2013 in Brazil, roughly 50% are used for the production of biofuels like vegetable coal and firewood[2]. However, the energy production from these sources and wood waste represents only 0,28% (405,3MW) in the Brazilian generation of electrical energy[3]. To harvest this raw material, the current production system is using mechanized forestry machinery like the harvester. This excludes the plant parts beneath the soil like stump and root material for natural decay or mechanized depression due to the disruptive potential during harvest and replantation[4]. However, especially these parts represent a dense wood material with high calorific values. To analyze the potential of these plant parts for energy production, the Brazilian forestry company Operflora - Operações Florestais, developed a new process to harvest and process these plant parts[5]. As a result of the laboratorial analysis by the UNICENTRO, the physical characteristics are an initial average moisture of 50%, an average bulk density of ~97 kg/m³ when dried and with a wide range in grain size between 1 and 12cm. The chemical specifications resulted in a lignin content of ~35% and lower heating value of ~4200 kWh/m³. With more than 5,47 million hectares of Eucalyptus plantations in Brazil, this creates new opportunity for the integrated production wood chips for energy production from biomass without additional land use and an faster plantation rotation as a positive by-product[6]. However, the identified challenges are the high associated content of soil material during the production and processing phase and the final costs of the wood chips due to the elevated production costs. Also, in terms of the associated environmental impacts of removing these plant parts from the soil, are further scientific investigations necessary. Especially due to the fact, that the absent of the recirculation of minerals from the material in the soil by decay makes it necessary to utilize increasingly artificial fertilizer for new seedlings and the heightened susceptibility to erosion.

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4: Borin, E. J. (17.05.2014) Personal interview
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Modelling human-environment interactions in a smallholder agricultural system on the Atlantic Rainforest (Ribeira Valley, SP. Brazil), with the use of a coupled socio-ecological model.

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Most Atlantic Forest remnants are found in the Ribeira Valley (southeast Brazil), one of the world's biodiversity hotspots. Ribeira Valley is also home to Afro-Brazilian *quilombo* communities, rural groups descending from former slaves. The first *quilombo* settlements in the region were formed during the 18th century, and survived in relative isolation thanks to shifting cultivation, a subsistence agricultural system in which fallow periods (used for soil recovery) are longer than cultivating periods. During the last decades, the *quilombo* system has been intensified in response to socioeconomic, geographic and political factors, with higher dependence on the market for foodstuffs and diminished social capital in labor. Also, new technologies have arrived and quickly been diffused. As a result, land use has been changing: fallow periods have been shortened, plot rotation has decreased, and nowadays the production is more focused on cash crops. Moreover, environmental laws have constrained the traditional agricultural system practice. Our aim is to couple a biophysical landscape and asocio-economic multi-agent models, to help farmers to plan future land use. The tool is expected to assist in optimizing the local resources use, improving *quilombos'* livelihoods and minimizing ecological impacts. In order to do so, we are going to identify factors influencing households in the decision-making process related to land use and to model, among the main production aspects, the process of technology adoption and diffusion. We will also simulate the consequences of shifting cultivation practices and recent land use changes on the local forest landscape. The catchment to be simulated is Pedro Cubas community (Eldorado – SP), with 50 households and 3806.23 ha. The chosen method is to build a socioeconomic and institutional scenario, which will be modeled by MPMAS (Mathematical Programming-based Multi-Agent Systems). MPMAS combines a cellular component representing a physical landscape with an agent-based component representing decision-making. But, in order to represent the system's productivity - as the combination of soil structure, topography, and fallow forest biomass -, MPMAS will be coupled with LUCIA (Land Use Change Impact Assessment tool). LUCIA dynamically simulates plot and landscape hydrology, soil dynamics and plant growth. In an additional step, the coupled simulations are going to produce maps, that will be used to model land use impacts on tree species diversity. A species distribution model will quantify species–environment relationships, and calculate the probability of finding determined species across a heterogeneous landscape. We expect the described methods to be able to dynamically capture the complex relations between ecology and economics, the forest landscape and farmers' decision making, in *quilombo* territories.

Can the optimization of air flow in commercial CA storage room for apples reduce the consumption of energy?

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Air circulation is one of the most important parameters during fruit storage, as it has a crucial influence on the climate within the storage room. During three years we investigated the impact of storage room modifications on air flow. The parameters investigated were temperature, humidity, air velocity, weight loss and fruit quality distribution. Therefore, two commercial CA rooms (40 tons each), one without ('non-optimized') and the other one with ('optimized') air deflector and evaporator sealing-off, were equipped with fruit temperature sensors at 9 different fixed positions in the room. At the same positions, air velocity was measured with a hand held anemometer. In addition, relative humidity and air temperature were logged during storage period. Weight loss and fruit quality (firmness, titratable acidity, total soluble solids and skin colour) of the apples were determined after 7 months of CA storage. Beginning with the second year we determined the transpiration rate of the fruit. In the third year we installed furthermore four mobile measuring-arms at the ceiling of the room, each with 10 hot-wire anemometers (m/s), to determine air flow distribution. On the front and back wall of the room additionally 9 hot-wire anemometers were installed to determine up and down streams. In each CA-room an evaporimeter, two psychrometers and two capacitive humidity sensors were installed to evaluate relative humidity and to analyze the different measurement methods. The summarized data of the third year will be presented in the poster. The average values of fruit temperature were lower in the 'optimized' room for all measured points during first and second year. Concerning fruit quality no differences have been observed between both rooms and different positions in the rooms. The transpiration rates were measured in the rooms during second year, were higher in the optimized room. Possibly caused by an increased evaporation due to higher air velocities at fruit surface. In contrast to these finding and to results from the first year, in second year weight loss was slightly lower in fruit from the 'optimized' room. In further experiments we will determine the necessary air turnover because the energy demand of storage facilities is directly correlated to ventilators runtimes. For that matter it is important to include the determination of air turbulences to support a comprehensive interpretation of air velocity measurements.

Flow Rate and Water Infiltration in three covers Soil

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The forest plays a fundamental role in the regulation of hydrological processes in watersheds. The objectives were to quantify the hydrological processes in different soil cover, analyzing the dynamic function of the vegetation in the water, sediment loading and erosion control plots. The work was carried out on the farm São Manuel, Faculty of Agricultural Sciences (FCA - UNESP). The circular plots in soil: forest cover, grasses and naked bare soil. The simulations were performed with water volumes in liters (L), time in seconds (s) in an area known (cm^2). The teaching evaluation model of hydrological processes was developed with cylindrical brass rings, with 57cm of diameter and area of $0.26m^2$, fixed on the ground, with output device water runoff and sediment in plastic tube (PVC) with one inch in diameter plastic coupled from 2 to 5 (L) to be removable in the act of reading the time of measurement of flow (cm^3) and the sediments in grams (g). Quantifying processes (mm) may be performed after the natural rainfall or precipitation after the simulation at any time. The parameters analyzed were: precipitation (P), rainfall intensity (I), runoff (Qds) water infiltration (If) runoff coefficient (CR) and carried sediments (S). The results of the variables precipitation intensity, runoff, infiltration were collected in liters and processed in millimeters. Through the relationship between flow and precipitation, got the coefficient of runoff (CR), and the sediments were quantified adduced by dry weight (g). The types of land cover influence the runoff, infiltration and sediment mobilization. The runoff coefficient was lower in the presence of vegetation resulting in increased water infiltration into the soil, while the erosion and sediment increased in unprotected soil altering the dynamics of water and allowing erosion, silting and floods in the drainage network of the watershed. Therefore concludes that the forest plays an important role in the sustainability of water in watersheds.

Soil physical evaluation of *Eucalyptus grandis* reforestation in the periods dry and rainy.

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The physical properties of the soil as moisture, density and porosity can serve studies to assist in the search for productivity of wood in reforested areas with *Eucalyptus.* These physical factors are interrelated and are responsible for the infiltration of water retention and drainage in the soil. The goals were soil physical evaluation of *Eucalyptus grandis* reforestation, with 6.5 and 7.0 years old, and bare ground, in the periods: dry and rainy. The studied areas are located at Lwarcel company, in the city of Lençóis Paulista, São Paulo, Brazil. Soil samples were collected in layers 0 to 100 centimeters (cm) in June 2014 and March 2015, periods characterized as: dry and rainy. The samples were brought to the laboratory for determination of moisture content, particle density and porosity of the soil. To calculate the moisture content, it used the wet mass and dry mass. For the porosity calculation were based on the average soil density and density of soil particles. The results show that the moisture content at the surface was low: 6.2 and 7.7% in soils with and without vegetation, the dry season and sandy texture class. The density of the soil particles from both areas was 2.1 g/cm^3, while the density in the dry period was 1.3 to 1.5 g/cm^3, resulting in an average porosity of 36.4% and 31.9%, respectively. In the rainy season density was 1.4 to 1.5 g/cm^3, an average low porosity 34.3 and 29.5% with increasing moisture to 9.2 and 8.3%. In both periods, soil porosity with *Eucalyptus* is greater, which is due to the higher organic matter content in forest litter. In the dry period, a smaller amount of water in the soil with *Eucalyptus* from the ground were noticed in the profile around 30%, due to the consumption of water, this fact is explained due to the evaporation process the trees. Furthermore, reforestation has a high density of trees per hectare spacing 3x2 meters 6m^2 per tree, a total of 1667 individuals per hectare.

Evaluation of Rainfall, throughfall and Interception by Canopies Trees in *Pinus Halepensis* - Albacete - Spain

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The objectives of the work were the evaluation of several parameters: rainfall, throughfall, interception by canopies trees, effective rainfall: throughfall and stemflow, soil water infiltration, surface runoff and accumulation of sediments in the soil. The experiments were developed during two rain events, during May and June of 2015, with a 32 years old *Pinus Halepensis*, located in the Centro Regional de Estudios del Água (CREA), University of Castilla de La Mancha, Albacete (Spain). The evaluations of rainfall redistributions were developed by means of 3 external pluviometers and 64 over the tree canopy. Moreover, a trunk interceptometer and an infiltrometer were installed. The average values of rainfall varied from 3.3 to 21.8 mm. The average values of efective rainfall varied from 2.0 to 15.2 mm and the rainfall interception by canopies trees varied from 30.4 and 38.5%. The efective total rainfall that reach the soil was 61.5 and 69.6%. A high infiltration capacity was reached (100% and 65.2%) with a low surface runoff (0 and 1.0 mm) with a charge of 396 $kg \cdot ha^{-1}$. A low rainfall intensity implies a high rainfall interception by canopies trees. Moreover, a decreasing in the efective rainfall took place. This is due to an increase of soil water infiltration and no runoff. With a high rainfall intensity the rainfall interception decrease and the efective rainfall is increased. Finally, the soil water infiltration is included (14.2 $l \cdot m^{-2}$) and a low runoff and sedimentation. This reflects that natural vegetation play a notable contribution to the replenishment of groundwater.

Cultivation of pecan (*Carya illinoinensis*) in Rio Grande do Sul, Brazil and climatic requeriments.

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In Rio Grande do Sul Brazilian state, agricultural production is very expressive on the national scene, especially for the high capacity, quality and diversity of production. Among the diverse temperate climate fruit crops production, pecan (*Carya illinoinensis*) is one of the most significant. Its origin is from southern and eastern regions of the United States and has been introduced in Brazil by north Americans immigrants in 1910. Today this cultivation is expanding, mainly in south Brazil. This research pretends to make an analyse of the geographical distribution of pecan cultivation in Rio Grande do Sul to compare its climatic requirements based on theoretical frameworks and the local climate background. Pecan is cultivated as an alternative crop production and a source of income in the medium and long term. It is very important specie in agroforestry systems, providing fruit and good quality wood in association with other cultures. The nuts have an elevated nutritional content, such as protein and oil. In 2006 the production of pecan was 1.1 ton in 1,366 ha cultivated in the state (IBGE, 2006). In 2014, it was estimated that the production exceeds 1.5 ton in 3396 ha planted (EMATER, 2014). On climate requirements, stand out temperatures between 24 and 30 °C in the nut growing and temperatures below 7 °C during the dormant, with predominance accumulation of more than 400 hours of cold (RASEIRA, 1990). Pecan is tolerant of frost, but late spring frosts or early autumn frosts are harmful (MADEIRO, 2003; SPARKS, 2005). Rain requirement is above 800 mm per year.

