

WC Climate Change 2018

Impacts & Responses

September 13-15, 2018 | Rome, Italy



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1
Day

Thursday

September 13, 2018

Hall Name - XXXXXXXX XXXXXXXX

08:00-09:00 _____ Registrations

09:00-09:10 _____ Opening Ceremony

Moderator: Ekaterina Shorohova, Forest Research Institute of the Karelian Research Centre, Russian Academy of Science, Russia

KEYNOTE FORUM

09:10-09:45 _____ **Title: Is time running out to cope with climate change - A nordic perspective**

V Benno Meyer-Rochow, University of Oulu, Finland and Research Institute of Luminous Organisms, Hachiojima, Japan

09:45-10:15 _____ **Title: Climate controls on long-term trends, inter-annual variability, and extreme anomalies in satellite-derived global land surface phenology from 1982 to 2016**

Xiaoyang Zhang, South Dakota State University, USA

Pleanary Talk

10:15-10:55 _____ **Title: How the world changes when climate interacts with human behavior**

Lei Wang, Peking University, China

GROUP PHOTO

Coffee Break 10:55-11:10 @ Foyer

Sessions:

Adaptation & Mitigation of Climate Change

Session Chairs

V Benno Meyer-Rochow, University of Oulu, Finland and Research Institute of Luminous Organisms, Hachiojima, Japan

1
Day

Thursday

September 13, 2018

Xin-Zhong Liang, University of Maryland, USA

11:10-11:30 ————— **Title: Climate Change Impacts on U.S. Agricultural Productivity**

Xin-Zhong Liang, University of Maryland, USA

11:30-11:50 ————— **Title: Identifying Forest genetic material tolerance to climate change through analysis of performance using REINFFORCE arboreta network climate gradient**

António Correia, Forest Research Center, Agronomy Institute, University of Lisbon, Portugal

11:50-12:10 ————— **Title: Extreme weather events, Population Vulnerability, and Impaired Health: Need for Community Specific Adaptation Strategies**

Amir Sapkota, University of Maryland - College Park, USA

12:10-12:30 ————— **Title: Accounting for air quality in climate change mitigation**

Shiliang Wu, Michigan Technological University, USA

12:30 -12:50 ————— **Title: Finnish ninth graders' views on climate change**

Mikaela Hermans, Abo Akademi University, Finland

12:50-13:10 ————— **Title: Integrating climate mitigation and adaptation into coastal urban land use planning in time**

Lilai Xu, Chinese Academy of Sciences, China

13:10-13:30 ————— **Title: Could Cohesion Policy push EU climate efforts?**

Michal Nekvasil, People in Need, Czech Republic

Lunch Break 13:30-14:15 @ Restaurant

Sessions:

Adaptation & Mitigation of Climate Change | Sustainability

Session Chairs

Mahbubur Meenar, Rowan University, USA

Moti Herskowitz, Ben-Gurion University of the Negev, Israel

1
Day

Thursday

September 13, 2018

- 14:15-14:35** ————— **Title: Planning and designing green storm water infrastructure to address climate change: Lessons learned from Philadelphia, USA**
Mahbubur Meenar, Rowan University, USA
- 14:35-14:55** ————— **Title: Impact of coastline changes on the groundwater level of coastal wetland**
Qiang Liu, Beijing Normal University, China
- 14:55-15:15** ————— **Title: Research on impacts and response of global change with specific landscape geographic units - A study in the Loess Plateau**
Mingjian Wei, Capital Normal University, China
- 15:15-15:35** ————— **Title: Enhancing Intersectoral action for promoting resilience to climate change and disaster risk reduction: An Indian perspective**
Sekar Kasi, National Institute of Mental Health and Neurosciences, India
- 15:35-15:55** ————— **Title: Game-changing, Eco-friendly and Sustainable Production of Renewable Liquid Fuels and Chemicals from CO₂ and Water**
Moti Herskowitz, Ben-Gurion University of the Negev, Israel
- 15:55-16:15** ————— **Title: Community micro hydropower generation: A sustainable model for climate change mitigation and adaptation**
Alberto Sanchez & Michela Izzo, GEF-SGP/UNDP & Guakía Ambiente, Dominican Republic
- 16:15-16:35** ————— **Title: The global activity of category 5 tropical cyclones**
Karl Hoarau, Cergy-Pontoise University, France
- Coffee Break 16:35 -16:45 @ Foyer**
- 16:45-17:05** ————— **Title: Controls and variability of greenhouse gas production and emissions from thawing permafrost**
Bo Elberling, University of Copenhagen, Denmark

1
Day

Thursday

September 13, 2018

- 17:05-17:25** ————— **Title: Grounding resilience and sustainability through building codes**
America Bendito, University of Los Andes, Venezuela
- 17:25-17:45** ————— **Title: Sustainability of climate change incentive market based mechanisms (IMBMs) in the livelihoods of rural communities**
Elinorata Mbuya, Ardhi University, Tanzania
- 17:45-18:05** ————— **Title: Development of composite briquettes from Agricultural wastes**
Michael Lubwama, Africa Center of Excellence in Materials, Product Development and Nanotechnology, Makerere University, Uganda
- 18:05-18:25** ————— **Title: Mechanisms and Applications of Green Infrastructure Practices for Storm Water Control and Pollutant Removal: A Review**
Chunhui Li, Beijing Normal University, China
- 18:25-18:45** ————— **Title: Climate Change, Food Insecurity and Emergency Response Revisited**
Prahlad Kasturi, Radford University, USA
- 18:45-19:15** ————— **Title: Characteristic profile of forest fire risk from social perception: A study with Spanish population**
Jaime Senabre, Director of SINIF, University of Alicante, Spain
- Poster Presentations**

Panel Discussions

2 Day

Friday

September 14, 2018

Moderator: Aiyin Jiang, University of North Florida, USA

KEYNOTE FORUM

- 09:00-10:00** ————— **Title: "*Dealing with Disasters*": Using film to show how the health, climate change and disaster sectors can collaborate for effective disaster response**
Cordia Chu, Griffith University, Australia
- 10:00-10:30** ————— **Title: Deep Integration of Surface Water and Groundwater for Water Security Under Climate Change**
Graham E. Fogg, University of California, Davis, USA

Coffee Break 10:30-10:45 @ Foyer

Sessions:

Risks of Climate Change | Sustainability

Session Chairs

Cordia Chu, Griffith University, Australia

Xiaoyang Zhang, South Dakota State University, USA

- 10:45-11:05** ————— **Title: The role of uncertainty in our climate understandings**
Peter Domonkos, ESPERE association, Spain
- 11:05-11:25** ————— **Title: Urban geochemistry – The importance and vulnerability of topsoil layer in urban areas: Case study in the city of Sisak, Croatia**
Ajka Šorša, Croatian Geological Survey, Croatia
- 11:25-11:45** ————— **Title: Influence of climate change and socio-economic development on catastrophe insurance: A case study of flood risk scenarios in the Netherlands**
Youbaraj Paudel, NN Group and VU University Amsterdam, Netherlands

2
Day

Friday

September 14, 2018

- 11:45-12:05** ————— **Title: Greenhouse Gas Emission Impacts by Waste Management Practices over Last 3 Decades; Korean Case**
Yong-Chil Seo, Yonsei University, South Korea
- 12:05-12:25** ————— **Title: A Role for Hydro-Economic Models to Inform Measures to Limit Economic Costs of Climate Adaptation**
Frank A.Ward, NM State University, USA
- 12:25-12:45** ————— **Title: A lifeline and a reason to be: The future of sustainable architecture in Spain and its European context**
Ir Sander Laudy, Universidad Autonoma de Barcelona, Spain
- 12:45-13:05** ————— **Title: Glass foams as ecological materials**
Negrea Petru, Politehnica University Timisoara, Romania
- 13:05-13:25** ————— **Title: Effects of Global Climate Change on Building Energy Consumption and Its Implications in Florida**
Aiyin Jiang, University of North Florida, USA
- Lunch Break 13:25 -14:05 @ Restaurant**
- Sessions:**
Global Warming Effects & Causes | Risks of Climate Change | Climate change & Agriculture
- Session Chairs**
Graham E. Fogg, University of California, Davis, USA
Yong-Chil Seo, Yonsei University, South Korea
- 14:05-14:25** ————— **Title: From Ediacaran to Devonian The Great Early-Middle Palaeozoic Biodiversification with palaeoclimatic considerations**
Alain Blieck, Palaeontologist, Former CNRS emeritus senior scientist, France

2 Day

Friday

September 14, 2018

- 14:25-14:55** ————— **Title: Utilization of CO₂ and Its Potential to Produce Ultra-clean Fuels and Chemicals**
Nimir O. Elbashir, Texas A&M University, Qatar and USA
- 14:55-15:15** ————— **Title: CO₂ Concentration Not the Cause of Warming in U.S. Bodies of Water Over the Past 89 Years**
Warren G. Hahn, P.E., Hahn Engineering Inc., USA
- 15:15-15:35** ————— **Title: Ambient endotoxin and PM₁₀ concentrations on air vents of subway stations**
Sung Ho Hwang, National Cancer Center, South Korea
- 15:35-15:55** ————— **Title: The Pace of Climate Change in Eastern China and Its Marine Ecological Effects**
Rongshuo Cai, Third Institute of Oceanography, State Oceanic Administration of China, China
- 15:55-16:15** ————— **Title: On the way to the predictability of El Niño-La Niña phenomenon**
Hernán Astudillo, University of Concepción, Chile
- Coffee Break 16:15 -16:30 @ Foyer**
- 16:30-16:50** ————— **Title: Livelihood diversification and climate shocks: Evidence from small-holders in Zambia and Tanzania**
Aslihan Arslan, Senior Research Economist, Research and Impact Assessment Division, IFAD(International Fund for Agricultural Development), Italy
- 16:50-17:10** ————— **Title: Analysis for risk likelihood to dams and bridges construction on Rift Valley fever ecosystem in River Nile, Sudan: A case study**
Mohammed Mansour, University of khartoum, Sudan

2
Day

Friday

September 14, 2018

- | | | |
|-------------|-------|---|
| 17:10-17:30 | _____ | Title: Carbon dioxide bio-fixation by <i>Chlorella</i> sp. BTA 9031 towards biomass and lipid production: Optimization using Central Composite Design approach
Onkar Nath Tiwari , Indian Agricultural Research Institute, India |
| 17:30-17:50 | _____ | Title: Mediating and Moderating Effects in the Process of Drought Impacting Rural Livelihood Vulnerability in China
Professor Jianjun Huai , Northwest Agriculture and Forestry (A&F) University, China |
| 17:50-18:10 | _____ | Title: A time-stepping scheme to simulate leaf area index and gross primary production via climate variables
Qinchuan Xin , Sun Yat-Sun University, China |
| 18:10-18:30 | _____ | Title: Climate Change and Drought: Potential Health Impact of Wastewater Reuse as Management Strategy for Water Security in South Africa
Olalekan Fatoki , Cape Peninsula University of Technology, South Africa |
| 18:30-18:50 | _____ | Title: Photocatalytic microbial removal and degradation of organic contaminants of water using PES fibers
Buthayna Al-Ghafri , Nanotechnology Research Center, Sultan Qaboos University, Oman |
| 18:50-19:10 | _____ | Title: Climate change education and vulnerable groups in southern Africa: The case for utilising the services of frontline human services professionals
Rodreck Mupedziswa , University of Botswana, Botswana |

Panel Discussions

3
Day

Friday

September 15, 2018

Moderator: Ekaterina Shorohova, Forest Research Institute of the Karelian Research Centre, Russian Academy of Science, Russia

Sessions:

Climate Change & Natural Environment | Climate change and Agriculture

Session Chairs

A. Pouyan Nejadhashemi, Michigan State University, USA

Peter Domonkos, ESPERE Association, Spain

09:00-09:20 ————— **Title: Large-scale modeling to evaluate stream health vulnerability to climate change**

A. Pouyan Nejadhashemi, Michigan State University, USA

09:20-09:40 ————— **Title: Place of origin and climatic variations as causes of groundwater contamination by arsenic in Nepal**

Barbara Mueller, Bamugeobiochem, Switzerland

09:40-10:00 ————— **Title: Do changes in boreal forest understory vegetation reflect climate change?**