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Ecological-Economic Zoning of Silveira Martins-RS, Brazil.

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Ecological-Economic Zoning (EEZ) is a planning tool with sustainability criteria, natural and socio-economic dynamics. Displays information about the territory needed to plan for rational occupation and sustainable use of natural resources, integrated in a geographic database (CAMPAGNANI; SANTOS, 1998). This research has objective to elaborate the Ecological-Economic Zoning of Silveira Martins, RS, integrating vulnerability to natural soil loss, the social potential and permanent preservation areas. Therefore, we used the methodologies proposed by Crepani et al. (1996) and Becker and Egler (1996). Created a spacial database in a Geographic Information System (GIS) using Spring 5.0.6 software. Was used information about geomorphology, geology, soils, slope, drainage network, soil use and occupation, population, economy and sanitation. Informations integrating was performad throught map algebra. As a result highlights the median social potential in the three census tracts. Silveira Martins has homogeneity of potential, showing equilibrium between dynamism and restraint. For Natural vulnerability to soil loss, there was predominance of moderately stable/vulnerable areas. This means that there is a balance between the pedogenetic and morphogenesis.The map zoning, summarizing the information, resulted with six zones. Conservation is the highest zone (40.72%) characterized by high vulnerability and social potential restriction. The second zone is consolidation (37.76%) characterized by productivity areas. Use restriction zone (10.20%), consisting areas with slope between 25 and 45º, and recuperation zone (2.5%), need more attention with agricultural practices. Permanent preservation zone (7.92%) also need attention with the conflicting areas. In the last, urban zone (0.90%) which is constituted by urban area.

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Water infiltration in the soil in vegetation cover of grassy

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The knowledge of capacity and infiltration speed as well as the understanding of the dynamic process of water movement in the soil is of key importance to the use and management appropriate of soil. Thus, the aim of this study was to determine the water infiltration into the soil of grassy vegetation. The study was performed at the State Park Serra do Mar - Nucleo Cunha (Cunha, SP, Brazil). To measure the speed of infiltration was using a lysimeter and the accumulated water infiltration into the soil, an infiltrometer (DIK-4200 model); 13 readings were made in water layer with a 5 minute interval (0-65 min). The data were analyzed by linear regression by drafting accumulation curves of infiltrated water and the speed of infiltration versus time. The speed of grassy infiltration mean was 31.84 cm/h, and with the passing of time the values decreased and stabilized from the 9th reading (45 min), with a low value of linear regression ($R^2 = 0.57$). The accumulated infiltration reached 31.2 mm of water into the soil profile at the 13th reading (65 min), thus presenting a high value linear regression ($R^2 = 0.99$), showing an inverse relationship with infiltration speed with the passing time. Therefore it can be concluded that the use of infiltrometer, being a practical and easy handling instrument, is suitable for determination of soil infiltration.

The main aspects of soy production in the municipality of Santarém, Pará, Brazil

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This reflection seeks to establish the main aspects of soy production in Santarém, contextualizing their strengths and weaknesses as well as its implications and consequences on the economic and environmental social scene in the city of Santarém located in the Amazon region and trace the evolution of soya along the BR-163, also analysing if the activity has generated socioeconomic returns for the stakeholders and the impact that transnational Cargill had in the region. Therefore, through a literature and document review sought to identify as was the expansion of this activity in the environmental and economic social, and as it now reflects the lives of citizens also should be noted that the exploitation of these environmental resources and strategic location contributed to the establishment environmental and especially social conflicts. Barbosa (2014) ensures that in Santarem, this activity has caused problems such as increased deforestation, conflicts over land ownership, contamination of water resources and loss of access to land, especially by traditional peoples, among others. In the economic field there was a strong growth trend in the country and in the region of Santarém, make a substantial contribution to GDP growth, thus implying a development to municipality. However, it has not turned out that way, transnational Cargill said that would generate new jobs, because in 2003 this company built a complex benefactor in the city of Santarém, which has a modern pier in front of the meeting of the Tapajós River with the Amazonas River, providing a waterway flow of production to the US and Europe. It was noticed that the hegemonic agents should not only develop infrastructure facilities to meet the needs of capital, as can be seen in the construction of the BR-163 and the Cargill port in the city of Santarém-PA. But also, provide an increase in the quality of life of society through public policies and investments in human capital.

Carbon stocks in a hybrid *Eucalyptus* plantation in southern Brazil

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Hybrid eucalypt clones in Brazil have a very fast growth rate and thus an important capacity of fixing atmospheric carbon. Carbon stock estimates in forestry plantations can be performed by biomass quantification and subsequent determination of C concentration. This study assessed the organic carbon stock in 10 years-old plantation of *Eucalyptus urophylla* x *Eucalyptus globulus* in Southern Brazil. Four experimental plots (35 m x 20 m) were established and a complete forestry inventory was conducted defining five diametric classes. In each diametric class three trees were harvested for biomass and organic carbon quantification. Understory biomass were quantified in five subplots of 25 m^2 each. Organic C in the soil (SOC) and in the fine roots (diameter ≤ 1.0 cm) was quantified until 100 cm in depth. C concentration in the *Eucalyptus* biomass fractions was 55.7 (± 0.6), 50.4 (± 0.4), 49.5 (± 0.6) and 45.4% (± 0.9) for leaves, branches, wood and bark, respectively. C concentrations in the understory fractions were 51.4 (± 1.0) and 50.0% (± 0.9) for canopy (leaves plus branches) and stem (wood plus bark), respectively. In the fine roots biomass a C concentration of 45.7% (± 1.4) was observed. C concentrations in the soil were 1.23 (± 0.32), 0.97 (± 0.10), 0.45 (± 0.14) and 0.24% (± 0.10) for 0-25, 25-50, 50-75 and 75-100 cm in depth. Total C in *Eucalyptus* aboveground biomass was 97.8 Mg ha^{-1}, allocated predominantly in the wood (84.6%), followed by bark (8.8%), branches (4.6%) and leaves (2.1%). Understory comprises a small aboveground C fraction (1.4 Mg ha^{-1}). Fine roots contributed with 0.9 Mg ha^{-1} of the C stock. The total content of SOC was 100.0 Mg ha^{-1}, manly in the depth 50 cm (75.7%). The total C stock for the *Eucalyptus* plantation was 200.2 Mg ha^{-1} with a similar share among plant biomass and soil, thus showing a very high rate of C sequestration in biomass (10 Mg ha^{-1} $year^{-1}$).

Can the use of new storage strategies provide possible energy savings during apple storage?

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Modern storage technologies, such as 1-methylcyclopropene (1-MCP) or dynamic controlled atmosphere (DCA), have the potential to save energy due to their intensive ripening inhibiting effects. On the one hand, these technologies allow fruit storage at increased temperatures, within a certain range, without any appreciable negative influence on fruit quality. On the other hand the strong inhibition of fruit respiration can reduce the respiratory heat input of the fruit. To evaluate the energy saving potential of 1-MCP (SmartFresh™) and DCA, experiments over seven years with different apple cultivars were undertaken in commercial (200 t capacity) and research facility (11 t capacity) CA-rooms to compare standard CA (1.0 kPa O_2; 2.5 kPa CO_2) at 1°C and DCA (HarvestWatch™) (~0.5kPa O_2; 2.5kPa CO_2) or CA (1.0 kPa O_2; 2.5 kPa CO_2) in combination with 1-MCP at increased temperatures (3, 4 or 5°C). Energy consumption for the refrigeration compressors, ventilation fans, defrosting and CO_2 scrubbing was calculated from the machinery run-time records or by measurements with installed electric meters. Fruit quality parameters (firmness, TA, TSS, colour), ethylene production and respiration were measured at different time points. Weight loss was determined at the end of storage. Experiments were accompanied by sensory tests. Results show reductions in energy consumption of up to 50% with increased storage temperatures from 1°C to 4°C without any appreciable negative influence on fruit quality and ripening, providing that apple harvesting, postharvest timings and applications are all carried out in accordance with good horticultural practice. The highest energy consumption and highest potential saving were observed for the refrigeration compressors and ventilation fans. Fruit quality analyses and consumer tests showed that 1-MCP and DCA-storage have the potential to compensate for the negative influence of increased storage temperatures and thus provide the possibility to reduce energy consumption when compared to conventional CA / ULO storage. For 'Pinova' apple, the experiment show that increased storage temperatures additionally to energy savings might be an effective way to reduce the occurrence of *Neofabraea* spp., the main postharvest disease for this apple variety, during storage.

Session 11: Global Geoparks & World Heritage Sites

Convener

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During the last decade, the Global Geoparks Network, which consists currently of 111 territories in 32 countries worldwide, has developed a wide range of tools towards sustainable regional development, geo-education, regional and international networking, science transfer, and conservation strategies. Their holistic approach, which includes the connection of Earth history, nature, man and culture, enables innovative development of territories and supports their regional identity, including their past, present and future. In this context, UNESCO World Heritage Sites (UNESCO WHS) and Global Geoparks are potential cooperation partners with respect to sustainable development, public awareness and protection of our natural and cultural heritage. UNESCO-WHS Messel Pit and Global Geopark Bergstrasse-Odenwald (Germany) have developed a close cooperation strategy, including common projects, public relations, education programs and products, which is considered as best practice model for WHS-Geopark cooperation at UNESCO. We expect contributions from Global Geoparks as well as from UNESCO WHS cooperating with sustainable Institutions like Geoparks.

Keynote **Lecture**:

Dr Margarete Patzak, UNESCO, Earth Sciences and Geohazards Risk Reduction Section, Division of Ecological and Earth Sciences, Paris, France,
Prof. Dr. Nikolaos Zouros, University of the Aegean Department of Geography, Mytilene, Greece,
Prof. Dr. Elizabeth Silva, Portuguese NatCom for UNESCO – Science Sector, Ministry of Foreign Affairs, Portuguese National Forum of Geoparks, Lisbon, Portugal
Prof. Dr. Jiangfeng Li, School of Public Administration, China University of Geosciences, Wuhan, China

Oral Presentations

Global Geoparks – Looking towards the future

Dr Margarete Patzak

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Global Geoparks are unified areas with geological heritage of international significance. Their bottom-up concept combining conservation with sustainable development while involving local communities is becoming increasingly popular. Since 2001, UNESCO has assisted countries around the world to establish Global Geoparks through the Global Geoparks Network (GGN) where national geological heritage initiatives contribute to and benefit from their membership of a global network of exchange and cooperation. The GGN was created in 2004 by 24 Geoparks from Europe and China in Beijing, at the first of six International Geoparks Conferences. Since then Global Geoparks have gained momentum and reached today 111 members in 32 countries.

Global Geopark activities have been supported by UNESCO since 2001 and, since 2004, UNESCO has offered direct ad-hoc support to individual countries. UNESCO's role has largely been one of guidance in quality and facilitating networking activities. However, the role of UNESCO in supporting the worldwide growing activities is limited because 'Geoparks' are not a programme of UNESCO per se. In recent years as the quality of the work carried out in Global Geoparks has become increasingly recognised and valued worldwide and Member States of UNESCO requested to re-examine the relationship with the GGN and how relations might be formalised. An important issue for many Member States was the ability to use the term "UNESCO Global Geopark" and to be able to use a "combined logo." An additional and very important issue was to retain, as much as possible, the bottom-up nature of Global Geoparks.

As a result of seven consultative meetings in UNESCO since 2013 a model has been developed to reform the existing International Geoscience Programme (IGCP) into an International Geoscience and Geoparks Programme (IGGP) which would have two main activities: the scientific projects of the Geoscience Programme plus Geopark activities as part of UNESCO Global Geoparks. Draft Statutes and Operational Guidelines were elaborated and submitted to the 196th session of UNESCO's Executive Board in April 2015. As a follow-up, the General Conference in November 2015 will decide whether to establish a new International Geoscience and Geoparks Programme which would introduce the label UNESCO Global Geoparks. If approved, UNESCO Global Geoparks would be the third label of UNESCO designated sites alongside with World Heritage sites and Biosphere reserves. This new label could become a new tool of excellence and UNESCO could take the lead in high-quality outreach on sustainable development linked to issues on geodiversity, environment, geohazards, climate change and the sustainable use of natural resources while working closely with local communities for peace and wellbeing. This new label under the lead of UNESCO could also be of clear advantage for the development of Global Geoparks in those regions where none currently exist.

Global Geoparks : Networking and collaboration between Europe and Latin America .

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The Geopark concept was introduced at late 90's following the declaration of the Digne Conference in 1991, aiming to protect and promote Earth heritage sites through the sustainable local development of territories containing abiotic nature of significant value. The European Geoparks Network (EGN) was established in 2000 by four European territories to address the strong need for effective management of important geosites and sustainable development of rural areas through the development of geotourism in Europe. Today EGN includes 65 territories in 22 European countries. The Global Geoparks Network (GGN) was established in 2004, under the umbrella of UNESCO and operates as an international network, which providing a platform of cooperation among Geoparks, brings together government agencies, non-governmental organizations, scientists and experts from all countries around the world in a unique worldwide partnership including 111 Geoparks in 32 countries working to protect Geological heritage and promote local sustainable development. In 2014 the GGN became an international non-profit association, operating under the French law, in order to sign an official partnership with UNESCO.

The Araripe Geopark, in Ceara state, Brazil is the first Latin American Geopark, recognized in 2006. In 2013 Grutas del Palacio Geopark in Uruguay is included in GGN. A diversity of activities have been organized by GGN and EGN to support the development of Geoparks in Latin America. Today in Latin America initiatives aiming protection, assessment and promotion of the geological heritage and the creation of Geoparks in Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Nicaragua, Peru and Uruguay.

A broad range of activities combines the main components for the operation of each Geopark, including scientific research, inventory of geological sites, protection and conservation of geological heritage, operation of open air parks, thematic museums and interpretation centers, interpretation and promotion of geological sites, organization of scientific and cultural events. Geoparks also promote themselves as ideal destinations for geotourism and educational activities.

Geoparks create links with local tourist enterprises, restaurants and small hotels in order to provide the necessary infrastructure to meet the needs of the increasing number of park visitors. In some cases the number of "Bed and Breakfast" accommodations has doubled over the last few years in order to meet the increasing demand. More importantly, visitors have increased the duration of their visit to the Geopark area. As a result many new enterprises are connected with the activities of the Geoparks. Geoparks also support the making of local handicrafts such as the production of fossil casts and souvenirs by local enterprises. Geoparks collaborate closely with women's agrotouristic cooperatives and local organic food producers to offer their visitors the opportunity to taste and buy local food products (pasta, organic vegetables, wine, liquors, traditional sweets and marmalades etc). The catering in Geopark events (conferences, meetings etc.) is supplied using the local traditional food.

Building Bridges between Science and Education: The Role of the Global Geoparks

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Accordingly to the guidelines of the proposed Program Global Geoparks of UNESCO, the Geopark concept "arose in the mid-1990's as a response to the need to conserve and enhance the value of areas of geological significance in Earth history". In this framework, Geoparks adopted a "bottom-up" strategy to ensure that an area with geological significance could be conserved and promoted for science, education and culture, in addition to being used as a sustainable economic asset such as through the development of responsible tourism. In this sense, one can say that Geoparks are the new territories of the 21st Century, functioning as kind of "mini-UNESCO". In fact, education at all levels is at the core of the Global Geoparks concept. From university researchers to local community groups, Geoparks encourage awareness of the story of the Planet as read in the rocks, landscape and ongoing geological processes. They also promote the links between geological heritage and all other aspects of the area's natural and cultural heritage, clearly demonstrating that geodiversity is the foundation of all ecosystems and the basis of human interaction with the landscape. Based on this concept, Global Geoparks contribute to achieve UNESCO's objectives by promoting geology and science in general through a wider contribution to UNESCO's mandate while cutting across education, culture and communication, through a very strong networking, facilitating the sharing of experience and good practices, creating joint initiatives and projects and especially by promoting capacity-building. That is why based in the objectives of the United Nations Decade of Education for Sustainable Development (2005-2014), the Portuguese National Forum of Geoparks in close cooperation with the Portuguese National Committee for IGCP and with the Portuguese National Commission for UNESCO, has been building bridges between Science and Education, based in the promotion of the Educational Program "GEA – Mother Earth". This program is divided in three tools: *i*) training courses; *ii*) school contests, such as "*it's the Soils that sustains Life!",* developed in the framework of the International Year of Soils (2015); and *iii*) itinerary exhibitions related with Geosciences themes. The main themes focused in the training courses are education for sustainable development, climate change, geohazards, water, desertification, evolution of life and biodiversity, and geosciences for society, always providing information in context.

In conclusion, due to the different activities promoted by *GEA – Mother Earth* and its role in capacity building, at a national and international level, mobilizing not only the four Portuguese Global Geoparks, but also several Portuguese Biosphere Reserves, as well as Araripe Global Geopark (Brazil) and the National Commission for UNESCO of Cape Verde, it has been possible to involve in this process the main objectives of several UNESCO Programs (such as "Man and Biosphere" - MAB or the International Geosciences Programme – IGCP) and the Global Geoparks Network, allowing a very successful cooperation between different programs and networks, based in different territorial approaches but with a common goal: the promotion of an education for sustainable development for the local communities.

Geotourism and the Sustainable Exploitation of the Chinese Geoparks: A case study of Jingpohu Global geopark, China

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Chinese attitudes regarding the protection of geoheritages and geosites have undergone dramatic changes in the last more than ten years since China established Geopark network in the early this century (At t present, there are currently 31 GGN memberships and 240 national geoparks in China). Because the geoheritage and its value in China is frequently neglected and threatened, it has been perhaps not surprising that the conservation movement to geoheritage and geosite came of age since establishing geopark network in China. Geotourism, since it is both a geoconservation and sustainable exploitation strategy, offers a means to address these issues. Its success depends upon attracting and maintaining the support of local governments, communities, developers and public by demonstrating the geoheritage's great potential for the tourism and outdoor recreation industries. Hence, geoscientists have recognized the need to promote the significance of their studies to other than committed audiences. The successful promotion of Chinese geoconservation, a significant and essential component of geotourism, requires the adoption of appropriate geosite designation, interpretative and other exploitation strategies. The case study from China Jingpohu Global geopark discusses these strategies. The presentation also provides an introduction for Geotourism and geoconservation in the Geopark. Essentially, this presentation focus on managing the challenges of geotourism, geoconservation strategy and sustainable exploitation in the Geopark.

Feasibility of sustainable tourism implementation in protected areas: comparative analyse between Colônia (Brazil) and Ries (Germany) Craters

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Impact craters are the result of a collision between Earth's surface and an asteroid, which can be observed on terrestrial planets in our solar system. Colônia Crater, located in the south of São Paulo city, is a 3.6 km-diameter circular structure and its peculiarities are able to increase the number of visitors in the region, considering that can help to the understanding of the past geological history as well as the impact cratering processes. Although some environmental laws attempt to protect its natural elements, irregular residents, markets and familiar agriculture are present in Colônia. Ries Crater, in the south of Germany, has a consolidated tourism and part of the local economic benefits come from this initiative.

This article provides an assessment of the main biotic and abiotic features of both craters, aiming a sustainable tourism development in the Colônia area. For this purpose, four main steps were executed: i) systematic literature review, ii) field survey of the possible tourism sites, iii) analysis, integration and interpretation of the obtained data, iv) application of SWOT analytical method. The achievements allowed an evaluation and customizing of Ries geotourism programs and its performance in Colônia. The following points were verified as a necessity to establish an effective action plan: a) human resource education in order to enable local agents for nature conservation, b) incentive local community participation in nature resources management, c) strengthen the preservation and conservation programs, d) improving basic infrastructures for diverse tourist activities, e) indicate a geotourism program and its networking with another touristic activities, f) local and regional broad divulgation of the natural elements.

It is important to emphasize the relevance of a detailed research for each one of the above mentioned proposals before performing any tourism strategy in Colônia.

Geo-education towards the interdisciplinarity and sustainable development. Study case at Cabo de Santo Agostinho (Pernambuco, Brazil)

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Interdisciplinary is an important learning tool. Through it is possible to extinguish the reductionist and fragmented view of the disciplines, investing in educational resources to enhance the perception and add value to the concepts. It is necessary to start from the complex thinking, which have as starting point the most enriching and less mutilating actions. In this context, the association of cultural and historical values to Geosciences can promote the awakening of a conservationist and humanist consciousness, and simultaneously aware of the importance of sustainability of natural resources, to the survival and longevity of mankind. Based on these principles and aiming a higher learning of the subjects study in classroom, as well as a broad overview of Geosciences, was proposed and developed an interdisciplinary trail in the municipality of Cabo de Santo Agostinho (Pernambuco, Brazil).
This pedestrian trail encompasses geodiversity, biodiversity, historical ruins, history of planet Earth, archaeology and cultural aspects of the local community, such as handicraft and culinary. The exceptionally beautiful landscape of this region is directly related to processes of the terrestrial dynamics, having as the main feature the breakup of Gondwana during Cretaceous Period. This incredible open sky laboratory allows that students grab a clear and hands-on notion of geological and biological processes. The information stimulate thoughts about the necessity of geoconservation measurements and develop a respect for the geological features that mark the evolution of the planet Earth.
It is believed that the absorption of the knowledge in an interconnected way contributes to form students and/or citizens more conscious of the importance of the real meaning of "Gaia". This *geo-didactic* trail was tested with undergraduate and graduate students of Geography and Archaeology of the Federal University of Pernambuco. It may be used also for visitors that reach the region searching for leisure. What is very important to bear in mind is the interdisciplinary holistic approach that aims to a better notion of geoconservation and sustainable development allied with responsible use of the natural resources. With this ideas in mind and with the field reality, it is possible to think in the possibility to create a Geopark in this region in the middle term.

Global Geopark Bergstrasse-Odenwald (Germany): Sustainable development by geo-education, communication, regional cooperation and international networking

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Since the last decade, the connection of the Earth's geology, man, culture and heritage as communication and cooperation tool as well as networking approach has been worked on and developed by various Global Geoparks. Connected with this multilayered task, the Global Geopark Bergstrasse-Odenwald has developed a wide facet of geo-education, communication, cooperation and networking tools together with local as well as international partners.

Besides the implementation of information facilities, hiking and MTB trails and Geosites, the Geopark has developed during the last 15 years a close and continuous cooperation network with local partners. These include tourism agencies, local museums, universities, schools, associations related to Earth heritage and nature (e.g. WHS Messel Pit), as well as partners from the regional economy (e.g. Bergstrasse wine growers, beemaster). In parallel, a comprehensive visitor service, performed by a team of 45 Geopark Rangers (nature- and geoscientists) as well as by more than 200 so-called "Geopark-on-site guides" (local volunteers), has been developed. The Rangers and guides have been educated by the Geopark in cooperation with regional experts and scientists. They offer guided tours, educational programs and represent the Geopark at local festivals.

The training of local residents and experts has been adopted by several Geoparks all over Europe and abroad. In this frame, the Geopark has operated intercultural geo-educational trainings for Hongkong Geopark (PR China), Gea Norvegica Geopark (Norway) as well as for Lesvos Petrified Forest Geopark (Greece).