Ilkka Vanha-Majamaa, Natural Resources Institute Finland, Finland

10:00-10:20 ————— **Title: Intrinsic water use efficiency after fertilization Douglas-fir plantation in the Oregon Coast Range**

Eladio H. Cornejo-Oviedo, Antonio Narro Autonomous Agrarian University, Mexico

10:20-10:40 ————— **Title: Climate change during Holocene in Northwestern Mexico based on geochemical, magnetic and palinological evidence**

Carmen Isela Ortega Rosas, State University of Sonora, Mexico

3
Day

Friday

September 15, 2018

10:40-11:00 ————— **Title: Increasing concurrent drought and heat during the summer maize season in Huang-Huai-Hai Plain, China**

Qingfeng Meng, China Agricultural University, China

Coffee Break 11:00 -11:10 @ Foyer

11:10-11:30 ————— **Title: Old-growth forests in view of climate change**

Ekaterina Shorohova, Forest Research Institute of the Karelian Research Centre, Russian Academy of Science, Russia

11:30-11:50 ————— **Title: The slick dairy cow as an adaptive asset for resilient dairy operations upon the uncertainty of climate change**

Guillermo Ortiz-Colón, University of Puerto Rico at Mayagüez, USA

11:50-12:10 ————— **Title: Impacts of Sectoral Emissions in China and the Implications: Air Quality, Public Health, Crop Production, and Economic Cost**

Steve Hung Lam Yim, The Chinese University of Hong Kong, Hong Kong

12:10-12:30 ————— **Title: Assessment of the Iberian Peninsula bioclimate (1950-2017)**

Cristina Andrade, Instituto Politécnico de Tomar, Portugal

12:30-12:50 ————— **Title: Response to climate change of cropping system from plant to field managements**

Hui JU, Chinese Academy of Agricultural Sciences, China

12:50-13:10 ————— **Title: Vulnerability Assessment of Groundwater to Contamination Using Electrical Resistivity Method at the Open Dumpsite in Gosa, Abuja, Nigeria**

Dr Abdulsalam Nasir Naeem, University of Abuja, Nigeria

3
Day

Friday

September 15, 2018

13:10-13:30 ————— **Title: Modeling potential redistribution of life zones and plant species communities under climate change in Puerto Rico**

Azad Henareh Khalyani, Colorado State University, USA

Lunch Break 13:30 -14:10 @ Restaurant

Sessions:

Global Warming Effects & Causes | Land, Water & Fisheries

Session Chairs

Alain Blieck, Palaeontologist, Former CNRS emeritus senior scientist, France

Sekar Kasi, National Institute of Mental Health and Neurosciences, India

14:10-14:30 ————— **Title: Causes of groundwater contamination using geochemical approaches and fuzzy logic on GIS platform: A case study of Busan Metropolitan City, Korea**

Sang Yong Chung, Pukyong National University, South Korea

14:30-14:50 ————— **Title: Winter atmospheric circulation anomaly associated with recent Arctic winter warm anomalies**

Bingyi Wu, Fudan University, China

14:50-15:10 ————— **Title: Thermal Tolerance of Fishes from Tropical Rivers in Thailand: Global Warming Implications**

Sampan Tongnunui, Mahidol University, Thailand

15:10-15:30 ————— **Title: Historical Development of the National Climate Change Policy and the Role of the Climate Change Secretariat in Sri Lanka**

Vindya Hewawasam, The University of Tsukuba, Japan

15:30-15:50 ————— **Title: Simulation of snowmelt-runoff under climate change scenarios in a data-scarce mountain environment**

Muhammad Yasir, WUHAN University, China

3
Day

Friday

September 15, 2018

15:50-16:10

Title: Quantifying green water deficit for wheat production in different climatic zones of Iran

Abdullah Darzi-Naftchali, Sari Agricultural Sciences and Natural Resources University, Iran

Panel Discussions

Thanks Giving & Closing Ceremony

Poster Presentations

WCCC201

Title: Response of flood to regional climate change in North China

Junping Wang, Capital Normal University, China

WCCC202

Title: Holocene climate change records from sand wedge at Linggo Co, Qiangtang Plateau

Baoling Pan, Capital Normal University, China

WCCC203

Title: Using statistical model to simulate the impact of climate change on maize yield with climate and crop uncertainties

Yi Zhang, Chinese Academy Meteorological Sciences, China

Notes:

Day-1

Keynote Session

WC Climate Change 2018: Impacts & Responses

September 13-15, 2018 | Rome, Italy



V. Benno Meyer-Rochow

Research Institute of Luminous Organisms, Hachiojima, Tokyo, Japan 100-1623 and Department of Genetics and Physiology, University of Oulu, Oulu FIN 90140, Finland

Is time running out to cope with climate change - A nordic perspective

Even the greatest sceptics are nowadays inclined to accept that climate change is real. What actually caused and drives it, however, is still being debated despite the evidence that human activities are responsible. Even more discussion involves what can be done to stop or at least slow down climate change. Generally viewed as 'negative' and with severe outcomes for the world as sea levels and temperatures rise, the consequences of climate change are manifold and there are many losers as well as some winners. Low lying areas are in danger of being flooded, islands may disappear and droughts in some areas and increasing precipitation in others can be expected. There are obviously biological changes with some plant and animal species expanding their ranges northward and into higher altitudes, but others finding it difficult to adapt. There are also health issues as well as social and economic repercussions to be considered. Some of the 'winners' could be Nordic countries: bluefin tuna, for example, have returned to Norway, squid as well as species hitherto mainly known from warmer waters are becoming increasingly numerous, but cod and other species now invade what used to be the Arctic region. In Finland southern species of moths occur in Lapland where earlier such species have hardly ever been seen and it's expected that by 2055 wheat, barley and peas may be grown near the polar circle. How these changes will affect the social structure, the fabric of society, the industry, but also public health as disease carrying mosquitoes and ticks can be expected to move northward are questions that have to be addressed before it's too late.

Biography

The New Zealander Victor Benno Meyer-Rochow, PhD in Neurobiology 1974 & DSc in Ethnobiology 2004, both from the Australian National University in Canberra, is Docent and Visiting Professor at Oulu University (Finland) and Managing Director of the Research Institute of Luminous Organisms (Hachiojima) in Japan. He became a Queen Elizabeth II. Fellow in Marine Science in 1975, had an opportunity to have lunch with Her Majesty and, as an ethnobiologist, carried out research in Papua New Guinea, India and East Asia, including the DPRK (North Korea). A recipient of an Alexander v. Humboldt Senior Research Fellowship, Finnish and Japanese Academy Fellowships, a British Council Grant to work in Cambridge, Harvard University's Ig-Nobel prize, a Fulbright Senior Professorship and recently (2013) the prestigious Bingh-Zhi Forum Prize of the Chinese Academy in Beijing, he has published more than 400 scientific articles in international journals, published 4 and contributed to 20 books. He led two Antarctic expeditions and took part in research trips to the South Atlantic Ocean, Papua Niugini, the Moluccan Islands, Central Australia, Spitzbergen and North-East India. Apart from his current duties in Finland and Japan, he held university positions in Australia, New Zealand, Jamaica and Germany, spent sabbaticals in France, New Caledonia, Brazil and India and is Adjunct Professor at Yokohama City University (Japan) and Pyongyang University of Science & Technology (DPRK). His major research tools are transmission and scanning electron microscopes and from 1991-95 he was the Director of the Electron Microscopy Centre of the University of the West Indies.

WC Climate Change 2018: Impacts & Responses

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Xiaoyang Zhang

*Geospatial Sciences Center of Excellence (GSCE),
Department of Geography, South Dakota State University,
Brookings SD, USA*

Climate controls on long-term trends, interannual variability, and extreme anomalies in satellite-derived global land surface phenology from 1982 to 2016

Vegetation phenology is the expression of the seasonal cycles of plant processes and their connections to climate change. Long-term observation and record of changes in vegetation phenology support efforts to understand trends in regional and global climate changes, to reconstruct past climate variations, and to predict biological responses to future climate scenarios. Over the last three decades, remote sensing has become a widely-used mechanism for monitoring the activity of vegetation from wall to wall at large spatial scales. This study introduces the land surface phenology detected from the Advanced Very High Resolution Radiometer (AVHRR) and the Moderate Resolution Imaging Spectroradiometer (MODIS) from 1982-2016 and the characterization of the interannual variation in magnitude and timing of ecosystems globally and their responses to a changing and variable climate. To generate long-term land surface phenology globally, daily two band enhanced vegetation index was derived from AVHRR and MODIS at a spatial resolution of 0.05 degrees (~5km) and was then used to track the phenological events of vegetation growth. Trend analysis reveals the spatial pattern of long-term single and multiple phenology trends in the start of growing season and end of growing season in response to the change in temperature and precipitation. However, the interannual variability of temperature and precipitation was considerably large and extreme events occurred frequently in recent several years. Therefore, further analysis indicates that the interannual variation in phenological events could be more than a month in precipitation-controlled tropical and dry climates and more than two weeks in temperature-controlled temperate, cold and polar climates, and that the variation of interannual phenology change presented a positive trend in most pixels. Overall, the interannual variation in land surface phenology and extreme phenological events over the past three decades could provide a powerful basis for improving understanding and quantifying the impacts of climate change.

Biography

Dr. Xiaoyang Zhang received the B.S. degree in geography from Peking University, China, the M.S. degree in geography from the Nanjing Institute of Geography and Limnology, China, and the Ph.D. degree in geography from King's College London, U.K. He is currently a Professor with the Department of Geography and a Senior Scientist at the Geospatial Sciences Center of Excellence at South Dakota State University (SDSU), USA. Prior to joining SDSU in 2013, he was a Research Assistant Professor with Boston University, and a Senior Research Scientist in Earth Resources Technology and a visiting Associate Research Scientist in the University of Maryland working at the National Oceanic and Atmospheric Administration (NOAA). His research focuses on satellite remote sensing for examining land surface phenology, biomass burning emissions, land cover and land use change, and climate-terrestrial ecosystem interaction using remotely sensed data across the globe.

Notes:

Pleanary Session

How the world changes when climate interacts with human behavior

Lei Wang

School of Psychological and Cognitive Sciences, Peking University, China

Although researchers have described human personality traits in many ways for thousands of years and believed that human personality traits are the “alloys” of nature and nurture/culture, little has been known about the role that natural factors play in shaping human personality traits, which in turn may also influence natural environment. In particular, why people from different places vary in personality traits is unanswered yet. Recently, some researchers tried to link climate with human social behaviors. We argue that climate, particularly the ambient temperature, may influence human personality traits. Here we propose a temperature theory of human personality traits. Specifically, for modeling the relationship between climate and personality traits, we choose to collect data at the city level since city is a relatively small unit of climate such that we can observe how the variance of climate within a geographical large enough country like China and USA will link to human personality traits. Using large-scale survey, big data and machine learning, we showed that regional ambient temperature is associated with personality traits, such that the more clement the temperature, the nicer the personality traits in terms of socialization/personal growth (i.e., agreeableness, conscientiousness, and emotional stability) and plasticity (i.e., extraversion and openness to new experience), even after controlling for migration, subsistence style, pathogen prevalence, GDP per capita, city population density, and response style. Then we will see how people will try to change their surrounding temperature at the micro-level, which will then influence the climate at the macro-level. This may lead to a vicious circle that damages the climate. We will discuss these findings in relating global warming to the change of human nature, pathogen control, emergency management, etc.

Biography

Dr. Lei Wang is a professor and director of the Applied Psychology Area in the School of Psychological and Cognitive Sciences at the Peking University, China with over 30 years research experiences. His research focuses on personality and social psychology and applied psychology and published over 150 papers. Recently, his research interest is in the relationship between climate and human behavior and he tries to explain how ambient temperature may shape human personality traits. He earned a doctorate in social psychology at Peking University and used to work in Oxford University as a senior associate researcher in 1995-96 and University of California at Berkeley as Freeman Professor in 2005. He also served as the chair of China National Committee of Higher Education in Psychology and the founding chair of China National Council of Professional Graduate Education for Applied Psychology. He is currently the vice president of China Association of Social Psychology.