The training programs are part of intense networking and exchange of knowledge and activities within the European and Global Geoparks Network. This includes also the participation in international workshops (management, communication, community participation, geo-education, economic benefit, sustainable development), the international evaluation and revalidation of Geoparks, the creation of Geopark partnerships (e.g. with Mt. Lushan, PR China), the consultancy for aspiring territories and the presentation of success and best practise at International Conferences.

Sharing experience and knowledge, collaborating closely together, developing new approaches and models for the protection and communication of our common geological, natural and cultural heritage are the most successful motors for sustainable development inside the Geopark territories as well as in the wider Global Geoparks Network.

Geotourism at Messel Pit World Heritage (WHS, Germany) by Earth Science Transfer & Geo-education offers: OUV, CI & media to raise public awareness

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Today geotourism has become a magic word for many municipalities and protected sites. The term gives the impression that visitor streams can be easily generated by people of our societies who like to travel across the globe and enjoy different landscapes and cultures. Also high rank quality labels like UNESCO-World Heritage Sites or certified Global or European Geoparks seem to indicate geotourism by their certification indication.

In 1996 the term “Geo Tourismus” was first used by FREY (1996) to describe activities in exploring the Geopark Gerolstein/Vulkaneifel, Germany being based on geological heritage, landscape, history, nature and culture implemented in the geotrails of the Geopark. Their aim was to attract visitors to this rural territory in the tourism destination “Eifel”. In 2003 a today wide known definition was brought up by Tourtelot (2003) supported by National Geographic which gives emphasis to the interconnection of these issues for tourism offers. In 2011 he included also “geological heritage” into the issues of his definition.

Geotourism is an attempt to develop economic benefit by using the above listed issues. However many examples show that it seems to be difficult to understand the functioning of this new field of interdisciplinary topics and needs of skills. In this presentation Geotourism is being understood as the linking up of Earth Science Transfer and education offers on scientific topics of the Messel Pit WHS. This case study shows the steps which have been taken from the OUV (Outstanding Universal Value) of the Messel Pit WHS having a profile of “Celebration of Eocene Times” to develop its Corporate Identity (CI) and media in the broad sense to raise public awareness and generate benefit by geotourism offers for visitors. Examples will be given of how the infrastructure of this site was used and developed, of the media to market this site of “Celebration of Eocene Time” plus its geodiversity as well as the concept for geotourism and education offers and souvenirs – workind or non-working for visitors - will be presented.

Within this process a new visitor centre was realised which today is the welcoming platform for all visitors. The main aim was to start a long term sustainable development. After 12 years time working on the development and implementation of geotourism and five years experiences marketing the WHS and the new visitor centre together visitor acceptance and benefit can be seen by the economic development of the non profit ltd. Company responsible for creating access and marketing this WHS. Within the whole development sharing experience and knowledge, collaborating closely together with partners of the Global Geoparks Network supported the positive development. Across the linking up of Earth Science Transfer and Geo-Education additionally World Heritage issues have been integrated into the geotourism offers. The interdisciplinary approach of earth sciences, economic demands, protection, high rank quality site as well as needs and demands of modern society has now reached a new phase of developing and training a follow up generation to strengthen the achieved acceptance and fasten a sustainable future.

Poster Presentations

Geoparks, geoproducts and local sustainable development

Mônica Amorim

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Conservation of geological heritage is key for the advancement of science, understanding of Earth´s formation and subsequent events, origin and evolution of life, and construction of human culture. Fossilized material of living beings and non-living matter contains information that may be useful to cope with contemporary challenges, such as climate change, natural hazards and even social issues, such as integration of different cultures. The UNESCO Geopark strategy attempts to encourage conservation of geological heritage through education, social awareness and promotion of economic opportunities for communities living close to sites (*geosites*) where important geological heritage can be found. One interesting approach adopted by Geoparks worldwide in promoting conservation of geological heritage relates to production and promotion of *geoproducts*, which are those local products available, developed and created in the geopark territory following sustainable practices and echoing the geosites´s legacy in terms of geology, history and culture. In AraripeGeopark, the first of the kind in the Americas, geoproducts may play a vital role in the efforts to protect precious fossilized material by developing and promoting geoproducts of different types. AraripeGeopark encompasses one of the largest and best preserved deposits of fossils from the Cretaceous period (more than 100 million years ago), some of these showing evidence of supercontinent Gondwana´s break up and the following emergence of the South Atlantic Ocean and separation of South America from Africa. The history and culture of the Araripe territory carry traces from native Brazilians, European colonizers and African groups brought there as slaves. The amalgamation of these different cultures gave rise to a sparkling pot of colors, tastes, shapes and beliefs that represent the current identity of the Araripe territory. Geoproducts reflect this rich character as well. Grounded in sustainable production methods, culture and geological heritage, geoproducts open a promising opportunity for communities to add value to local products, access niche markets and enhance local income. Araripe is a prominent territory in terms of potential for geoproducts. This paper shows a range of possibilities for geoproduct development in Araripe Geopark, including local goods, as well as the specific types of support needed to reach the envisioned strategy.

The Independece Square at Corumbá: its history and typological identification as relevant element for a Geopark Project in the Mato Grosso do Sul State (Brazil)

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In 2006 the Geological Survey of Brazil (CPRM) implemented the project "Geoparks of Brazil" in order to identify, classify, catalog, georeferencing and disseminate the Brazilian geological heritage and set guidelines for sustainable development in line with local organizations and communities. Among the proposals of Geoparks then presented, appeared in 2007 the project "Geopark Bodoquena-Pantanal" covering an area of about 22,000 km^2, comprising a total of 45 geosites inventoried in 13 municipalities with a population of 265,000 inhabitants. Geologically, the main peculiarities of this territory are associated with the occurrence of global changes at the end of the Neoproterozoic, as result of the fragmentation process of the Supercontinent Rodinia. However, much remained to work in the historical and cultural identity of the proposed area. In this sense, this work aims to identify the historical and cultural potential of the Independence Square in Corumbá and thus contribute to increase the knowledge about the tangible heritage of a future Geopark project in the State of Mato Grosso do Sul. The city of Corumbá, located near the border with Bolivia, was founded on September 21st, 1778, aiming to define and ensure the Portuguese dominions in the co-called captaincy of Mato and is constituted as one of the oldest urban centers of the western portion of Brazil. In the period 1864-1870, Corumbá was beset by the "Paraguayan War". However, after this dark chapter of its history, it was observed the development of a spatial reorganization, which marked the city with a wealth of historic buildings, with a differentiated spatial configuration for the time. It was through the Paraguay River that Corumbá prospered as a major trading center connected with the capital Rio de Janeiro and the countries of the River Plate Basin and of Europe. This flow enabled the formation of a peculiar cultural mosaic in the urban context, which includes the Independence Square that has a type that is associated with the important work of the French landscape architect Auguste Glaziou. In this context, understanding that the city of the future will be a city that recognizes and preserves its heritage, we intend to compare and analyze the similarities found in the Square of Independence of Corumbá with the squares that were being remodeled around the world, based on typological models of the French landscape architects. Thus we present a contribution to safeguard the local heritage, added value for a future Geopark in the State of Mato Grosso do Sul.

Proposal to new geotourist sites from Parnaíba Basin in "Monumento Natural das Árvores Fossilizadas", Tocantins State, Brazil

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The “Monumento Natural das Árvores Fossilizadas (MNAF)” is one of the most important Permian palaeobotanical site from the Parnaíba Basin, North Brazil. In this area can be seen different groups of phytofossils preserved in Motuca Formation sediment and area with importance also for geoturism. Considering the scientific and heritage significance of the site, the study was guided aiming the evaluation of conservation measures for the area, focusing on geotourism. To stabilize the effectivity of the protection activities which are applied at the area, the research has been developed with the review of documentary files related to the preservation area. Three potential locations, with touristic appeal and palaeobotanical significance, were described and evaluated in detail using the forms proposed by previous authors. As for the patrimonial relevance, it was revealed that, although the MNAF contains a well-developed and approved conservation project, it is minimally implemented. The specific environmental education programs as well as the development of strategic sustainable tourism, demand emphasis and effectiveness. That will certainly be of great value especially for the population living in the park area or vicinity. The studied geological sites indicated as potential areas to geotourism are the “Fazenda Andradina”, “Fazenda Buritirana” and “Fazenda Torre da Lua”. Considering the results so far produced, the palaeobotanical heritage observed at those areas are scientifically relevant and will be preserved with the new conservation approach.

Session 12: Cities of the Future – Megacities – Urban Areas

Convener:

Prof. Dr. Ing. B. Eisenberg

Institut für Landschaftsplanung und Ökologie, Stuttgart, Germany

Examples from the fields of Cities of the future, Megacities, and Urban Cities shall provide information on issues already established and studied by research projects of sustainable interaction between natural resources and processes and demands of human societies. In addition, we seek for presentations related to the sustainable future of Cities, Megacities, and Urban areas. The talks shall provide information on analytical tools that help to retrieve necessary information for decision makers that have to implant managing systems, define economic behaviours and formulate and change necessary judicial systems to initiate and provide the legal base for sustainable development.

Keynote **Lecture**:

Prof. Dr. Bernd Eisenberg, Institute of Landscape Planning and Ecology, University of Stuttgart,
Prof. Dr. Joel Dias da SILVA, Departamento de Engenharia de Produção e Design, Programa de Pós-Graduação em Engenharia Ambiental, Universidade Regional de Blumenau, Santa Catarina, Brazil

Oral Presentations

Adapting Strategies for Integrated Urban Planning - Challenges and Limitations

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Water scarcity is both a natural and a human-made phenomenon, affecting a large number of the world's population on every continent, with lacking access to clean, safe water and as a consequence, illness and deaths caused by unsafe water. Urbanization processes are the driving forces and in arid regions they create even more challenges regarding a secure and healthy water supply. Urban planning approaches for those regions but also for areas, where water scarcity is not extreme, need to integrate and consider the urban water cycle in order to propose new alternatives within its local context.

The paper looks at the existing scientific and practical knowledge of water oriented urban planning. It focuses on the concepts of water sensitive urban design (WSUD) and green infrastructure (GI). It investigates their potential for adapting to divergent conditions in general and the application to the real case of metropolitan Lima.

Lima is facing tremendous challenges, due to the unparalleled complexity of its problems – a dry desert location, minimal rainfall, low level of wastewater reuse. Furthermore climate change effects over the Andean mountains that are predicted to lead to a decreasing water supply (Kosow et al. 2013) and rapid, uncontrolled urban growth consumes land with important ecosystem services and leaves a large proportion of the population in risky and vulnerable living conditions.

With the Lima Ecological (Green) Infrastructure Strategy an example is presented for an integrated urban planning strategy that tackles both urban development and water management alike supported by landscape and urban planning and design tools.

The challenges for adapting concepts like WSUD and GI to a situations characterized by highly dynamic urban growth, limited water resources and weak urban planning institutions are explored and limitations for the transferability of planning concepts are highlighted.

Sustainability performance tracking of social housing programs: the tale of two projects in Brazil

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Design evaluation, during the synthesis phase of the architectural and urban design processes, is usually performed in an informal manner by professional teams. Reflecting in action takes place continuously during the development of a project, when designers assess the validity of the solution that is emerging. Design evaluation involves comparisons between different proposals or designs at various stages.
Evaluation methods are important design quality support tools. Most of these methods come from academic environments and are not readily applicable to typical everyday professional projects. But some of them might be pragmatic enough to produce useful design outputs, which should be tested. In this paper, a mix of three pragmatic methods is applied for design solutions screening of social housing projects, aiming at evaluating their contribution towards more sustainable solutions. The methods are: Comparative floor plan (CFA), Transit Oriented Development (TOD) and a selection of sustainable site plan indicators compiled by researchers at the University of Campinas (Kowaltowski et al, 2006).
CFA is based on the comparison of building layouts for similar organizations. The transit-oriented development (TOD) method is based on the urban planning concept of mixed-use residential and commercial areas designed to maximize access to public transport. The third method is based on six quality of life and sustainability indicators for residential developments in a Brazilian context, these are: integrated community and security; site-planning; street and path system and parking; public and private open space; landscaping and architecture.
To assess the capacity of such methods to (1) detect contributions regarding sustainability performance and (2) allow for improvement opportunities, we applied these three methods to two case studies, developed under the auspices of the Brazilian Social Housing Program “Minha Casa Minha Vida” - PMCMV (My House My life). The first project represents typical practice for the PMCMV. The second project followed TOD principles aiming at improved urban insertion and mobility quality. Our results showed that, though not specifically developed to assess issues of sustainability, the studied tools provided important insights, which are indirectly related to the concept of building more sustainable communities.