Day-1

Scientific Sessions

Climate Change Impacts on U.S. Agricultural Productivity

Xin-Zhong Liang¹, You Wu¹, Wei Gao² and Robert G. Chambers³

¹Earth System Science Interdisciplinary Center, and Department of Atmospheric and Oceanic Science, University of Maryland, USA

²The USDA UV-B Monitoring and Research Program, Natural Resource Ecology Laboratory, and Department of Ecosystem Science and Sustainability, Colorado State University

³Agricultural and Resource Economics, University of Maryland

This The U.S. agricultural economy, as measured by total factor productivity (TFP), has grown continuously for over half a century. This growth has been largely attributed to technological improvements, discounting how it has been and will be affected by climate. Most climate impact studies have focused on local effects or partial productivity measures insufficient to capture national economic outcomes. Here, we directly link climate variables in specific U.S. regions to TFP. We quantify the national economic consequences of past climate variations, identify critical agricultural regions with national significance, and project future changes in TFP under different climate scenarios. We show that, while the impact of climate on U.S. agricultural productivity seems relatively weak in the 1951-1980 period, TFPC sensitivity to climate variables has greatly increased in more recent times. This increase was accompanied by substantial changes in regional and seasonal correlation patterns. So far, the aggregate effects of regional climate trends on TFP have been outweighed by improvements in technology. However, should these relationships continue, the projected climate changes could cause TFP to fall to pre-1980 levels by 2050 even when accounting for present rates of innovation. Our analysis provides a physical understanding of the climate-economic links, demonstrates that the agricultural economy is becoming increasingly sensitive to climate, and lays a more concrete foundation for informed policy and decision making on adaptation/mitigation strategies to maintain the productivity.

Biography

Xin-Zhong Liang is a professor of the Department of Atmospheric & Oceanic Science at the University of Maryland. His expertise is in developing improved representations of physical processes and integrated global and regional models to advance numerical simulations of the Earth climate system, and applying these and other models to tackle major roadblocks in predicting weather extremes and climate anomalies as well as assessing environmental consequences (terrestrial hydrology, ecosystem dynamics, air quality, water quality) at regional-local scales. He has also been expanding collaboration to conduct interdisciplinary research across a wide range of sciences, including agriculture, economy, health, and decision support.

Identifying Forest genetic material tolerance to climate change through analysis of performance using REINFFORCE arboreta network climate gradient

António Correia¹, Christophe Orazio², Margarida Tomé¹, Manuela Branco¹ and Maria Helena Almeida¹

¹Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda 1349-017 Lisboa, Portugal

²European Forest Institute, Atlantic Region, France

One of the foremost concerns about forest adaptation to climate change is the selection of material resilient/ capable of adapting to future climate. The current available information, originated from models that do not account for species/provenance plasticity, nor for behavior at more extreme conditions, only observable outside current species distribution, beyond the marginal growth areas, adds uncertainty to selection procedures.

Can we identify from the presently used species and provenances those more tolerant to climate change, capable of providing better performance when subjected to future climate conditions, or provide alternative to replace the more susceptible material?

In order to address these questions about plant response to Climate Change conditions, REINFFORCE arboreta network (38 arboreta, located along a wide range of climatic conditions, from latitude 37° to 58° N) proposed to improve our understanding on 35 forest species' field performance, Through a common monitoring protocol and a database that brings together all the data. This will allow reducing the uncertainty of species behavior predictions in response to Climate Change, assessing adaptation measures for Atlantic forest resources and contributing for a successful REINFFORCE arboreta network first data analysis revealed that Site climate and Climate transfer difference have different impact on early plant development. Site Annual and Growing Season Dryness Index ($V(\text{Growing degree-days}) / \text{Precipitation}$) showed to be significant for Yearly Height growth explanation. For survival explanation, only climate transfer distance variables for Annual and Growing Season Dryness Index, Growing Season Precipitation, Mean Maximum and Minimum Temperature were significant.

Within the studied climate gradient, we have identified species response trends, and from the 38 species, the best and worst performing ones. *Quercus suber*, *Cupressus sempervirens*, *Quercus petraea* and *Pinus taeda* seem to be more tolerant to climate variation for survival, while for growth, *Quercus shumardii*, *Quercus suber*, *Pinus pinea* and *Pinus pinaster* revealed to be more tolerant.

Biography

António Henrique Correia holds a master's degree in Forestry, by the Agronomy Institute, University of Lisbon, Portugal, and currently, is a Ph.D. student, by the Forest Research Center, of the same institution. Interests and previous work center on Forest regeneration material, seedling production improvement, and modeling forest material suitability. He has integrated the REINFFORCE project team, during the design and the installation phase, and is conducting analysis on the network's data, in order to improve knowledge on 33 species behavior along this infrastructure's climate gradient, predicting responses under climate change scenarios.

Extreme weather events, Population Vulnerability, and Impaired Health: Need for Community Specific Adaptation Strategies

Amir Sapkota, PhD. Associate Professor

University of Maryland School of Public Health, College Park, MD, USA

An increasing body of literature suggests that extreme weather events are increasing in frequency, duration as well as intensity, and this trend is projected to continue in the foreseeable future in response to changing climate. This presentation will highlight how extreme weather events are impacting both the chronic and infectious disease burden in the Northeast United States, with a particular emphasis on population vulnerability. Specific research needs that will not only advance scientific knowledge but also lead to increased community resilience at local and regional levels will be discussed.

Biography

Dr. Amir Sapkota is an Associate Professor of Environmental Health at the University Of Maryland School Of Public Health (UMD-SPH), College Park, MD USA. He also serves as the Director of the Exposome Small Molecule Core facility within UMD-SPH. He received his PhD from The Johns Hopkins Bloomberg School of Public Health, and Post-Doctoral training from the International Agency for Research on Cancer (IARC), Lyon, France. His expertise is in the area of Exposure Assessment and Environmental Epidemiology. His research has two primary focus areas: 1) Impact of climate change on human health, and 2) Exposure to combustion related air pollution and cardiopulmonary diseases. He played a key role in developing the Climate and Health Profile Report for the State of Maryland, which has been instrumental in informing adaptation strategies to protect public Health. Most recently, he spent six months in Nepal as the Senior Fulbright Fellow. He has authored numerous manuscripts on issues related to climate change, extreme weather events and human health which are available at: <https://www.ncbi.nlm.nih.gov/myncbi/browse/collection/51873157/?sort=date&direction=descending>

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Accounting for air quality in climate change mitigation

Shiliang Wu, Pei Hou, and Mingrui Li

Michigan Technological University, Houghton, MI, USA

Climate change and air pollution are two significant challenges we are facing today. Many climate mitigation efforts such as the reductions in anthropogenic emission have the co-benefits of reducing air pollution. But some mitigation efforts, if not done right, could have unexpected impacts on air quality. Certain tree species can emit large amounts of volatile organic compounds (VOCs) that have important implications for ozone and aerosol air quality. However, this factor has never been accounted for in afforestation and reforestation activities around the world. This implies that afforestation and reforestation efforts aiming to improve the environment (through carbon sequestration and climate mitigation, erosion control, etc.) could have unexpected, negative impacts on air quality if the wrong tree species are planted in the wrong locations. We demonstrate a technical solution to help incorporating the considerations for air quality in afforestation and reforestation activities and thus maximize the benefits from afforestation and reforestation efforts.

Biography

Hongxin Zhu has completed his Ph.D from Medical School in Fudan University and postdoctoral studies in UT Southwestern Medical Center at Dallas. Currently Dr. Zhu is an associate professor in Bio-X Institutes, Shanghai Jiao Tong University. He has been serving as an associate editor for Journal of Advances in Cardiology Research and editorial board member of International Journal of Clinical Therapeutics and Diagnosis, Journal of Biochemical and Pharmacological Research, genetics and genetic disorders, and Journal of Cardiology and Cardiovascular Medicine. He is a guest editor for the Journal of Medical Imaging and Health Informatics.

Finnish ninth graders' views on climate change

Mikaela Hermans and Johan Korhonen

Faculty of Education and Welfare Studies, Åbo Akademi University, Vaasa, Finland

Both educational researchers and policymakers have highlighted education as an important strategy in climate change mitigation. For the development of climate change education (CCE), insight into the views of students who have completed all the CCE requirements of compulsory school is essential. In addition, those students, i.e. ninth graders, represent a generation of societal actors and decision-makers at a time when drastic mitigation has to be realized, and, thereby, their views have implications for the prospects of achieving climate targets. The aim of the study is to enhance the understanding of Finnish ninth graders' views on the background to, consequences of, and mitigation of climate change. Students (N = 549) from eleven secondary schools participated in the study. For data collection, a questionnaire with Likert-type items and open questions was used. The quantitative data were analyzed with descriptive statistics, factor analysis, and inferential analyses. The qualitative data were analyzed with inductive content analysis. The results show that there is a gap between, on the one hand, the ninth graders' understanding of the background to climate change and, on the other hand, the scientific perspective. Egocentric thinking in relation to the consequences of climate change is common among the students. The students experience climate change as an overall risk. Although these students find climate change mitigation relevant, there is room for improvement in terms of their own willingness to act. Interest in environmental issues, perceived relevance of mitigation, and views on the design and contents of CCE are identified as important positive predictors of students' willingness to act. In conclusion, the study shows that CCE in Finnish schools needs to be further developed in order to reach its full potential as a climate change mitigation strategy. The study serves as guidance on focus issues in CCE.

Biography

Dr. Mikaela Hermans is a university teacher in the didactics of biology and geography and environmental education at the Faculty of Education and Welfare Studies at Åbo Akademi University in Finland. Her research focuses on climate change education, and in her dissertation, she examined ninth graders' and geography teachers' views on climate change and climate change education. She has experience of working as a teacher in biology, geography, and health education at secondary school. She earned both her doctorate and Master of Science degree at Åbo Akademi University.

Dr. Johan Korhonen is a university teacher in special education and quantitative research methods at the Faculty of Education and Welfare Studies at Åbo Akademi University in Finland. His research focuses on student learning and well-being, mathematical learning difficulties, and math anxiety. He earned both his doctorate and Master of Education degree at Åbo Akademi University.

Integrating climate mitigation and adaptation into coastal urban land use planning in time

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Cities play a significant role in climate change mitigation and adaptation. Urban land planning shapes the urban form and is considered to be an effective approach for climate mitigation and adaptation. Yet there is little knowledge about what urban form should be planned to reduce both greenhouse gas emissions (GHGs) and climate impacts while considering trade-offs between them. Here we investigate the role of urban land use in both climate mitigation and adaptation. In particular, we quantitatively assess the competition between strategies for mitigation and adaptation and identify corresponding win-win solutions in land use responses. Using a coastal city as a case study, we find that if land use strategies for mitigation or adaptation are considered in isolation they can adversely affect each other, i.e. reductions in GHGs could adversely affect climate impacts or vice versa. This could in turn potentially compromise international efforts to meet the Climate Action in the Sustainable Development Goals (SDGs). Properly integrated mitigation and adaptation strategies or climate-change-sensitive land use planning however, can lead to win-win outcomes and eventually achieve co-benefits. Having said that, any co-benefits will gradually diminish if there is a delay in climate change sensitive land use planning. The diminishing co-benefits can be increasingly exacerbated by growing GHGs and intensified climate impacts. Our analysis indicates that integrating climate mitigation and adaptation in urban land use need to be enacted as soon as possible as the window to act to maximize the co-benefits will rapidly closing if implementation is delayed.

Biography

Dr Lilai Xu is an Assistant Professor of Institute of Urban Environment, Chinese Academy of Sciences. His expertise is on land use and urban planning strategies for climate change mitigation and adaptation in coastal cities. Dr Lilai Xu has been focusing on 1) investigating the impact of land use on urban form, and its consequent effects on greenhouse gas emission and climate risks, e.g. urban heat island, coastal flood induced by storm surge and sea level rise; 2) exploring the trade-off and synergy of land use strategies on climate mitigation and adaptation, and the win-win solutions in land use responses.

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Could Cohesion Policy push EU climate efforts?

Dr. Michal Nekvasil

People in Need, Czech Republic

The central point of this presentation is an evaluation of the extent to which the Cohesion Policy of the European Union contributes to its climate change mitigation effort. While climate change mitigation and the EU Cohesion Policy have been both thoroughly studied theoretically, the novelty of this research lies in an analysis of their mutual relationship. Also, a unique feature of this research is an analysis of the contribution of the Cohesion Policy to climate change mitigation over a period of 20 years, including a comparison of the three last programming periods (2000–2006, 2007–2013 and 2014–2020). The results of this research suggest that, while the beginning of the new millennium saw the Cohesion Policy neglecting the issue of climate change mitigation, the current programming period (2014–2020) placed it among its priorities. This conclusion is supported by a comprehensive set of data on five selected indicators. This presentation will also display the results against the perspective of the overall climate change mitigation objectives of the EU.

Biography

Dr. Michal Nekvasil is a free-lance expert working on climate-change related issues for various organizations – UNDP, World Bank, People in Need (a Czech NGO), Czech Development Agency, HE3DA (private company producing new generation energy accumulators). He has spent 13 working for the European Commission as an EU official – expert at the Directorate General for the Environment in Brussels, Deputy Head of Cooperation at the EU Delegation to Georgia, and Head of Cooperation at the EU Delegation to Nicaragua and Central America. Besides that, he has passed the ‘Environmental Studies’ programme at the Faculty of Humanitarian Studies of the Charles University (Prague, the Czech Republic) and he received his PhD degree in 2016. He published the results of his research, besides others, in the impacted Climate Policy journal.

Planning and designing green storm water infrastructure to address climate change: Lessons learned from Philadelphia, USA

Mahbubur Meenar

Department of Geography, Planning, and Sustainability, Rowan University, USA

Green storm water infrastructure (GSI) can help global cities—which are becoming drier, wetter, or hotter-become more resilient to climate change. Many urban areas face stormwater management issues due to buried streams or filled-out water bodies and wetlands, excessive impervious surfaces, and poor drainage, causing recurring flooding, sewer overflow, riparian habitat loss, and water quality impairment. GSIs are considered a sustainable alternative to conventionally engineered grey systems, and can capture stormwater allowing for infiltration, evaporation, and plant use. In addition to environmental benefits such as addressing water pollution, flooding, energy use, greenhouse gas emissions, and heat island impacts, GSIs can also offer social and economic benefits. However, GSIs—which are usually designed by professionals following a traditional top-down planning approach—are typically intended to provide only stormwater management benefits. They are usually designed with little or no direct community involvement and do not usually offer educational, recreational, and community-building opportunities for residents. How can we design GSI projects in a way that they become sources of community pride, awareness, and appreciation while serving their primary purposes? This paper starts with a review of the role of GSIs as a local-level response to climate change. Next, it presents brief case studies of four GSI design and planning projects conducted in Philadelphia, USA, in the last three years, applying mixed-methods (e.g., community design, GIS analysis) to highlight multi-functionality of GSI projects: stormwater management, education, and recreation. Based on the outcomes of these projects, this paper proposes a methodological framework for GSI planning and design process in urban areas. Although the projects presented in this paper were conducted in Philadelphia, lessons learned from this process would be relevant and applicable to other similar world cities.

Biography

Dr. Mahbubur Meenar is a faculty member in the Department of Geography, Planning, and Sustainability at Rowan University, NJ, USA. He examines the connection between human and spatial dimensions (e.g., natural and built environments) in developing plans for sustainable and resilient communities, focusing on the nexus of land, water, and food. His research interests also include the use of geo-spatial and other technologies in participatory spatial planning. He is a principal investigator on multiple research grants—funded by the U.S. Environmental Protection Agency and nonprofit organizations—and his work has been published in leading journals in the fields of Urban Planning and Environmental Geography. Dr. Meenar received a PhD in Geography and Urban Studies from Temple University, USA, in 2014. He currently teaches courses on environmental and sustainability planning, GIS, geovisualization, and urban design.

Impact of coastline changes on the groundwater level of coastal wetland

Qiang LIU

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The changes of coastline, resulted from anthropic and natural influences, inevitably altered the groundwater level of coastal wetlands, which can result in the ecological degradation of coastal wetland. In present study, the changes of coastline type were explored according to the historical coastline, and then the influences of different types of coastline (e.g., silt, erosion and dam regions) on the groundwater level of coastal wetland were assessed using the Visual MODFLOW (VMOD) in the Yellow River Delta, China. We also discussed conception framework for the variation of groundwater level in silt, erosion and dam regions. Results showed that: (i) coastline can be divided into three types, which are silt, erosion and dam regions; (ii) the groundwater flow field varied with the changes of coastline in seaside region, while a similar pattern was also found in upper region in the southwest region and riverside of Yellow River, where groundwater level is high; (iii) the groundwater level increased with the expansion of land area influenced by silting processes, while presented slightly decreasing trend in erosion region; and (iv) increasingly, the ground water level of coastal wetland presented substantially decreasing trend in the region protected by dam. The cause for the changes of coastal wetland is that the silting and erosion processes altered the topography, and then altered the hydraulic conductivity, which led to increasing or decreasing groundwater level of wetland. For dam region, decreasing groundwater level was mainly resulted from the blocked hydrological connection between groundwater and sea, which led to reduction of supplement from sea to groundwater. Our findings indicated that clear response mechanism of groundwater level to coastline alteration could help in understanding how coastline influences groundwater in freshwater wetlands and also aid in maintaining the integrity of coastal wetlands.

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Biography

Dr. Qiang Liu is Associate Professor with State Key Laboratory of Water Environment Simulation, School of Environment, Beijing Normal University. He earned a doctor's degree in Environmental Sciences at Graduate University of Chinese Academy of Sciences. Current his research fields are focus on ecohydrology, response of hydrology to climate changes. Dr. Liu's research contributes to assessments of interaction between groundwater and wetland, contributes to assessments of climate change impacts on water resources. He is the member of IAHR (International Association for Hydro-Environment Engineering and Research) and member of the Geographical Society of China. Current joined in research program: State's Key Project of Research and Development Plan, Restoration technique for degraded wetlands using ecological water transfer and ecohydrological regulation (2016-2020), The Major State Basic Research Development Program of China (973 Program): Ecological restoration and compensation for the damaged wetlands induced by reclamation (2013-2017), and the National Science Foundation for Innovative Research Group: water environment, water ecology and integrated management (2012-2017). Dr. Liu has prized by: first prize of Ministry of education by science and technology progress (Integrated assessment models, optimized allocations, and ecological operation technologies of environmental flows for wetlands) in 2012. And he is reviewer for several intentional journals, e.g., *Journal of Hydrology*, *Water Resources Research*, *Hydrological Processes*, *Water Resources Management*, *Ecological Engineering*.

Research on impacts and response of global change with specific landscape geographic units - A study in the Loess Plateau

Mingjian Wei, Junping Wang, Baolin Pan and Xinling Li

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Loess Plateau in China is a special physical geographical landscape region. Many previous studies have shown that climate change at different time scales has regional consistency in this area.

Based on that character, here we present an in-depth and systematic study of 12 high-resolution climatic change sequences during the Holocene in this area. Climatic conditions of the suitable and optimal period are obtained. They can be used as the best analogue of climate warming to deduce the response characteristics of precipitation to global warming in the area (The mean annual precipitation will increase by 100-200mm).

The upper and middle Yellow River Management Committee happened to draw up the check dams project planning of the Loess Plateau region. They had planned to build 163,000 check dams but the plan did not take into account the impact of global warming on dams. Based on the results of our research, the implementation of this plan may have a serious hazard because of global warming. It is proposed that the quality, safety standards and budget of the dams in the "Plan" should be fully adjusted and the number of large and medium-sized backbone dams should be increased, which is of strategic significance to ensure the safety of the middle and lower reaches of the Yellow River.

Our advice, as one of the important reverse suggestions for the construction of check dams, was adopted by the government. The government canceled such a grand construction and avoided the potential and huge ecological disaster in the Loess Plateau region.

The reason why such a response can be successful is due to the inherent laws of physical geography in Loess Plateau. On the different time scales of climate change, the Loess plateau region is as a whole and has a unified direction of change. Accordingly, we believe that other similar regions on the earth should be the key areas for impacts and response studies to global change.

Biography

Wei Mingjian, Professor, Ph. D. tutor at Capital Normal University, has tackled research on climate change. In view of the complexity of climate change such as multi-factor interaction, feedback, extraction of climate information, regional difference and response to climate change, the research is focused on extraction and restoration of high-resolution climate information and the establishment of spatio-temporal variation sequence of dust source by loess or fluvial deposit; which is beneficial to discuss the evolution law of climate and environment in the past, explore the trend of environmental evolution in the future, predict the direction and extent of environmental change in China.

Enhancing Intersectoral action for promoting resilience to climate change and disaster risk reduction: An Indian perspective

Dr. K. Sekar

Professor of Psychiatric Social Work, NIMHANS, Bengaluru, India

Climate change in India has led to the occurrence of many disasters. India witnessed major changes in disaster management in the past twenty years, following the 1999 Orissa Super-cyclone, 2001 Gujarat Earthquake, 2004 Indian Ocean Tsunami, 2005 Kashmir Earthquake, 2014 Hudhud Cyclone.

Government of India and other International NGO's had earlier responded to post disaster management rescue, relief, and rehabilitation measures up to the turn of the century. The efforts gradually changed to preparedness and risk reduction. The National Guidelines for Psychosocial Support and Mental Health Services in Disaster 2009 by National Disaster Management Authority (NDMA) of India is a landmark development. Despite the significant strides in psychosocial support, there is a large gap that exists in terms of professionals, infrastructure and service delivery. International and National guidelines and standards, and specifically NDMA's Guidelines, accentuates the relevance of community-level Psychosocial Support. Intersectoral approach is the solution to deal with disasters, risk and building resilience.

In 2016, India became the first country ever to have its National Disaster Management Plan, a document based on the Sendai Framework for Disaster Risk Reduction. NIMHANS along with USAID and UNDP aims to build capacity for community-based psychosocial support strategies at different level towards enhancing institutional and community resilience to disasters and climate change. This partnership has led implementation of the programme in five States and six cities across the country with a population of 68, 20,310. The professionals from government, non-government and varied Institutions in the states are collaborating to work towards disaster risk reduction. Capacity building is being provided by NIMHANS on building resilience in the community. Enhancing Intersectoral coordination shall lead towards building resilient communities.

Biography

Dr. Kasi Sekar is a Professor of Psychiatric Social Work and currently the Registrar of National Institute of Mental Health and Neuro Sciences, (NIMHANS), Bengaluru, India. He has worked in most of the major disasters in India and South East Asian countries in the last three decades. He has developed a normalizing paradigm of psychosocial intervention for survivors of disaster which is solution focused using spectrum of care. Currently he is engaged in development of human resources for psychosocial support for disaster survivors at National level in collaboration with the Directorate of Emergency Medical Relief, Ministry of Health and Family Welfare, Government of India. In collaboration with the USAID and UNDP he is also involved in "Enhancing institutional and community resilience to disasters and climate change" in six cities across the country covering a population 68,20,310 and varied Governmental and Non-Governmental sectors. He is a core group member of the National Disaster Management Authority on the National Guidelines on Psychosocial Support and Mental Health Services in Disaster Management.

Game-changing, Eco-friendly and Sustainable Production of Renewable Liquid Fuels and Chemicals from CO₂ and Water

M. Herskowitz¹, T. Hos¹, A.P. Kulkarni² and S. Giddey²

¹Blechner Center, Ben-Gurion University of the Negev, Israel

²CSIRO Energy, Australia

CSIRO Energy and the Blechner Center have teamed to develop a new technology – the use of renewable energy to convert CO₂ into high-value fungible liquid fuels (gasoline, jet fuel and diesel). This novel, potentially game-changing technology can support large-scale (MW-scale) renewable energy storage, suitable for solar, wind or tidal power generation systems, while replacing petroleum-derived transportation fuels and chemicals. This technology can also be integrated with existing power grid to utilize excess grid electricity efficiently enabling power to liquid fuel conversion and storage.

CSIRO researchers have developed a novel solid oxide electrolyser and process based on an oxygen ion (O²⁻) conducting ceramic membrane layered between two ceramic composite electrodes to split electrochemically a mixture of CO₂ and steam supplied to the cathode (negative electrode) to form syngas. CSIRO is also developing concepts for integrating concentrated solar PV and thermal energy source with solid oxide electrolyser. Blechner Center researchers have invented and patented catalysts that are integrated in proprietary catalytic processes. Extensive tests conducted in bench and mini-pilot fixed-bed reactors demonstrated high activity (>80% syngas conversion at >1.0 kg syngas/ h/kg catalyst), selectivity (>80wt%C₅+ hydrocarbons) and stability (> 4000 h on stream) of the catalysts. This work has led to the design of a plant to feed 20,000 Nm³/h (LHV=70 MW) syngas yielding 3,300L/h (500 barrels per day) of liquid fuels (55% gasoline and 45% diesel range). The pure oxygen available from the syngas generation process can be integrated in this process to further improve overall efficiency.