Minha Casa Minha Vida" housing program: the gap between what we know and what we should know

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The Program "Minha Casa Minha Vida" - PMCMV (My House My life) is coupled with infrastructure investment programs as part of a large federal housing policy in Brazil. The purpose of the PMCMV is to eradicate the Brazilian housing deficit, which was in 2010 estimated at 5 million homes. The official numbers report that 3,7 million units were contracted and that about 2 million houses were delivered by December 2014, in contexts ranging from small towns to megacities. Such enormous interventions frequently stretch city perimeters and stress infrastructure capacity. In some cases, they even create new, incomplete, urban satellites, with substantial impacts in many fronts.

In 2012 the Ministry for Cities created an independent research network to evaluate the program. A plethora of other studies on the PMCMV has generated about 1489 bibliographic items in the past five years. Kowaltowski et al. (2015) presented a research synthesis and gap spotting to drive the discussion of housing quality and the impact of the PMCMV on Brazilian cities. Some major pillars of research became clear, including: urban design and impact, financial and economic questions, social issues, public policies, and sustainability and environmental aspects. This paper re-examines the portion of the published material with regard to the issue of sustainability. The international discussion on the same topic, as well as the gaps between the Brazilian and global contexts, are explored further. Results indicate that research is frequently repeated without addressing crucial questions. They also point out directions for new studies to effectively improve the quality of social housing, with positive impact on present and future cities.

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São Paulo Megacity: investigating a general model of causality involving the extreme urban environment and mental disorders

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Background: It is important to investigate the erratic impacts of megacity development on the mental health of humans who live in them. São Paulo Metropolitan Area (SPMA) is a unique setting for this type of study for its socioeconomic diversity, with extremes of poverty and wealth existing side by side. This, not surprisingly, results in social tensions and high rates of urban violence, despite São Paulo's being the major financial and economic powerhouse of Brazil, with a Gross Domestic Product (GDP) corresponding to 16.7% of total Brazilian GDP.
Methods: The structural equation modelling (SEM) technique using the Mplus statistical software (version 7.0) was chosen to investigate the mediating role stress could play in the association between the unwelcome development variables of a Megacity - such as level of urbanizacity (LU), crimes/offenses/violence (COV) experienced as well as social deprivation (SD) – and the two dimensional phenotypes which better capture the most common mental disorders in current times in a representative sample (n = 5,037) of the population of the SPMA. Through SEM, we have tried to find a general model of causality involving the extreme urban environment and mental disorders.
Results: Stress acts as a mediating factor in the association between two megacity developmental variables (LU and COV) and the two dimensional phenotypes of mental disorders (phenotype 1 = anxiety, depression, impulsivity and insomnia; phenotype 2 = substance use disorders). However, we also found direct effects of megacity developmental variables (LU and COV) in these two phenotypes. In contrast, this model was not valid for SD. SD only had a direct effect on the substance use disorder phenotype. Other models, including a third dimensional phenotype of common medical disorders largely found in megacities (i.e., cardiovascular, respiratory and digestive disorders, diabetes, and migraine) were also investigated. LU would appear to have no direct effect upon this phenotype, having only an indirect effect via stress.
Conclusion: These findings point to important differences in the causal chain of mental and medical disorders within the large urban environment. The phenomenon of megacities could be seen as a "negative legacy" for the next generation, from the psychological/psychiatric point-of-view, which would investigate to what extent living in a stressful urban environment might generate a wide range of mental disorders.

A Sustainability Index in a Environmental basin: An alternative approach to urban river management and planning.

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The present work sought to develop an index that could promote environmental sustainability, provide preemptive information to both society and the government, as well as propose conservation actions that could harmonize the urban environment with ecosystem services provided by rivers and green areas in João Pessoa, PB, Brazil. The research project investigated the vulnerabilities and strengths of an urban socialecosystem in relation to urbanization projects, taking into consideration the harmony with natural environments still present in cities even with high degrees of urbanization - but without proper planning – in order to avoid the continuous deterioration of environmental conditions. The need for both government and society to work in an integrated manner to promote sustainability is emphasized. This work analised five urban rivers and use a methodology of performance evaluation of four dimensions of sustainability (social, economic, environmental and institutional) Van Bellen, 2006. This area was selected because it contains well-defined geographical limits and easily identified and by having strategic importance for tourism and relevance in the conservation of coastal ecosystems. However, the river basins of the city had their conformations almost changed because the urbanization. Thus, the urban water management based on the watershed concept, is inefficient way, because the area of influence of urban changes in the river basin, beyond its geographical borders. Thus in territorial aspects, environmental basin is characterized by a territorial space of dynamic properties, whose limits are set by environmental sustainability relations between the dimensions involved and not by topographical or territorial jurisdiction limitations (RUTKOWSKI, 1998 SANTOS, 2004) allowing transform, revitalize and maintain the river landscape in an environment of promoting sustainability, strengthening the potential and minimizing local vulnerabilities.

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Aspects of Environmental Sustainability in Blumenau City, State of Santa Catarina

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In recent years, a growing concern for sustainability, seeking the integration of environmental issues with economic, social and political aspect is perceived in the Itajaí Basin River (*HBIR).* Inserted in *HBIR*, the *Serra do Itajaí* National Park is home to the headwaters of the main creeks that supply the nine cities in which it embeds; one of those towns is Blumenau. In this park, the preservation of natural ecosystems of great ecological relevance and scenic beauty, enable the accomplishment of scientific research and the development of educational activities and environmental interpretation, recreation in contact with nature and ecological tourism. In this regard, since 2003, the city has a legal framework for Environmental Education (EE), upon approval of Complementary Law 404, on June 5, the result of a highly participatory process, depicting the perception of the ones involved – representatives of the society on strategic actions for the implementation of the EE in town, besides expressing local features. In parallel, the Municipal Environmental Agency (*FAEMA*), in turn, through referendum, elected 21 trees immune to cutting for its environmental, historical or sentimental value to Blumenau population. The preservation of riparian forest in non-buildable and non-cultivable areas of the Master Plan, as well as the prohibition of hunting in the city, made many animal species reoccupy their natural habitat in the field of municipal administration. After reviewing the 1989-Master Plan, the Building Law started requiring planting a tree on the sidewalk for the shipment of "certificate of occupancy" for new buildings. This way, re-urbanization projects of some of the main streets of the city sought afforestation, creating pleasant spaces to remain, with new floor layout, differentiated street furniture, emphasis on accessibility and urban mobility, with the extension of sidewalks, cycle-tracks integration and shelter for passengers of public transport. Blumenau also participates in the project "50 Partners for Climate 2015" in which it operates as a partner of the city of Weingarten (Baden-Württemberg, Germany) on the joint development of a program of bilateral actions in the area of mitigation and adaptation to climate change. Still, through the Intermunicipal Regulation Agency of the Itajaí Medium Valley (*AGIR*), an international cooperation agreement aimed at the solid waste management was signed between the Intermunicipal Consortium of Itajaí Medium Valley (*CIMVI*), the Association of Municipalities of Itajaí Medium Valley *(AMMVI)* and *BN UMWELT GmBH*, a German company of Environmental and Civil Engineering, which are provided for the training of civil technicians in regulatory areas of the *AGIR*. Other environmental initiatives materialized in the recent deployment of technological platforms in the areas of energy efficiency and renewable energy, as well as valuation of waste and sustainable logistics provided in the Plan for the Sustainable Competitiveness of Santa Catarina Industry, sponsored by the Federation of Industries System of Santa Catarina *(FIESC)*. Those initiatives, which occurred in the last decade in Blumenau, clearly demonstrated the emergence of a new mindset and a new concept of city relationship - environment, less antagonistic and seeking complementarity.

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Urban ecosocioeconomics: social sustainability indicators for accidents of bicycle and motorbike messengers in Brazil

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The transition to sustainable development brings up new possibilities on daily practice actions. In small scale, a set of urban alternative ecosocioeconomics solutions is found for socio-environmental problems at regional scale. This work deals with indicators of socio-environmental sustainability for delivery of light freight by bicycle messengers in the city of Curitiba, Estado do Paraná, Brazil. The goal is to demonstrate the effectiveness of an ecosocioeconomics experience promoting sustainability in its territory. Although urban logistics is a subsystem of urban mobility, there are few studies considering this alternative transportation. Partially, this is due to the fact that the activity is merely a private business and the responsibility weights on private entrepreneurs. In spite of it, the impacts of urban logistics in the urban mobility system led to an increase in the number of these scientific studies on the urban space. The choice of urban logistics to assess a case study of ecosocioeconomics is related to the fact that Curitiba (1.7 million inhabitants) is a model city in the subject of urban mobility emphasizing on transport planning. A multiple-case study methodology has been applied to compare the use of bicycles with motorcycles for urban light freight. The number of accidents per year was chosen as social indicator for the sustainability of either bicycle or motorbike delivery. Statistics for the entrepreneur Ecobike showed that their bicycles run 891,000 km before having a harmful accident (with hospitalization), while also in Curitiba motorbikes drove 396,000 km without accidents. In order to compare to a case outside Brazil, we have interviewed a German company in Berlin (3.5 million inhabitants) dedicated to bicycle delivery, and found that it runs around 193,600 km without having accidents. The difference between cities might be due to different approaches to recording accidents in the two locations, and showing sensitivity of the indicator to institutional methodology to record data. In any case, in Curitiba, under the same methodology to record accidents, bike messengers can drive more than double distance than motorbike deliveries without accidents. We concluded that the urban experience of ecosocioeconomics Ecobike messengers presents positive results regarding the sustainability of the urban environment. More so, this research contributes to policy decision makers with estimates on light freight urban delivery and the convenience of bicycle use in urban freight logistics.

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Poster Presentations

Flight Control and Navigation for scalable and arbitrarily dimensioned UAV and manned Multicopters

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The NAVKA navigation technologies at IAF/HSKA were awarded as Baden Württemberg winner and on international level with bronze, among 434 competitors in the European Satellite Navigation Competition (ESNC) 2014 [1].
The NAVKA flight control system (algorithms, software and hardware) is part of the above technologies. It was developed by the authors in the scope of the NAVKA project [2] and the ZIM project [3] at IAF/HSKA. The flight control system can be used for the navigation and control of multicopter UAV and manned multicopters. Hereby the multicopters can be designed scalable in respect to

- Applications
- Size
- Payloads
- Sensor equipments.

The flight navigation and control system is based on redundant GNSS, MEMS, camera and MOEMS sensors. Possible applications and use-cases for the developed NAVKA flight control system on UAV and manned Volocopters are:

- 3D mapping and geosensing
- Film industry
- Search and rescue of people
- Agriculture UAV
- Facility management and monitoring UAV
- Wild-life protection
- Transport UAV
- Fire-Fighting air vehicles
- ABC sensing UAV for emergency event
- Environment-friendly and silent manned air taxis

The above mentioned further sensors, e. g. cameras, laser scanners, radar and others can be geo-referenced by using the state-vector of the UAV navigation. Changes in the payload are detected automatically and considered in the physical properties of the UAV and manned aircraft, respectively. The mathematical models of the navigation and control algorithms and the complete system design (NAVKArine-FC-4) are presented. The running further developments on the NAVKA flight control system are also part of the presentation. Different UAV and manned volocopters, where the NAVKA flight control already runs are shown.