Techno-economic analyses indicate that up to 8 tons/h CO₂ can be converted in 70 MW plants, generating 500 barrels/day of liquid fuels ready for use in vehicles. The projected cost of fuel-grade products (ready for use and transportation) using this technology is about 0.9 \$/liter with electrical power input cost of 5 c/kWh

Biography

Professor Moti Herskowitz is the Director of the Blechner Center of Industrial Catalysis and Process Development and the incumbent of Israel Cohen Chair in Chemical Engineering at Ben-Gurion University of the Negev. His research focuses in the fields of advanced materials, heterogeneous catalysis, and reaction engineering and cleantech and renewable fuels. He served, among other positions, as Vice-President for R&D at the Ben-Gurion University from 2003 to 2014. Moti established the Blechner Center for Industrial Catalysis and Process Development in 1995 and has led scientific programs and technology development work ever since. Applications developed at the Blechner Center have been commercialized. Moti has published over 145 papers and 26 patents based on basic and applied research. Many publications are related to advanced catalytic materials and processes in general and their application in the production of novel renewable and sustainable fuels and chemicals in particular.

Community micro hydropower generation: A sustainable model for climate change mitigation and adaptation

Alberto Sánchez and Michela Izzo

GEF Small Grants Programme, Dominican Republic

Since 1998, when the first micro hydropower system was established in the Dominican Republic, community micro hydropower generation has turned into a model of sustainable development at a local level. Through an innovative mechanism of cooperation established with the Dominican NGO Guakía Ambiente and the national government, the GEF Small Grants Programme has been implementing these initiatives as a sustainable solution to electric service access, with a focus on rural isolated areas.

Making the most of suitable topographic and climatic conditions, a synergy was established among numerous stakeholders that now constitute a network around renewable energy initiatives, focusing on community empowerment. 47 systems are in operation, with over 1.3 MW installed and approximately 4500 clients and 20000 people directly benefited.

Among the many key factors for the success of these actions, there is the engagement of people, who have demonstrated to willingly serve to the purpose in all the phases, providing local knowledge, work labor, as well as in cash contributions for the development of the projects. With this at hand, local organizations become stronger and build capacities to effectively manage their own system, where each household pays for electrical service. A community management structure is constituted to guarantee the good performance of the hydropower plant, based on payment and cost recovery by each user and appropriate maintenance of the system, including parts replacement.

These systems have proved to be very effective to contribute in solving basic needs of vulnerable groups, while contributing to climate change mitigation and adaptation, as well as environment protection. Through these actions of energy production from renewable sources and forest cover restoration more than 25000 tons of CO₂ are avoided and/or absorbed each year. The model has great potential to be scaled up through South-South cooperation. This experience has encouraged Haitian communities and institutions to start similar processes in their country. Other Latin-American countries showed interest in knowing about the innovative model implemented.

These initiatives impact local populations significantly through: access to technology, better communication, cleaner environments, and more time for other activities. Furthermore, after the project, each family saves between 100 and 300 USD/year and have access to 4-9 times more electricity.

So far, other eight systems are being built and we are working at strengthening the national network that is giving support to these initiatives, focusing on reducing the vulnerability of each system. Among the actions taken there is the establishment of an insurance that cover the cost of possible damages, especially linked to cyclones and extreme events, improving climate change adaptation and resilience of

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these systems.

Biography

Ing. Alberto Sánchez is the National Coordinator of the GEF Small Grants Programme in the Dominican Republic. MSc. Degree in Tropical Forest Management, he is a specialist in rural electrification through renewable energy sources. Furthermore, he is a facilitator for local development, as well as a specialist in biodiversity conservation, land restoration and climate change adaptation.

Dr. Michela Izzo, executive director of Guakía Ambiente, is a specialist in environment. In 2011 she obtained a PhD in Land and Environment, developing a thesis on “Analysis of climate and its dynamics in the Dominican Republic and influences on land”. Since 2006, she has been collaborating with the GEF Small Grants Programme as a specialist in rural electrification through renewable energy sources, accompanying processes of local development under a community participatory scheme. She is competent in vulnerability studies, having worked in team and individually at analysis of land vulnerability to climate change and dynamics. She collaborates with different academic institutions of different countries on themes related to scientific research on land and climate.

The global activity of category 5 tropical cyclones

Karl Hoarau¹, Johnny Chan², Mark Lander³, Chip Guard⁴ and Roger Edson⁴

¹Cergy-Pontoise University, France

²City University of Hong Kong, China

³University of Guam, USA

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In the current debate on climate warming and the worldwide changes in the number of tropical cyclones, studies have highlighted an increase of the frequency of category 4 and 5 hurricanes in the six ocean basins. Other studies have shown that the intensity of the strongest cyclones has gradually increased in recent decades. However, an important issue was the quality of existing database. This database brings together data from all of the regional specialized meteorological centres and the tropical cyclone warning centres in the various ocean basins. These data were combined in the International Best Track Archives for Climate Stewardship (IBTrACS). Reanalyses of category 4 and 5 cyclones in the southern Pacific Ocean and in the north-western Australia area showed that their intensity was underestimated, especially in the 1980s. Did this problem concern most of the world's ocean basins? Were data of the best quality after the 1980s? Is there already a trend in the number of the more intense cyclones? To try to answer these questions, we made a study on the global category 5 cyclones (maximum sustained wind at least of 70 m s^{-1} over 1 minute) since recent model projections indicated that the number of the very intense cyclones (at least 65 m s^{-1} wind) would increase strongly worldwide in the late twenty first century. We reanalysed the cyclones intensity from the satellite pictures with the Dvorak's technique. Due to the lack of images of several basins in the satellite database, it was not possible to reanalyse the intensity of cyclones before 1980. Therefore, this research covers the period 1980-2017 (38 years). The aim of this research is to determine the global number of very intense tropical cyclones of category 5 and not to create a best track data. The results of the reanalysis are compared to those existing in the IBTrACS database. The category 5 cyclone activity is highlighted at the interannual and at the decadal scale to study the role of multidecadal and interannual variations (PDO, El Niño, La Niña).

Biography

Karl Hoarau was born in Reunion Island where he experienced several tropical cyclones until he left the island to go to Paris for studies at the university. In 1994, he has successfully defended a doctoral thesis at Paris – La Sorbonne University on "A climatology of the tropical cyclones in the south-west Indian Ocean". Then, he travelled to the Philippines (1996 and 1998) and in Australia (1998) to study the cyclonic risks. Currently, he is a teacher in climatology and a researcher at the Cergy-Pontoise University (near Paris). His recent research concerns the strongest tropical cyclones on Earth.

Controls and variability of greenhouse gas production and emissions from thawing permafrost

Bo Elberling

Center for Permafrost (CENPERM), Department of Geosciences and Natural Resource Management, University of Copenhagen, Øster Voldgade 10, DK-1350 Copenhagen, Denmark

Climate change in the Arctic is leading to accelerated thawing of permafrost and the mobilization of soil organic matter that have accumulated over thousands of years. A recent focus has been on the release to the atmosphere in the form of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Incubation experiments are widely used to quantify and discuss the importance of single factors and variability on subsurface CO₂, CH₄ and N₂O production and consumption. Combining results from incubation experiments and field measurements have provided new insight on the environmental controls of the production of mainly CO₂ and CH₄ associated with thawing permafrost. Here, the understanding of both short and long term controls on the production of these gasses is discussed including: differentiating between short and long term effects and trends, feedback mechanisms linked to heat production and changes in the availability of water and nutrients and stable land surfaces undergoing slow and steady thawing/warming as compared to rapid changes linked to erosion as observed in e.g. permafrost thaw ponds, coastal erosion and warming experiments.

Results presented highlight the importance of moisture and future water balance on the net gas emissions in areas with thawing permafrost. Secondly, the problems using short term incubation results when projecting long term effects of permafrost thawing. Finally, the results highlight the links between carbon (C) and nitrogen (N) cycling, as N is being released from thawing permafrost in bioavailable forms, which are shown to be taken up by plants and leading to enhanced plant growth and fixation of atmospheric CO₂ during the growing season.

Biography

Professor Bo Elberling is the director of Centre for Permafrost (CENPERM) at University of Copenhagen, a Centre of Excellence under the Danish Research Foundation. His research interests include biogeochemistry, soil sciences and environmental impact with a focus on the controls and environmental impacts resulting from oxidation processes in soils. These processes including sulphide oxidation in relation to mining, chemical fluxes in frozen soils, heavy metal mobilization and decomposition of organic matter in natural and managed ecosystems. Currently, he is interested in the consequences of permafrost thawing and possible feedbacks to the climate system. Research is based on field measurements, laboratory experiments and modelling. Bo Elberling has participated in more than 20 longer expeditions to different parts of the Arctic and Antarctica. He has a Master of Science degree in geology at Aarhus University (Denmark), and a Ph.D. in environmental biogeochemistry from University of Waterloo (Canada) and Aarhus University.

Grounding resilience and sustainability through building codes

América Bendito

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Given the inherent interconnectedness of global risk challenges, it is clear that sectoral approaches, although important, can only have limited effectiveness. Urban migration and concentration, climate change, and high levels of inequity are major global risk challenges particularly affecting the poorest communities. There is increasing consensus that a transdisciplinary approach is required to unify efforts to cross multiple disciplinary boundaries, to foster engagement of scientific and non-scientific sources or practices, and to encourage the use of methodological tools that facilitate collective learning from different disciplines indispensable to generate holistic understanding of socio-ecological processes. Sustainable development is unlikely without reducing risk, and risk reduction would be limited without a transdisciplinary approach. Effective risk management requires a focus on building codes that should integrate among other features hazard maps developed for different events (e.g. multi-hazard maps) as well as for different lifetimes of a structure. It is important that buildings not only protect the lives of the occupants, but also protects the building structure, architectural components and facades, mechanical/electrical/plumbing equipments after a hazard occurs. Building codes can help to develop effective risk maps (that includes multi-hazard and vulnerability data) as useful boundary objects to communicate risk to society and improve the coordination of response measures.

Biography

América Bendito is a civil engineer with MSc and PhD in Structural Engineering. After more than 20 years working as a university professor, researcher, and now as an independent consultant for different UN organizations, she believes that Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) should be strategically combined during the planning of future development efforts in rural, peri-urban and urban contexts. She is the sole author of a book entitled "Introduction to the Behavior and the Design of Steel Structures with Load and Resistance Factor Design (LRFD)" with the second edition under preparation, has published extensively and has been serving as reviewer and editorial board member in international peer reviewed journals.

Sustainability of climate change incentive market based mechanisms (IMBMs) in the livelihoods of rural communities

Elinorata Mbuya and Deusdedit Kibassa

Ardhi University, Dares Salaam, Tanzania

Rural areas in developing countries are disadvantaged from climate change due to their inability to adapt to the impacts, coupled with poverty. In order to reverse the situation, initiatives for adaptation and mitigation are employed, including reducing emissions from deforestation and forest degradation (REDD) and climate change incentives market based mechanisms (CC-IMBMs). In Tanzania, these innovative finance mechanisms projects have been extensively implemented, aimed to reduce greenhouse gas emissions from deforestation and forest degradation through provision of equitable incentives for communities to conserve forests sustainably. Nevertheless, the impacts of the initiatives on community livelihoods have not been documented. Additionally, most implemented projects are active during operationalisation but they cease to function soon after projects' phasing out, making sustainability an issue of concern. This paper presents how IMBMs have impacted livelihoods of forest village communities and challenges that affect exit plans and sustainability. A case study research strategy was employed with data and information on socioeconomic conditions, involvement processes and role played by initiatives' implementing agency collected through focus group discussion, interviews and household questionnaires. Two cases were purposely sampled: Mufindi district where carbon selling is implemented by privately owned company; and Milola district where REDD project is implemented by Non-Governmental Organisation. Despite accruing some benefits, critical issues found to limit efficacy and sustainability include limitations in scheme sensitisation that compromised project acceptance; disagreement over forgone benefits including food insecurity; questionable agreements between carbon market investors and villagers; and, forests' border conflicts between villages, which significantly halted sustainability. For sustainability, contractual provisions and critical risk analysis of interventions should precede land acquisitions for forest plantations; clearly stipulated roles of local government in supervision of carbon marketing and benefits sharing; certifications, global carbon markets operations and income verification mechanisms should be known to the villagers to avoid conflicts.

Biography

Elinorata Mbuya completed her PhD in climate change and the built environment analysis. She is a research fellow at the Institute of Human Settlements Studies of Ardhi University, carrying out research, consultancies in various areas of related to human settlements development, and teaches both undergraduate and postgraduate students. She has carried a number of technical assignments including feasibility studies and planning for projects. Dr. Mbuya has carried extensive research in areas of building construction and the built environment, climate change and disaster risk management in urban areas and in Arid and Semi-Arid regions.

Development of composite briquettes from Agricultural wastes

Michael Lubwama, Frank Muhairwe and Vianney Andrew Yiga

Department of Mechanical Energy, Makerere University Kampala. Africa Center of Excellence in Materials, Product Development and Nanotechnology, Uganda

Charcoal, in urban areas, and firewood, in rural areas are the primary sources of domestic cooking fuel in Uganda and most other sub-Saharan countries. Composite briquettes make use of agricultural wastes in the development of a sustainable cooking fuel. Composite briquettes were developed after carbonization of coffee husks, rice husks and groundnut shells. Cassava starch in ratios varying from 10% to 40% was used as binder in different combinations with bio-char from the waste materials. Four categories of composite briquettes were developed including rice and coffee husk briquettes, rice and groundnut shell briquettes, groundnut shell and coffee husk briquettes and a composite comprising all three agricultural wastes in combination. Thermogravimetric analysis and bomb calorimetry determined the physical properties and calorific values respectively, of the raw materials as well as the developed briquettes. Drop tests and particle density determinations were performed to study the mechanical strength and integrity of the developed briquettes. Thermal properties were determined as using a water boiling test and observing the flame temperature during and after combustion. Using an infrared thermometer, the temperature of the briquettes during the water boiling test was recorded at 1 minute intervals. Calorific values for the developed briquettes ranged between 16 MJ/kg and 22MJ/kg. Drop strengths were all above 86%. Composite briquettes developed using coffee husks and rice husks bio-chars took less time to boil compared to all the other composite briquette combinations. Maximum attainable temperatures of the briquettes ranged between 250°C and 820°C. Particle densities ranged between 430 kg/m³ and 580 kg/m³. The results indicated that composite briquettes are suitable replacements of charcoal and firewood as domestic cooking fuel sources. All of the developed briquettes had satisfactory characteristics in terms of drop strengths and particle densities regardless of the type of bio-char combination and binder amount.

Biography

Dr. Michael Lubwama is the Deputy Center Leader of the Africa Center of Excellence of Materials, Product Development and Nanotechnology. He is a Lecturer in the Department of Mechanical Engineering at Makerere University. He received his PhD in Mechanical Engineering in 2013 from Dublin City University, Ireland.

Mechanisms and Applications of Green Infrastructure Practices for Storm Water Control and Pollutant Removal: A Review

Chunhui Li and Cong Peng

Key Laboratory for Water and Sediment Sciences of the Ministry of Education, School of Environment, Beijing Normal University, Beijing 100875, China

Green infrastructure (GI), an innovative storm water management approach that mitigates the impacts caused by urbanization and climate change, was first implemented in the early 1990s. Numerous research results have proved the significant environmental benefits of GI compared with conventional gray infrastructures. GI has been gradually accepted and used worldwide. This review mainly focuses on the hydrological aspect of GI and provides a summary of the knowledge about GI as a storm water management alternative. In this review, we outline the operating mechanisms of a few widely-used GIs from two aspects: water quantity and quality. We describe policies for promoting GI implementation in some countries, including the sponge city in China and water sensitive urban design (WSUD) in Australia, and review the effectiveness of GI on treating storm water quantity and quality in real world applications. In addition, we also used Bibliometrics to analyze the GI research trends and found GI has been popular in an increasing number of countries and regions. However, many barriers impede the further development of GI, and strategies to overcome these barriers are also summarized. This review gathers knowledge from many sources to provide an overview of GI to better understand its mechanisms and applications, and to highlight the areas that require future study.

Biography

Li Chunhui, professor, School of environment, Beijing Normal University, doctoral supervisor, major researches include water resources assessment and management, agricultural water saving and integrated watershed management, etc.. In recent years, he hosted and participated in more than 40 research projects, and published more than 140 journal articles and conference papers, more than 40 journal paper published in SCI journals.

Climate Change, Food Insecurity and Emergency Response Revisited

Prahlad Kasturi

Radford University Radford, Virginia, USA

Economists are fond of drawing out linkages in the chain of causes and effects. This paper links climate change with greater food insecurity and lower economic growth. It points out that while the whole world may experience lower agriculture production due to climate change; those who suffer the most from lower crop yields live mainly in developing countries, many of which are geographically more susceptible than developed countries to the negative effects of climate change. The paper argues that food security can be enhanced through strategies of mitigation and adaptation.

Various mitigation and adaptation strategies are discussed to illustrate how multilateral organizations are increasing world-wide awareness of the problem of food insecurity and marshalling resources to address food insecurity in the developing world from both a short-term perspective (emergency response) and a long-term perspective. These efforts include financial assistance; food assistance; innovative approaches to crop insurance; investment in global agriculture knowledge, science and technology; and various policy discussions to reduce greenhouse gases, develop biofuel energy, liberalize trade, and build human capacity. Ironically one attempt at mitigation, reducing the amount of greenhouse gas emissions from carbon fuels by producing more biofuel, appears to reduce food security by raising the world price of grain. Because many strategies to solve problems can also create new problems a multi-pronged approach to food insecurity needed. To implement such an approach requires stepped up coordination and negotiation to make sure that intended effects are achieved while minimizing the harm of unintended effects.

Biography

Dr. Abdullah Darzi-Naftchali is currently assistant Professor at the Sari Agricultural Sciences and Natural Resources University, Sari, IRAN. He is interested in the areas of Irrigation and drainage, Climate change, Environmental Impact Assessment of Irrigation and Drainage projects.

Characteristic profile of forest fire risk from social perception: A study with Spanish population

Jaime Senabre^{1, 2}

¹Director of SINIF.

²Research Group on Climate and Territorial Planning. University of Alicante. Spain.

Forest fires represent an evolutionary opportunity for some species and, at times, a tragedy for human societies. The devastating fires of 2017 in Portugal and 2018 in Greece are a clear example of this. Forest fires have been considered by many researchers as a Natural Hazard or Risk, something that makes us disagree, given that the human being has a predominant influence on the origin of most ignitions and, in the evolution and consequences thereof.

From an anthropogenic vision of the fires, we are convinced that not only must we work on prevention, self-protection and integral management of the territory, but also on proactive fire education programs.

For this reason, we present a characteristic profile of forest fire risk, developed from the study of the social perception of this threat with a population resident in Spain. There is no doubt that there are many factors that can affect the social perception of risks: cultural, sociological, situational, psychological, psychosocial and those related to the qualitative characteristics of the source of risk. All these factors are interrelated.

The evaluation of the qualitative characteristics of forest fire risk based on the study of social perception, will allow us to better understand the reasons for not acting proactively in the face of the threat of forest fire. Also, it can be useful when designing campaigns to raise awareness and prevent forest fires, in short, as a tool for education on environmental safety issues.

Biography

Psychologist and Environmental Consultant. He did doctoral studies in the Department of Personality, Evaluation and Psychological Treatment of the UNED. Chief of Brigade in a Forest Fire Service with more than 20 years of experience. He collaborates with several companies and institutions in the area of training in Psychology in Emergencies and Human Resources. He is Professor at the University of Valencia in the Master in "Intervention and Operational Coordination in Emergencies and Catastrophes" and other postgraduate courses on emergencies. Director and President of the International Scientific-Professional Committee of the National Symposium on Forest Fires (SINIF). He has lectured internationally and has been part of the Organizing Committee of several International Congresses on Earth Sciences and Climate Change. He is part of the Editorial Board of several international scientific journals. He has published articles on forest fires, risk perception, stress, psychosocial risks and emotional trauma, mainly in relation to emergency services and natural disasters. Currently, he is assigned to the Research Group on "Climate and Territorial Planning" (University of Alicante), where he researches on the social perception of forest fire risk and behavior in the event of possible disasters.

Notes:

Day-2

Keynote Session

WC Climate Change 2018: Impacts & Responses

September 13-15, 2018 | Rome, Italy



Cordia Chu and Elena Schak

Centre for Environment and Population Health, Griffith University, Australia

"Dealing with Disasters": Using film to show how the health, climate change and disaster sectors can collaborate for effective disaster response

Although Scientific evidence demonstrates that climate change is intensifying and increasing the severity of various climate-sensitive extreme events and their associated health risks. To deal with these challenges, a growing body of literature stresses the need for the health sector to link disaster risk reduction (DRR) and climate change adaptation (CCA) in order to bring coherent synergies, and maximize complementary strengths and resources for disaster response effectiveness and efficiency. However, despite growing recognition by global communities of the necessity of such links, it is difficult to understand how these links can occur in real-world contexts. Meanwhile, funding bodies are increasingly calling for this complex scientific knowledge to not only be communicated in understandable, user-friendly ways for decision-makers, but also for it to be translated into policies and practices that meet users' needs.

This presentation suggests that one method of meeting these aims is through story-telling in film. Film can not only demonstrate, but also advocate the 'why', 'what', and 'how' of linking disaster risk reduction and climate change adaptation in health. In particular, this presentation uses a film developed by the Centre for Environment and Population Health at Griffith University in Australia. The film, "Dealing with Disaster: the Silent Achievers in Public Health", tells the story of how public health dealt with a series of cascading disasters in 2010-2011 in Queensland, Australia, or what is known by locals as the "Summer of Sorrow". This presentation argues that by seeing the human story of real people in real crises, decision-makers can better understand the value of combining the knowledge and efforts of the health, climate change and disaster sectors when dealing with disasters.

Biography

Professor Chu is the director of the Centre for Environment and Population Health, Griffith University. Her key areas of research expertise are global health, eco-friendly healthy settings; reproductive health; health promotion and integrated health planning; workplace health promotion and safety management; community needs assessment and policy development. She is committed to translational research and capacity-building, particularly in linking environment, health strategies and sustainable development, and has been active as an international consultant to facilitate the development of healthy cities, hospitals and workplaces in many countries in the Asia-Pacific. Her recent focus is on global health security, climate change adaptation and health. Awarded the Member of the Order of Australia (AM) in 2013, she has published over 180 articles, delivered 55 key note addresses in conferences, graduated 38 PhDs and has won a national commendation for 2018 excellence in research supervision by the Australian Council for Graduate Research.

WC Climate Change 2018: Impacts & Responses

September 13-15, 2018 | Rome, Italy



Graham E. Fogg

*Hydrologic Sciences Graduate Group, Department of
Land, Air and Water Resources, University of
California, Davis, USA*

Deep Integration of Surface Water and Groundwater for Water Security under Climate Change

Availability of good quality water for humans and ecosystems has been problematic in much of the world and will only become more so as the climate changes. Future threats to water security can be mitigated by addressing obvious structural and managerial deficiencies in our current water resources management. For example, although water demands are satisfied by both surface water and groundwater, only the former is routinely managed proactively. In contrast, groundwater is typically treated essentially as an extractive resource in which wells are pumped with little regard for consequences except when they are so obviously negative (e.g., seawater intrusion into coastal aquifers) that pumping must be curtailed. The consequent, widespread overdraft of groundwater has left behind vast volumes of subsurface space for storage of water – volumes that far exceed the world's surface reservoir capacity. Despite the abundance of available subsurface space for water storage in many regions, civilization's typical response to water storage challenges is still to propose construction of additional dams. With future increases in both extreme precipitation and drought, water storage is becoming even more crucial, yet not just the surface storage that can empty during a multi-year drought, but also the much more voluminous subsurface storage. True water security will come only through deep integration of surface water and groundwater in which both these 'reservoirs' are managed jointly and on the decadal timescales that it takes for groundwater systems to be recharged through both natural and engineered recharge processes. In many regions, it appears that the water for this additional recharge and storage can come from high-magnitude flood flows that will likely be more common. These changes are urgently needed now and will also prepare us for how best to secure our water resources under climate change.