[1] ESNC 2015 Website: www.esnc.info/index.php?anzeige=bawue14.html
[2] WebSite NAVKA Project: www.navka.de
[3] Website ZIM Project Volocopter: http://www.navka.de/index.php/de/ueberblick-evolo

Environmental Monitoring of Pollutants Related to Climate Change using Sensors of Low Cost

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The fast expansion of the cities have been the triggering factor of global climate change, along with an increase in economic activity, industrialization and consumption levels associated with cities and their populations. Among the harmful agents, the carbon monoxide emissions (CO) caused by the use of motor vehicles is one of the most important. Search to control the emissions of air pollutants in big cities is a sine qua non condition for promoting quality of life and the health of their inhabitants. Low-cost sensors can become a robust and reliable technology for expansion of environmental monitoring networks and make them viable, from an economic point of view, especially for adoption in developing countries. The objective of this study was to adapt a capitation module, deployed in a computing and communications infrastructure, scalable and cost-effective for quantification of air pollutants in real time in order to provide data for decision making related to environmental quality issues, focusing on large urban centers. The capitation module consisted of an electronic board type Arduino, simple electronic connectors, electronic boards support and environmental sensors for carbon monoxide (CO), temperature and relative humidity of the air. The process of capture of atmospheric data was due the exposure of the capitation module in area with moderate flow of vehicles and with greater intensity in the rush hours. The data collect took place at intervals of 15 minutes, yielding about 50 data per day, over a period of 5 days. To perform the analysis of the captured data, the capitation module was connected to a computer. The average level of Carbon Monoxide (CO) was 154, temperature of 31.8 °C and Relative Humidity 45.7% (without calibration values). The experiment was a test sensor network module concept of elements that characterizes the air quality index, being able to identify abrupt changes in air quality. The prospect of comparative testing and adjustment of the equipment point to the feasibility of use of the capitation module as low-cost technology for environmental monitoring. The proposal consists of the aggregate functions mechanism, such as the expansion of capture dynamics (example, SO_2 and NO_2 sensors), the transmission of information remotely and sharing of environmental data with targeted systems for urban mobility.

Comparative LCA of treatment options for packaging and residual waste in Germany: Case study

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In 1991 the German Packaging Waste Ordinance introduced the product responsibility principles, and as consequence, manufacturers and distributors of packaging became responsible for the packaging brought to the market. In Germany sales packaging waste are disposed of in so-called yellow bags or bins and collected from households by dual system commissioned companies. A high percentage of these yellow bags is converted into energy and heating in incinerators. The German recycling law was updated in 2012 and a legal basis for the introduction of a single recycling bin was created to replace the yellow bags. This bin will be filled not only with packaging, but also with non-packaging materials. The present study aims to support involved municipal and private companies through evaluation of the environmental impacts of the single bin in comparison to the other waste management alternatives (business as usual, total incineration and total land filling), using specific data from a an economic strong area located in the Frankfurt/Rhine-Main Region.

Dashboard Sustainability applied in a Cuiá river basin, João Pessoa, Paraíba, Brazil

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This article presents the Dashboard Sustainability applied in an urban river in João Pessoa, Paraíba, Brazil. The Cuiá river hidrographic basin was selected to this study, because presents a moderate state of urbanization, it contains many green areas, have a strategic importance because receives 30% treated domestic sewage and have a relation with an erosion process in south region in João Pessoa. This method based on the inseparability principle of relationships of influence factors that cause changes in natural environment. Dashboard Sustainability is an index that represents the sustainability of a system comprising the average of several indicators with equal weights, categorized into four performance categories: economic, social, environmental and institutional. By linking the performance indicators that involve economic growth, social equity, environmental preservation will be possible provide viable targets for urban environmental planning.

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Streilling, Sérgio De Souza; Ferreira, José Hilário Delconte; Prates,
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The Geodetic Network used for environment georeferenced surveys and mapping in Brazil

SAATKAMP, E.D.

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Technically, positioning consists on determining the position by mean of coordinates, relative to a reference. The technical and scientific activities that require positioning on the Earth's surface need a reference that is fixed to it. In this case, positioning is characterized by being georeferenced. Almost all human activities are carried out on the physical surface of the Earth (environment). Thus, almost all environment activities need to perform georreferenced positioning: for planning, previously to implement a Project; for the location of the projected features; or others. The planning can be performed with the aid of topographical charts or maps from geographical area of interest. For mapping surveys or georeferenced positionings be possible, there must be a geodetic reference network. This work presents the Brazilian geodesic network: its definition, its implementation, and an overview of the data and services it provides publicly in Brazil.

The Brazilian Geodetic System consists basically of three reference networks: planimetric, altimetric and gravimetric (IBGE, 2015). Frame points of each network is made by landmarks implanted on the surface of the country. They are the thousands order. However, the fact that Brazil has a large territory (about 16 times that of Germany), geodesic marks sometimes are relatively far apart. The planimetric network is divided into subnets, according to the technique used in the survey, at the time of implementation of that framework. SAT subnet (landmarks raised with Satellite positioning system(s)) is the most current and accurate. And she is also broken down into two subnets: passive (SAT landmarks with precise coordinates) and active. The active subnet consists of landmarks or stations where there is a high quality GNSS (Global Navigation Satellite Systems) receiver thats continuously tracking on it. This subnet is called Brazilian Network for Continuous Monitoring-RBMC, and the tracked data are public. Users have access to this data for post-processing surveys through the geodetic database, available on the website of the Brazilian Institute of Geography and Statistics-IBGE, which is the institution responsible for Cartography and Geodesy in Brazil. Still, most of the active network stations (RBMC) also provides real time tracked data by mean of Networking Transportation of RTCM Internet Protocol-NTRIP. In Brazil, this service is called RBMC-IP, and enables users to perform real time precise georeferenced positioning or survey. The geographic distribution of the landmarks of this network, as well as some statistical access and use data of it will be presented.

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Session 13: Infectious Diseases

Convener:

Dr. T. Jänisch[1], Prof. Dr. E. Marques[2]

1: Department of Infectious Diseases, Section Clinical Tropical Medicine, Heidelberg University Hospital, Germany
2: FIOCRUZ Pernambuco, Recife, Brazil

Dengue is causing a pandemic of unprecedented extent. With an estimated 2.5–4 billion people at risk in 126 countries (>40% of the global population), dengue is the most important mosquito-borne disease worldwide and is present on all continents. Large-scale unplanned urbanization in the southern hemisphere has created favourable breeding conditions for the *Aedes* mosquito vectors of dengue. Increased mobility of people and goods lead to frequent introductions of potentially viraemic travellers in uninfected regions and have helped to disperse the mosquito vector to previously uninfected locations.
Two large dengue projects, funded by the European Union, were coordinated in direct sequence by Thomas Jänisch at Heidelberg University Hospital. The partners of the current IDAMS consortium (International Research Consortium on Dengue Risk Assessment, Management, and Surveillance) include WHO, Oxford University, Liverpool School of Tropical Medicine, the Red Cross Climate Centre, and twelve partners in disease-endemic countries in Latin America, Africa, and Asia. In Brazil, the partners are FIOCRUZ (Pernambuco & Rio de Janeiro) and the State University of Ceará (Fortaleza). The research efforts within the consortium include clinical observational studies, virology and immunology, surveillance, and the prediction of outbreaks. Brazil is currently reporting more dengue cases to the WHO than any other country – in 2012 close to 500.000 cases.
The session will concentrate on the determinants of dengue in urban environments in Brazil as a case study for interdisciplinary research.

Keynote Speaker:

Prof. Dr. Ernesto T. Marques (FIOCRUZ-Pernambuco, Recife, Brazil
Prof. Dr. Carlos Passos, Faculdade UnB Planaltina, Universidade de Brasília, Planaltina, Brazil

Oral Presentations

Indroduction – Environmental links of current dengue pandemic

Thomas Jaenisch

Section Clinical Tropical Medicine, Department for Infectious Diseases and Parasitology, Department for Infectious Diseases, Coordinator IDAMS consortium, Heidelberg University Hospital, Im Neuenheimer Feld 324, Heidelberg, Germany, Thomas.jaenisch@urz.uni-heidelberg.de

In the session on “Infectious Diseases in Urban Environments” we will discuss the current challenge of infectious diseases in urban environments with a focus on dengue fever.
Dengue has become the most important vector-borne disease globally with an estimated 390 Million infections per year and ~40% of the global population living in dengue endemic countries. In the last years, Brazil has reported more dengue cases to WHO than any other country worldwide. Urban environments with man-made containers provide ideal breeding conditions for the mosquito vectors. Main drivers for the ongoing pandemic are (unplanned) urbanization and globalization. There is currently no licensed vaccine and no causal therapy available. Dengue fever has become a “signature disease” of the environmental health problems associated with large urban areas in tropical as well as subtropical countries.

The distribution of Aedes aegypti and Ae. albopictus in Brazil, current knowledge and implications for dengue and chikungunya spread.

Moritz U.G. Krämer

Spatial Ecology & Epidemiology Group (SEEG), Department of Zoology, University of Oxford, United Kingdom

Dengue and chikungunya are increasing global public health concerns due to their rapid geographical spread and increasing disease burden. Both species are invading new constantly colonizing new areas fuelled by increased global trade and travel. Mapping the global distribution of these vectors and the geographical determinants of their ranges is essential for public health planning especially in areas where reporting is sparse. Brazil has a very comprehensive and systematic dengue surveillance system but is challenged with the introduction of two different genotypes of chikungunya recently. Here we show the current knowledge of the vector distribution that transmit these viruses and overlay them with occurrence data of dengue and chikungunya to show their environmental niche. Some of the data is then paired with detailed genomic data to show differences in risk of spread in Brazil.

Dengue in the urban context in Brazil: what can vector control contribute?

Olaf Horstick

Institute of Public Health, Heidelberg University Hospital, former Advisor to the Brazilian Government on external health cooperation

This analysis describes 1) the urban setting in Brazil and its environment in relation to *Aedes* habitats and 2) a systematic approach for vector control and recommendations towards its implementation.
The urban setting in Brazil is characterised by very dense human populations, largely susceptible to dengue infection - although partly exposed to all dengue viruses (DENV1-4) - and dwellings offering no or limited protection to larval and adult infestations of Aedes. With the geographical location in the subtropics and tropics, this environment offers ideal conditions for the transmission of dengue, witnessed by the increasing number of reported dengue infections and also the number and scale of dengue outbreaks in recent years.
Vector control efforts in Brazil are largely organised by local governments, with a technical back-up of federal agencies, and involving communities. The interventions applied vary in different federal states, most importantly the quality of the delivery varies. At this stage it is difficult to argue, whether vector control operations contribute to a reduction of transmission.
Dengue vector control is currently discussed on three levels:
1) single and combined vector control methods: Pyroproxifen, Temephos, Bacillus thuringiensis israelensis, Copepods and larvivorous fish;
2) or for a specific purpose: peridomestic space spraying, intradomicialary residual spraying, outbreak control, and
3) on a strategic level, as for example decentralization versus centralization, with a systematic review on vector control organisation.
Although vector control can be effective, implementation remains an issue. Single interventions are probably not useful; combinations of interventions have mixed results; careful implementation of vector control measures may be most important; outbreak interventions are often applied with questionable effectiveness.
A feasible solution – considering the limitations and community-effectiveness of interventions - may consist of outbreak prediction and early outbreak detection followed by an emergency package of combined intervention for 1) Clinical management including emergency health service planning, 2) Health promotional activities for disease prevention and control awareness and 3) vector control operations tailored around locally available mean.

Poor ***L***and ***U***se, ***P***oor ***H***ealth: primary prevention of human health through sound land-use for small-scale farmers of the humid tropic - The **PLUPH** Project

Carlos José Sousa Passos[1], Christine Romaña[2], Frédéric Mertens[3], Robert Davidson[4], Marc Lucotte[5]

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Deforestation for small-scale agriculture has been associated to health risks for vulnerable populations in the Amazon. For instance, slash-and-burn activities have been (1) favouring the transfer of naturally-occurring mercury (Hg) from soils into aquatic ecosystems and resulting in the contamination of fish resources; (2) increasing the risk of human exposure to *Trypanosoma cruzi* and hence American Trypanosomiasis (Chagas disease), following the proliferation of Attalea palms upon deforestation, Attalea being the main forest ecotope for triatomine insect vectors of the pathogenic protozoan. The PLUPH project - http://www.pluph.uqam.ca - part of the Canadian Global Health Research Initiative, has used these two environmental health emergent problems as exemplary pretexts to address primary prevention of human health through sound land-use for small-scale farmers. It has fully integrated socio-economic and biophysical dimensions and has unfolded in the Tapajós Region watershed, an active pioneer front where both old riparian communities and newly established inland colonies are found. Among other things, we mapped the basic epidemiologic system of the American Trypanosomiasis in the study area, identifying the Attalea palms local species, their infestation by triatomines, the level of *T. cruzi* infection of insects and their dispersion between palm trees. In parallel, we characterised the transfer of Hg from terrestrial to aquatic ecosystems according to different land-use strategies, and assessed the human exposure to this contaminant taking into account both dietary, cultural, and socio-economic features of small agricultural and fishing riparian communities. The scientific results of our project are now being applied to design sustainable agroecosystems and used to promote education, modes of rural development and public policies inland Amazon, combining population health and environmental protection.

Session 14: Sustainability of German-Brazilian projects/joined ventures

Convener:

Dr. M. Schulze

DAAD, Director of the regional Office in Rio de Janeiro, Brazil,

Brazilian-German projects, cooperation, and joint ventures are various and cover nearly all fields of human action. Some projects are more successful and have more impact than others. The questions to be asked and (hopefully) to be answered in the section are: What are the necessary conditions to make German-Brazilian cooperation projects sustainable? Are there specific drivers that make the difference? Within this session we seek for contributions from all academic fields, best practices as well as failure analysis. The outcome of the section should be a list of essential sustainability criteria for future German-Brazilian projects, cooperation, and joint ventures.

Keynote Lecture:

Prof. Dr. Gerhard Overbeck, Instituto de Biociências, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

Prof. Dr. Benno Pokorny, Faculty of Environment and Natural Resources, Freiburg, Germany,

Oral Presentations

Brazilian-German cooperation for conservation: joint research on the South Brazilian grasslands, a success story.

Gerhard E.Overbeck

Universidade Federal do Rio Grande do Sul, Instituto de Biociências, Departamento de Botânica, Porto Alegre, Brazil, gerhard.overbeck@ufrgs.br

Biodiversity conservation is a global issue, and research cooperation can contribute significantly to the scientific basis for conservation. This is not because Brazilian institutions lack experience or knowlegde in the field, but because cooperation projects offer new possibilities and allow for broader, sometimes new perspectives. The South Brazilian grassland region is a good example for this. Brazilian-German cooperations projects have contributed substantially to advances in scientific knowledge in a region hitherto neglected in terms of conservation. Using the example of the cooperation between the Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil, and the Technische Universität München (TUM), I wish to discuss key points that make up successful and long-term cooperation projects and that allow for long-term achievements in terms of research and application, benefiting sustainable development. The cooperation in question has been going on for almost 15 years, with involvement of a large number of researchers and students, as well as with considerable scientific output. Funding has been obtained from different agencies, and the cooperation builds on projects with very different approaches and objectives that are complementary to each other. The aim of the talk is to identify the main factors for success, but also to analyze points that may complicate cooperations. In this, both the question of selection of the cooperation topic, and the way the cooperation is perceived on both sides and the way it is organized will be addressed, as both are of equal importance for cooperation success.

The Partnership Between SENAI in Paraná and the German Government Supporting the Industrial Sustainable Development

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In 1996 the SENAI National Department signed a Technical Cooperation Agreement with the Federal Republic of Germany through the State of Baden-Wurttemberg with the objective of upgrading the Technology Center in Sanitation and Environment (CETSAM) to a National Center of Environmental Technology. During this period CETSAM counted with the support from German specialists and SENAI specialists travelled to Germany to increase their knowledge on laboratory environmental essays, clean technologies, water and wastewater treatment systems, atmospheric emissions, solid residues and environmental management systems. Many joint consultancy projects were carried out, including hazardous waste industrial landfills; water and soil contamination evaluation; environmental diagnosis; pioneer measurements of atmospheric emissions using isokinetic collectors; organic compounds and metal traces analysis. The 2nd phase of this Project (2000-2001) strengthened industrial sustainable development in Brazil and emphasized solid residues management, environmental liabilities and clean technologies. The FIEP Waste Exchange was implemented based on a German initiative to promote recyclable material exchange between companies and nowadays it operates as a national integrated online system (SIBR). In these two initial phases each partner invested over 700,000 DM to increase laboratorial infrastructure. The 3rd phase (2002-2006) focused on health residues management, laboratory analytical essays and environmental liabilities remediation. A partnership was established with the University of Stuttgart (ISWA) and professors taught at a SENAI specialization course, which later (2008) evolved to the Professional Master's Program in Urban and Industrial Environment in partnership with the Federal University of Paraná. From 2006-2012 there were organizational and administrative adjustments in SENAI but the National Center of Environmental Technology kept its characteristics of providing quality services and education for industries in the environmental area. Considering the existing expertise and infrastructure, with further financial support from the National Bank for Economic and Social Development (BNDES) and SENAI in Paraná, plus technical support from the German Fraunhofer Institutes, the Center became the SENAI Technology Institute (STI) of Environment and Chemistry. Over 2,3 million Euros were invested mainly to purchase cutting edge technology analytical equipment and in a building that will be used for specialized training programs and applied research laboratories. The strategic activities of this STI comprise technology development, applied research and professional education since these are considered essential to adequately provide environmental solutions for industries and reduce environmental impacts. It is evident that the partnership established since 1996 between SENAI in Paraná and Germany has significantly contributed to the Brazilian industrial sustainable development.

5 Centuries of German-Brazilian Relationship

Eckhard E. Kupfer

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As a contribution to the presentation of German Business and Cultural activities during the year 2013/2014, the Institute was invited to organize a summary of the relationship of the two nations from the early visits of adventurers like Hans Staden, in the sixteenth century, until the contemporary time in the field of diplomatic, economic, scientific and cultural activities.

The organizers of this project, Professor Dr. Willi Bolle, from the department of German Literature at the University of São Paulo, and Eckhard E. Kupfer, journalist and head of the Martius-Staden Institut for History of German Immigration to Brazil, invited over fifty authors, specialists in their areas, to contribute with popular-scientific essays to this publication.

The first book presented in October 2013 at the Goethe Institut in São Paulo and at the Frankfurt book fair is divided in three chapters: 16th to 18th century (an unknown country), the 19th century (open doors for scientists and immigrants) and from the beginning of official relationships of the two nations (from the Empire to the Republic). This edition ends by the time Brazil joint the alliance for world war two.

The second book again is divided in three chapters. Starting with the resumption of the official relations of the two nations in 1950, and relating the contemporary activities in diplomatic, economic, scientific, industrial and cultural interchange. An additional part contains essays of social relations such as tourism, football, typical food-receipts and asks: “Am I Brazilian or German?”, statements of natives living abroad. The two books are published in German und Portuguese. Each essay is accompanied by informative illustrations.

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Annegret Trettin

Baden-Württemberg International, Abteilung Wissenschaft, Forschung und Kunst, Stuttgart, Germany, Annegret.Trettin@bw-i.de

Baden-Württemberg International (bw-i) is Baden-Württemberg's competence centre for the internationalisation of business, science and research. bw-i lends support to domestic and foreign companies, research institutions and universities by serving as the central first point-of-contact in all questions related to internationalisation.
In Baden-Württemberg, all research universities and most of the universities of applied sciences maintain relations with Brazilian universities and research institutions. Therefore, bw-i regularly presents Baden-Württemberg as a location of higher-education at recruitment fairs such as Salão do Estudante in Brazil. In the area of research, bw-i plans and organizes delegation trips and participates in the annual SBPC conference in Brazil, for instance. Acting as a broker that initiates international cooperations is one of bw-i´s most important tasks. Some of our information brochures are also available in Portuguese.

A bridge between Baden-Württemberg and Brazil

- Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen -

Sabine Heinle

Baden-Württembergisches Brasilien-Zentrum der Universität Tübingen, Germany, brasilien-zentrum@uni-tuebingen.de

In 2000, an agreement was signed between the two states Rio Grande do Sul and Baden-Württemberg in order to enhance the scientific cooperation. One focus is the bilateral exchange of students, researchers and visiting professors; another one is the advice of preparation and organization of study and research stays and scientific projects, multidisciplinary and for all universities in BW.

In addition to language courses in Brazilian Portuguese to prepare an exchange to Brazil we organize every year students' excursions to various regions of Brazil and a field course on geoecology in southern Brazil, together with partner universities in RS.

Since 2012 the BZ prepares and organize the study stay for the incoming students from the great Brazilian scholarship program "Ciência sem Fronteiras" to study at Tübingen University. The BZ is contact during their whole stay.

Beside this, the BZ supports and co-organize the biannual German-Brazilian Symposium for Sustainable Development together with partners.

Possibility and Potential of German-Brazilian Projects on Sustainability of Amazon through Joint Ventures Collaboration

Peregovich, BP[1]; Vale, WG[2]

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One third of the world's remaining rainforests belongs the Amazon rain forest. The bulk of Brazil's forest cover is found in the Amazon Basin, a mosaic of ecosystems and vegetation types including rainforests (the vast majority), seasonal forests, deciduous forests, flooded forests, and savannas, including the woody *cerrado*. Terrestrially speaking, it is also the most biodiversity country on Earth, with more than 56,000 described species of plants, 1,700 species of birds, 695 amphibians, 578 mammals, and 651 reptiles. This region has experienced an exceptional extent of forest loss over the past five decade in whole area exceeding almost 800.000 square kilometres, or about 19 percent of its total surface area of more than 4 million square kilometres, has been cleared in the Amazon since 1970, when only 2.4 percent of the Amazon's forests had been lost. The increase in Amazon deforestation in the early 1970s coincided with the settlement of the region through the construction of the Trans-Amazonian Highway, which opened large forest areas to development by settlers and commercial interests, likely the exploration of the forest and mineral resources and the establishment of extensive cattle farming system. In more recent years, growing populations in the Amazon region, combined with increased viability of other agricultural operations, have caused a further rise in deforestation rates. Thus there are vast possibilities for German-Brazilian academic community to set up bi-national projects to study the impacts and consequences caused by the exploration of those different activities, mainly small-scale gold mining, (*garimpagem*), industrial mining activities in general, forestry, cattle farming, large scale soybean cultivation and other agricultural activities and the sustainability of such practices for the future generations affected by it. With the recently, in 2009, founded Federal University of Western Pará - UFOPA in Santarém, being located at the banks of Amazon and Tapajós rivers, there is an interdisciplinary institution in the middle of the lower Amazon basin as a new potential partner for any kind of cooperation and research projects directly in the Amazon region, despite all the difficulties and problems a new university has to surmount in their initial stage.

What makes a SUCCESSFUL applied scientific project? Lessons learned from Minas Gerais, Brazil

Jörg Matschullat[1], Eleonora Deschamps[2]

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A successful piece of applied research will not only influence the related problem perception within the scientific community, but also lead to much better understanding of a complex challenge, including the delivery of solutions. Ideally it may contribute significantly to reducing possible risk situations for people and/or the natural environment. In short, a successful study will have a broader impact beyond the sphere of science. Planning and timing, funding, networking, communication, and interdisciplinarity are identified as key aspects for a successful project and are being examined in their scope and boundary conditions, while not forgetting about the particular role of local and regional people and authorities (Matschullat and Deschamps 2015).