Biography

Dr. Fogg is PI of the National Science Foundation IGERT Center for Climate Change, Water, and Society; and Co-PI of the University of California Water Security and Sustainability Research Initiative (UC Water). He received a B.S. in Hydrology from the University of New Hampshire, an M.S. in Hydrology and Water Resources from the University of Arizona, and a Ph.D. in Geology from The University of Texas at Austin. He has more than 40 yrs experience researching and teaching about subsurface water flow and pollutant transport processes and water resource sustainability. He teaches courses at UC Davis in groundwater hydrology, groundwater modeling, applied geostatistics, and water resources.

Notes:

Day-2

Scientific Sessions

The role of uncertainty in our climate understandings.

Peter Domonkos

ESPERE Association, Spain

The equantitative knowledge of our natural environment cannot be absolute precise. Not even for the past and present worlds and even less for the future. The main uncertainty sources of future climate predictions are i) Uncertainty of future human impact on the change of the Earth atmosphere; ii) Uncertainty of future changes in solar and volcanic activity; iii) The complexity of physical-chemical processes influencing climate.

The true uncertainty range is narrower than which appears in media communications. One extreme of the uncertainty range perceived by the public is the negation of human impact on climate change. Mass climate skepticism has moral and political aspects, but first of all it is due to the shortcomings of basic education in natural sciences.

Inactivity in relation to climate change is often reasoned by the scientific uncertainty. This reasoning is perverse, as in preparing against potentially disastrous events, usually the upper tail of the risk uncertainty is considered. It is the case e.g. in the protection of transport security, hygienic care against epidemics, security installations for protecting power stations, etc. On the other hand, such precautions may put big burden on the society, and it is the case also with the desired climate protection and climate adaptation.

As a climate researcher, I work on the quality improvement of observed climatic data with statistical methods, with the exploitation of the hidden spatial redundancy of observational information. The method family is known as time series homogenization in natural sciences. In international efficiency tests, my method "ACMANT" is proved to be one of the best homogenization methods ever constructed. The increased accuracy of the observed climatic data reduces the uncertainty also of the future climate, as during the development of climate models they are tested against observed data.

Biography

Dr. Peter Domonkos is a climate researcher. His doctor theses (1999, Debrecen, Hungary) were about the statistical properties of extreme temperature events. He is expert in statistical climatology, climate change and climate variability, data quality control and time series homogenization. After having finished his PhD, he was a researcher of the Hungarian Meteorological Service. Since 2009 he lives in Spain. Between 2009 and 2015 he was a senior researcher of the Centre of Climate Change at the University Rovira i Virgili. He is secretary of the Environmental Science Published for Everybody Round the Earth (ESPERE) and member of OPACE I and OPACE II of the Commission of Climatology of World Meteorological Organization.

Urban geochemistry–The importance and vulnerability of topsoil layer in urban areas: Case study in the city of Sisak, Croatia

Ajka Šorša¹, Goran Durn² and Josip Halamić¹

¹Croatian Geological Survey, Sachsova 2, Zagreb, Croatia

²University in Zagreb, Faculty of Mining, geology and petroleum engineering, Pierottijeva 6, Zagreb, Croatia

According to the United Nations, in 2018 55 % of the world's population lives in urban areas, and is expected to increase to 68% by 2050. Quantitative boom of the number of city inhabitants increases environmental risks and the risk to the human health in urban areas. Climate change facilitates risks and could disturb sensitive balance between urban environment and people.

Topsoil layer accumulates potentially harmful elements/substances (PHES) in urban areas and can, therefore, be considered a good medium for investigation of potential environmental risks. An urban geochemical study is carried out to determine the concentration and spatial distribution of the PHES in the soil and to assess their risk for the environment and human health.

Anthropogenic inputs significantly change the concentration of PHES in urban soils. There are various ways to gathering and preserving anthropogenic PHES in the soil: long-lasting urban development, even from the antique; among other things, industrial activities, especially uncontrolled industrial development and emission of hazardous elements; along the roads, from waste waters and dumps.

Collected PHES are mainly bound to organic matter, carbonates, clays or Fe and Mn oxyhydroxide. The risk of (re)mobilization of PHES in the environment and potential risk for human health increase with any imbalance in the environment.

The impacts of the climate change by the flooding, fluctuation of the level of underground waters, heavy rainfalls, landslides, heating and drying change the mobility of PHES and can cause their (re)mobilization from polluted to unpolluted areas. The elevated mobility of PHES rises, as well as the availability to people and increases the risk for human health.

Biography

Ajka Šorša, PhD, is Research Associate in the Croatian Geological Survey where her research focuses on the regional and urban geochemical investigation. She participated in the production of the Geochemical Atlas of Croatia and Geochemical Atlas of Sisak. Her dissertation examined content, spatial distribution and sources of potentially toxic elements in the topsoil and pedological profiles in the city of Sisak and its surroundings. The main result of the research was risk assessment to the human health in the Sisak area.

Influence of climate change and socio-economic development on catastrophe insurance: A case study of flood risk scenarios in the Netherlands

Youbaraj Paudel, Wouter Botzen, Jeroen Aerts and Theo Dijkstra

NN Group, Netherlands

Damage from weather-related events is expected to increase in the future due to socio-economic growth that increases exposure to natural disasters and anticipated climate change along with sea-level rise. This paper studies the long-term impacts of climate change and land-use planning on flood risk and, in particular, flood risk insurance in the Netherlands. We estimate the full probability distributions for flood damage under four different projection scenarios of climate change and two scenarios for socio-economic development for the year 2040. Subsequently, based on this information the risk-based (re) insurance premiums for flood risk are estimated for each of the 53 dyke-ring areas in the Netherlands, using a method that takes insurer's risk aversion rate and risk variance also into account. On the basis of the results, we can draw four main lessons. First, extreme climate change with a high sea level rise has a higher impact on flood (re)insurance premiums compared with socio-economic development in the future. Second, (re)insuring large flood losses may become very expensive in the future. Third, a public-private insurance system in which the government acts as a risk-neutral reinsurer of last resort, accompanied by comprehensive adaptation and risk reduction measures, could be a good solution for making flood risk insurance available at an affordable price. Fourth, given the projected increase in flood risk, it is especially important that flood insurance contributes to climate change adaptation.

Biography

Dr. Youbaraj Paudel is currently working as a senior quantitative risk analyst at the NN Group in the Netherlands. Before he began his career in the private sector, he obtained his PhD at the VU University Amsterdam on catastrophe risk modelling, risk management and (re) insurance. In his research he investigated extreme risky events such as floods, earthquakes and terrorism and offered tools, techniques and solutions to quantify and manage them. As a case study, he studied flood risks in the Netherlands under various climate change scenarios and provided with valuable recommendations for tackling the problem. He obtained two Master of Science degrees in Business Analytics and Actuarial Science from the VU University and the University of Amsterdam (UVA) respectively.

Greenhouse Gas Emission Impacts by Waste Management Practices over Last 3 Decades; Korean Case

Yong-Chil Seo, Jang-Soo Lee and Won-Seok Yang

Department of Environmental Engineering, Yonsei University Wonju, R.O.Korea

After the enforcement of Waste Management Law in Korea from 1987, a systematic waste management has been made. Since then major effective policies and strategies by the government were utilized to promote reduction and recycling of waste and to implement appropriate technologies for disposing waste in safe and permanent methods. In recent the waste becomes not a waste being disposed of but resources having values, so management policy is focusing on 'waste to energy' as one of renewable energy resources and the establishment of 'sustainable and recirculating society'. By such practices for last 30 years in South Korea, the recycling rate has increased from under 10 % to 80 %, and the share of landfilling became less than 10 % in overall waste streams. Using the WARM code developed by US EPA, the greenhouse gas emissions by different practices of waste treatment were estimated for 30 years. Due to a significant increase of recycling rate, the reduction of greenhouse gas emission was achieved around 110,000 tons of CO₂, from around 25,500 tons of generation to 85,000 tons of credit. The paper will present such changes in different waste streams by effective waste management efforts for last 30 years.

Biography

Prof. Yong-Chil Seo is Former President of Korea Waste Management Society. As a professor of Yonsei University he is now directing two national programs to support graduate student research and fellowship in the fields of "Waste to Energy and Environmental Engineering". His main research areas are Waste and Biomass to Energy, Waste Recycling and Air Pollution Controls, especially Heavy Metals including Mercury. He has been working as an expert working group member for UNEP to develop the implementation guidance of Minamata Mercury Convention last several years (UNEP Mercury Global Assessment Report 2013 & 2018, UNEP Emission BAT Guideline, Partnership members in Coal Emission and Waste Management).

A Role for Hydro-Economic Models to Inform Measures to Limit Economic Costs of Climate Adaptation

Frank A. Ward

NM State University, USA

Issue: Climate, water, food, and energy policy decisions are made by national governments or regional, national or multilateral organizations, with large impacts on the resource-related sectors, both international and domestic. A hydro-economic model (HEM) is a state-of-the-arts approach to incorporate complex climate-water-energy-food systems knowledge into a systematic form that informs policy design and permits tracking of various elements through a complex system. Yet, despite their considerable potential, HEM's are rarely used to inform policy. Policy decisions are weakened when not based on best current knowledge and on the relations of knowledge elements to each other.

Gaps: One important reason that resource policy decisions are not more evidence-based is that the research community rarely produces HEM's in a usable form to support policy choices even when the evidence on that impact is available. Barriers include difficulty of quickly incorporating new scientific information and challenges of tracing impacts of climate or policy over time and location. Common questions policymakers pose include: economic and physical impacts of water-food-energy infrastructure, water-climate futures, crop water use requirements, population levels, and changes in price-cost relations for water-energy-food services.

Goals and Methods: This talk presents two approaches to overcome barriers between HEMs and their application to policy design, based on the author's recent experience of building HEMs and showing results to stakeholders.

Results: Two methods show promise for communicating results of HEMs.

First, a small number of posted downloadable results tables can be made accessible in stakeholder- chosen formats that carry clear policy implications. It helps if the results tables are backed by a mathematical documentation of models used to produce the results.

Second, user interfaces (front ends) accompanying HEMs are a promising method to allow policymakers and their staffs to access, review, and adjust data used by a HEM without being overwhelmed by minutiae. Interfaces can be posted and accessed by hand-held devices, for which an HEM runs on a background server with no need for specialized software. An example is the interface currently posted for policy analysis of North America's Rio Grande at <https://water.cybershare.utep.edu/> An interface can permit sensitivity analysis (SA) for cases where data are weak, poorly-measured or subject to change. Several examples at this talk are presented from recent policy analyses of the Amu Darya, Nile, Tigris-Euphrates, Jordan, and Rio Grande showing how both anticipated and unexpected results can occur for policy proposals run through an HEM.

Conclusions: Clear results with policy implications and well as user interfaces offer two promising approaches to make HEMs accessible to policymakers, ministry staff, and other stakeholders.

Biography

Dr. Frank Ward is Professor of water economics and policy in the department of Agricultural Economics and Agricultural Business at New Mexico State University. His research and teaching emphasize conservation, valuation, and economically efficient use of water resources in basins that face competition among uses and time periods. Since the late 1990s, Dr. Ward has spearheaded development of innovative basin scale hydro-economic models to inform water, energy, and agricultural policy design. His work integrates hydrologic, agronomic, institutional, and economic linkages to support sustainable river basin management and policy analysis in the face of a climate water-stressed future.

A lifeline and a reason to be: The future of sustainable architecture in Spain and its European context

Ir. Sander Laudy

Universidad Autonoma de Barcelona, Spain

Architecture and construction in Europe have felt, like few other sectors, the consequences of the financial crisis that set in during 2008. This is only a logical result of their enormous dependency on different kinds of resources (financial, material, energetic). The outcome of these events can be interpreted within a general urgency to establish more sustainable patterns of life and this leads us to analyze the shifting paradigms that society applies regarding the appreciation of building performance. This affects Spanish architecture specially, since both the causes and the effects of this traumatic transition have been very prominent in this country.