Defining what makes a successful environmental geochemical study is clearly best based in this work on experience and evidence found, and not upon any particular theoretical concept. Here, experience is drawn for the outcome of many projects, and specifically first-hand from the complex ARSENEX project in Minas Gerais, Brazil (Deschamps and Matschullat 2007, 2011). Against the backdrop of both perceived and real arsenic contamination of environmental compartments, including local people, all subsequent project steps and proposals were set up using a three-prong approach that sought to a) understand the processes, b) educate and inform the public and all other stakeholders and c) remediate the situation.

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Capacity Building and Fundamental Research to Develop and Implement a Mechanical Biological Treatment Facility with an Integrated Fermentation Stage in Jundiaí-SP, Brazil

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The National Policy for Solid Waste, published in 2010 in Brazil, moved the theme solid residue to another level, extrapolating discussions focused exclusively on forms of final disposal in landfills. The new legal framework incorporates the consciousness of wealth and potential possibilities in waste management, italso reveals the errors and omissions that have been accumulated over the past 30 years.

The Project “Capacity Building and Fundamental Research to Develop and Implement a Mechanical Biological Treatment Facility with an Integrated Fermentation Stage in Jundiaí-SP, Brazil” aimed to open a multidisciplinary discussion integrating several market segments, in order to allow the design of tools for the implementation of a sustainable management of municipal solid waste.

During the project implementation it was possible to enter into debates that spanned from the technologies in the form of fermentation, composting, recycling, and energy recovery up to the provision of information, advice on the introduction of a sustainable waste management and, still, the engineering and scientific content, as well as the relevant aspects for the implementation of the projects, such as trends and challenges of management, among other aspects of the market.

This project also provided comprehensive knowledge about this new market for Brazil and also the construction of an inter-relationship with the sector of waste within Brazil-Germany, establishing an exchange with iconic German institutions on best practices to ensure climate protection and the preservation of natural resources, thus providing a continuous exchange of experiences, through vocational and technological education.

The established technical cooperation between German and Brazilian institutions has enhanced the best practices in the management of municipal solid waste transcending preliminary aims by provision of technical staff and infrastructure, and creating opportunities to democratize the information for promoting purposes of a holistic view as differentiated waste management. These efforts has caused a cultural change that will protect our natural resources and climate, ensuring a better future for next generations.

BAYLAT: Science and Research – Internationalization and Sustainability

Irma de Melo-Reiners

Bavarian University Center for Latin America (BAYLAT), Erlangen, Germany, Irma.demelo@baylat.org

The presentation will focus on the university center's main activities: cooperation opportunities in science and research with Latin America and especially Brazil, an emergent and excellent research region, in the light of internationalization and sustainability.

The Bavarian University Center for Latin America (BAYLAT) is a service institution founded by the Bavarian State Ministry of Education, Science and the Arts (StMBW). BAYLAT's main goal is to further connections and collaborations between Bavarian and Latin American universities and research institutions; within the scope of its international research marketing, BAYLAT recruits excellent Latin American scientists for Bavaria.

BAYLAT's objectives are related to the Bavarian universities' internationalization strategy. To achieve those objectives, BAYLAT plans and performs its activities within the concept of Science, University and Cooperation Diplomacy.

As a competence and information center for Bavaria and 20 Latin American countries, BAYLAT has several focal points:

BAYLAT encourages the creation of networks between Bavarian and Latin American universities and research institutions and supports furthermore the lasting establishment of research alliances. The university center wins over strategic partnerships in both regions and assists research alliances with its international research marketing. BAYLAT also provides competent consultancy for matters regarding universities, research areas as well as opportunities for academic and scientific collaboration with Latin America and Bavaria. In addition to the coordination and the program organization for official delegations from and to Latin America, the center organizes scientific conferences and meetings concerning subjects relevant for both regions. With its own initial funding programs BAYLAT encourages and aids innovative binational projects in research and academic teaching.

German-Brazilian Cooperation in Science and Technology

Matthias Frattini

German Aerospace Center, Project Management Agency, European and International Cooperation, Bonn, Germany, matthias.frattini@dlr.de

Brazil is a priority partner for scientific-technological cooperation of Germany in Latin-America. The talk addresses the framework conditions and the thematic priority areas of the bilateral research cooperation. Environmental and sustainability topics are of special importance in this context. DLR Project Management Agency is introduced with its mission to support the Federal Ministry of Education and Research in the cooperation with Brazil and to implement funding programs. Examples are given for building up research networks with Brazilian partner institutions.

„Funding Programmes of the Alexander von Humboldt Foundation and the Cooperation with Brazil”

Dr. Anne Sperschneider

Head of Division Central and South America, Alexander von Humboldt Foundation, Bonn / Germany, Email: info@avh.de

Every year, the Alexander von Humboldt Foundation enables more than 2,000 researchers from all over the world to spend time researching in Germany with a fellowship or research award. The Foundation maintains a network of about 27,000 Humboldtians from all disciplines in more than 140 countries worldwide – including 51 Nobel Prize winners.

The long-lasting cooperation with Brazil has shown a strong increase lately due to a new cooperation with CAPES (*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*) through the “*CAPES-Humboldt Research Fellowship Programme*”. In this programme, fellowships of the Humboldt Foundation for researchers coming from Brazil are being financed and granted together with CAPES. The programme is open to all fields of research, starting at a postdoc-level. 50 highly qualified researchers have been selected in this joint initiative so far.

Every Humboldtian needs an academic host in Germany. Humboldt hosting offers an opportunity of mutual exchange and global networking. Every active academic at a research institution in Germany can become an academic host for a Humboldt Foundation fellowship holder or award winner. The host supports the Humboldtian in carrying out a freely chosen research project. For costs incurred by the host‘s institute relating to a research fellowship, the Humboldt Foundation offers a subsidy.

Brazil is one of the five participating countries in the “*German Chancellor Fellowship Programme*”. Every year, the Alexander von Humboldt Foundation grants up to ten scholarships to prospective leaders from the USA, the Russian Federation China, India and Brazil respectively. The programme is targeted at accomplished young professionals who are likely to become decision-makers, thought leaders, and influential voices in their respective fields. This fellowship enables them to come to Germany for 12 months in order to conduct a project with a host of their own choice. The role of a host in the German Chancellor Fellowship Programme can be taken on by anyone working for a public or private institution in Germany. As a mentor, the host is expected to support the German Chancellor Fellow in conducting his/her project and to provide an appropriate position.

“Once a Humboldtian – always a Humboldtian" – from the very beginning, this has been the hallmark of the Alexander von Humboldt Foundation. Humboldtians can count on the Foundation for maintaining the connections with Germany on a long-term basis through alumni sponsorship programmes. This applies also for the roughly 400 Humboldtians in Brazil: After their initial research stay in Germany, they can keep in touch with specialist colleagues through further research stays to Germany, amongst other things. The Research Group Linkage Programme allows Humboldtians in developing or threshold countries to cooperate over a period of three years with a researcher working at a German institute.

Research Cooperation with Brazil, DFG Statistics, Programmes, and Future Perspectives.

Dietrich Halm

Deutsche Forschungsgemeinschaft, Director, International Cooperation with Latin America

The presentation “Research Cooperation with Brazil, DFG Statistics, Programmes, and Future Perspectives” will reflect on recent developments of DFG-funding and co-funding with Brazilian funding organizations between German and Brazilian researchers / research institutions. DFG funding programmes will be introduced in short and perspectives of the German-Brazilian cooperation in research will be given.

Cooperation for sustainability: A critical reflection on the success of the German-Brazilian cooperation initiatives

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Ever since the Earth Summit in Rio 1992 and the here initiated Pilot Program to Conserve the Brazilian *Rainforest (*PPG-7), Germany has become a major partner of Brazil in the attempt to achieve sustainable development. Since then, there has been, however with ups and downs, an impressive proliferation of German-Brazilian cooperation initiatives including hundreds of projects, programs, and joint ventures involving universities, development organizations, civil society and grassroots organizations, churches and the private sector. During the recent visit of chancellor Merkel in Brazil, both governments highlighted the success and achievements of the intensive cooperation of the leading economic powers of Europe and South-America in the fields of science, technology, commerce and environment. But what exactly means success, and what have been the achievements and influencing factors. This presentation intends to shade light on these questions by reflecting concepts, approaches and evidences from the German-Brazilian cooperation. This exercise indicates that assessing cooperation efforts strongly depends on the underlying actor-specific goals, mindsets and interests. In this understanding, the most effective cooperation schemes are those where powerful actors are involved for achieving their specific interests, while approaches targeting less privileged societal groups show a higher probability of failure. Accordingly, cooperation is most successful if coherent with mainstream development dynamics. This experience in turn has influenced the scope of financing and programs. The alignment of cooperation with economic capacity and interest may, but not necessarily do, contribute to broader sustainability goals. Organizations promoting cooperation should be aware of this ambivalence implied in targeting elites, and more consciously deal with the strategic challenge of promoting collaboration with less privileged societal groups and financially unappealing topics.

Development: a multifaceted concept with multiple perspectives

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In the past century, "development" became one of the main concepts to social change processes. However, development is a multifaceted concept that holds multiple perspectives. In fact, development is a term that depends on the individual background of who uses it. The individual background is in its turn determined by academic and contextual factors and also by cultural and ideological visions of each person. Background understanding is not often clearly revealed; sometimes even it is unconsciousness to the user.
In an open international dialogue, we intend to start debate on the concept of development according to each author background, study area and contextual point of view. "We" are a group of academics from Brazil and Germany joined by an international exchange programme called UNIBRAL that is supported by DAAD from Germany and CAPES from Brazil. This programme has showed us that we have very different accesses to the meaning of development. At the same time, it is for all of us a central issue in our reasoning. Our dialogue aims to make us consciousness about these meanings and to converge some basic aspects that we could share in our international discussions about processes of social change.

Explaining our distrustful assumption…

Development does not need further explanations in national and international discussions about political and economical goals. The national states were divided by an International Development Strategy on UN-level into "developed", "developing"and "least developed countries"[1]. According to UN, this division was based on an understanding of Human Development:

> "Human development – or the human development approach - is about expanding the richness of human life, rather than simply the richness of the economy in which human beings live. It is an approach that is focused on people and their opportunities and choices."[2]

This definition was taken in 1990 as the basis for the first UNDP Report on Human Development. Without any doubt, this was a great increasing in international common sense on development. Nevertheless, there remain a lot of different approaches and meanings of human development once it depends on a series of social and cultural factors. This is the reason for our continued distrust.

1: http://www.unitar.org/resource/sites/unitar.org.resource/files/document-pdf/GA-2767-XXVI.pdf
2: http://hdr.undp.org/en/humandev

Sharing Steinbeis experience across borders

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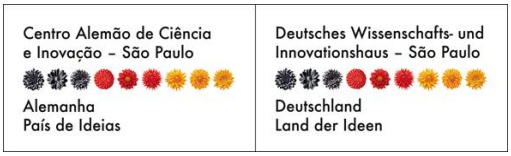
A new chapter has been written in the success story of German-Brazilian collaboration in the Steinbeis Network. On August 26, 2014, organizers Diego Nascimento and Professor Dr. Nazem Nascimento of Steinbeis Consulting Services - Brazil welcomed more than 90 participants to the first German-Brazilian water resources seminar, held in the city of Resende near Rio de Janeiro.
The host of the seminar, the Association for the Management of the Paraiba do Sul River (AGEVAP), under the leadership of its managing director Dr. Andre? Luiz de Paula Marques, placed a spotlight on the sharing of information and experience between Germany and Brazil, touching on topics such as technology, systems and the targeted monitoring of activities in the water management field.
During the event, speakers presented specific examples and processes from the German water management sector, rainwater management methods for flood prevention and safeguarding the local environment, as well as ways to share technology between Brazil and Germany. This will serve as an impetus for further seminars and projects as the two countries continue to collaborate on water resources.

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