Through the comparison of different phenomena that affect architecture in a more or less direct way tendencies can be discerned, on what will be defining architectonic criteria in the years to come. A description of these heterogeneous interfering aspects establishes a preliminary approach to interpret the Spanish situation, for which then more specific examples are listed. After having recognised a series of sustainability themes, which society takes into account generally, they are being extrapolated to the field of architecture.

The interpretation of social and economic phenomena as conditioning circumstances for the creation of architecture is a first step to apply the forthcoming logics to the profession. After this, a coherent set of results generates new objectives, which mark a way for the profession to become meaningful from the point of view of a scarcity of resources, covering simultaneously economic and ecological aspects. Examples from legislation and reports confirm this arising framework for the Spanish context.

Answering the questions that society poses to architecture implies taking a stand in the rapidly developing discussion on sustainability and therefore Spanish architects have an important series of tools to their disposal. It is paramount nevertheless that the lecture of the new situation in which they have to work, takes into account the various conditioning aspects combined with a coherent interpretation of their effects. Thus a new social legitimization of architecture can be established.

Biography

Sander Cornelius Laudy, 1974- Amsterdam, the Netherlands, Architect MSc 1999, Delft University of Technology, the Netherlands. Partner at B01 arquitectes, Sander Laudy has been responsible for Sustainable Building projects like the Green Energy Central of Olot and the Energy Efficient Offices of Vichy Catalan in Barcelona. He has lectured on Universities and Design Academies like EINA, ETSAB and in Barcelona and has been a visiting Scientist at the University of Sassari, Italy. The architecture studio of B01 arquitectes works on innovative building technologies like prefabricated housing, sustainable material investigation an ecological landscape and urbanism projects.

Glass foams as ecological materials

**Petru Negrea, Cosmin Vancea, Giannin Moșoarcă, Adina Negrea and
Marius Jurca**

*Politehnica University Timisoara, Research Institute of Renewable Energy, 2, Victoria Square,
Timisoara, 300006, Romania*

Glass foams are building materials that now compete with classic insulating polymeric and fiber materials for thermal enveloping. Glass foams are obtained from glass powder using foaming agents able to release gases due to decomposition at temperatures higher than the glass softening point. The gas expands generating a lightweight thermal and acoustic insulator with a porous closed cell structure. The low flammability, high chemical durability and thermal stability are distinct advantages over polymeric materials, compensating the high production costs. Considering all these advantages, the foam glass is used to create a complete building envelope including external and internal insulation systems, roof insulation, perimeter insulation, floor and below ground insulation etc. The foam glass fulfils all the physical, chemical and ecological requirements for the construction of passive buildings having low environmental footprint.

The present paper proposes the possibility of producing glass foam using two types of recycled glass wastes (window panes and bottle glass) together with three foaming agents: SiC wastes from grinding wheels, fly ash and plaster wastes from used ceramic casting molds. The suggested alternative of using different wastes to produce a marketable product having controlled properties is very attractive.

The aim of this paper is to study the correlation between the type of glass waste and foaming agent, the thermal treatment and the properties of the obtained glass foams. Optical microscopy, measurements of apparent porosity and density, hydrolytic and chemical stability, as well as thermal conductivity were used in order to characterize the obtained glass foams as insulator materials for the building industry.

Biography

NEGREA PETRU (51 years) PROFESSOR PhD. ENG. at Politehnica University of Timisoara, Romania, Faculty of Industrial Chemistry and Environmental Engineering. Licensed in the Chemical Engineering field, Inorganic Chemical Technology specialization. He is the Coordinator of research activity in Research Institute for Renewable Energy – ICER and Specialized in: chemical engineering, chemical analysis (ICP-MS, AAS, XRF, UV-VIS spectrometry) waste water treatment, waste management. He is the Co-author to 180 scientific articles: 54 articles published in Thomson Reuters indexed journals and Coauthor of 4 books for higher education and 4 patents. He is Member/coordinator in 75 national or international research-development grants/ project

Effects of Global Climate Change on Building Energy Consumption and Its Implications in Florida

Aiyin Jiang

University of North Florida, USA

Many studies have investigated the impact of global warming on energy consumption. In this study, the morphing method and EnergyPlus (E+) software were used to investigate the impact of climate change on commercial building energy use under the A2 medium-CO₂ emission scenario. The study simulated electricity and gas consumption of nine types of commercial buildings in eight cities, representing three climate zones in Florida. The nine types of commercial buildings included apartments, hotels, offices, and schools. The energy simulation results showed the future trends of growth and reduction in electricity and gas consumption for cooling and heating in TMY2 (TMY3), 2020, 2050, and 2080 in the eight selected cities. In general, gas and electricity demands for heating are projected to decrease, and electricity demand for cooling increases, at different rates in various areas of Florida. The study provides guidance for policy-makers and utility companies as they craft their response to climate change in various regions of Florida.

Biography

Dr. Aiyin Jiang is an Associate Professor in the Department of Construction Management at University of North Florida. Her research areas include global climate change impacts on buildings and infrastructures, renewable energy application in buildings and infrastructures, sustainable construction materials, construction scheduling and cost control, etc. She earned a Master of Engineering Degree in Architectural Engineering at Southwest Jiaotong University and a Master of Science degree in Decision and Information System at the University of Florida. She also earned a doctorate in Construction Management at University of Florida.

From Ediacaran to Devonian - The Great Early-Middle Palaeozoic Biodiversification with palaeoclimatic considerations

Alain R. M. Blieck

ULille, Campus Cité Scientifique, Faculté des Sciences & Technologies, bâtiment SN5 (Sciences de la Terre), Blvd. Mendeleiev, F-59655 Villeneuve d'Ascq cedex (France)

Geobiological developments of end-Proterozoic-Phanerozoic life on Earth are traditionally described and/or interpreted as a series of rises, 'plateaus', falls, crises, (r)evolutions & whatsoever. A reappraisal of the Ediacaran (ca. 635 to 540 Ma BP) to Mid-Palaeozoic (ca. 440-360 Ma BP) portion of this story is proposed. Most recent data &/ re-analyses of palaeobiologic databases as, e.g., the PaleoBiology Database, show that (1) life on Earth suffered of hundreds of common 'small', 'medium' & 'wide' crises all along its duration [what has been known for long], (2) ordinary, 'normal destiny' of all individuals, species, ecosystems is death [idem], (3) the 'Cambrian [ca. 540-520 Ma BP] Explosion' began in the Ediacaran, (4) it is continued with the GOBE (Great Ordovician Biodiversification Event, ca. 490-440 Ma BP), (5) the latter does peak in Early Devonian time or GEBE (Great Eodevonian Biodiversification Event sensu Blieck, 2015, 2017; ca. 415-400 Ma BP), (6) this is part of a Palaeozoic Plateau that ends with the Permian/Triassic crisis (at ca. 255-250 Ma BP), (7) the latter does correspond to a 'two shot' crisis, (8) the Early Triassic (ca. 250-245 Ma BP), post-crisis recovery did not exist because palaeontologists find more & more evidence of 'normal' life during this time slice, (9) this is followed by a near-continuous Mesozoic (245 to 0 Ma BP), logarithmic-like, rise (or MCR) until the Present, (10) the Mesozoic/Cenozoic, a.k.a., the K/T boundary & crisis (at ca. 65 Ma BP) was not that important &, in any case, just an 'ordinary' event, with the now classical case of dinosaurs survived by birds, (11) latter MCR is going on, (12) there is no rationality in thinking that this will soon end, & (13) the so-called '6th Extinction' which would be operating nowadays, is a 'pure figment of the imagination'. I thus propose to replace the now traditional biodiversity curve for the Ediacaran to Devonian by a 'Half-Horst' one as an analogic model that needs (i) not being discarded, (ii) being 'filled' with additional data, & (iii) being statistically re-analysed with a new open mind. This programme needs multi-disciplinary collaborations in order to reach a multi-factor numerical model that, in turn, will be included within a new palaeobiological model for Earth Life inside a renovated theory of biological evolution such as the 'Phylo-Evo-Devo-Eco-Etho-Geo-Bio' one being in progress. 'This is another story' as everybody may imagine.

Biography

ARMB has completed his Highest Teaching Degree (Agrégation) of Biology-Geology from the University of Paris at 25 years, his 1st Doct. Degree at the age of 27 years from Paris 6-Pierre-et-Marie Curie University & his State Doct. Degree at 32 years from P6 University & National Natural History Museum in Paris (France). He was director of the CNRS-ULille Palaeontological Research Team from 1997 to 2005, a worldwide reknown group of palaeontologists devoted to the Evolution & Biogeography of Palaeozoic Life on Earth. He published more than 750 publications incl. 150 papers, plus essays, short notes, 61 co-edited volumes, 115 abstracts, 75 other publications (Facebook, Web, oral comm, confs), 43 pubs devoted to popular science & geoheritage & an uncountable number of short articles devoted to all audience.

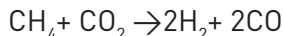
Utilization of CO₂ and Its Potential to Produce Ultra-clean Fuels and Chemicals

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The rise in average global temperatures has driven governments and the research fraternity to search for reliable, cost-effective ways to reduce the CO₂ emissions. This can be achieved by two ways; the first is by capture of the emitted CO₂ and storing underground as in CCS (Carbon Capture and Sequestration) or to utilize CO₂ as a feedstock to produce value added products, which is termed CCU (Carbon Capture and Utilization). The goal of this research work is to study the potential of using the Dry reforming process as a CCU process to supplement or replace existing processes thereby helping reduce the carbon footprint of existing processes. Dry reforming of methane (DRM) is a promising fixation approach that converts two GHGs to syngas according to the following reaction:



$$\Delta H_{298} = 247 \text{ kJ/mol}$$

Syngas is a valuable intermediate that can be used to monetize natural/shale gas to produce a variety of chemicals and petrochemicals. Furthermore, syngas can be converted into liquid fuels through the Fischer-Tropsch (FT) process. Qatar, having the world's third largest natural gas reserves at ~ 872 tcf (trillion cubic feet), has various syngas production technologies in operation in the industrial cities of Ras Laffan and Mesaieed. This presentation will highlight the potential for the DRM to be integrated with existing syngas production infrastructure to produce ultra-clean fuels and chemicals at lower greenhouse gas emissions (GHG) compared with the existing products obtained from conventional technologies that convert fossil resources to fuels and chemicals.

Biography

Professor Dr. Nimir O. Elbashir is the Chair of the Petroleum Engineering Program at Texas A&M University at Qatar and he holds a joint appointment as a professor of Chemical Engineering and Petroleum Engineering. Also, he is the director of the TEES Gas and Fuels Research Center of Texas A&M University and the Chair of the ORYX GTL Gas-to-Liquid Technology Excellence Program. His research focuses on the design of advanced reactors, catalysts and conversion processes for natural gas, coal, and CO₂ to ultra-clean fuels and value-added chemicals. He has established several unique global research collaboration models between academia and industry with research funds exceeding \$13 million during the past six years. He holds several U.S. and European patents and a large number of scientific publications in the form of peer-reviewed journals papers, conference papers and technical industry reports, as well as invited and conference presentations. Prof. Elbashir received several awards including 2017th TAMUQ Faculty Excellence Award; 2017th Research Laboratory Safety Excellence Award; 2016th Texas TEES Genesis Research Excellence Award; 2015th Dean Leadership Award; 2015th Texas A&M University Association of Former Students Excellence Award in Teaching Excellence; 2012th Qatar Foundation Best Energy & Environment Research Team; 2007th BASF Excellence in Environmental Engineering Catalysis and several paper excellence awards from the American Institute of Chemical Engineers (AIChE), International Gas Processing Symposium, Gordon Conference and others.

CO₂ Concentration Not the Cause of Warming in U.S. Bodies of Water Over the Past 89 Years

Warren Hahn P.E.

Hahn Engineering Inc., USA

A study of the water temperature of eight bodies of water recorded for up to 89 years compared to the quantity of CO₂ concentrations recorded during the latter 58 years of this period, conclusively shows that carbon dioxide has no proportional effect on the change in water temperature. The water temperature graphs of the study indicate a linear average change of +0.0373 degrees F per year, with a low of -0.0036 degrees F change per year to a high of + 0.082 degrees F change per year. For the time period measured, CO₂ show an exponential increase with no correlation to the linear water temperature increase.

Water temperature data for the study included Lake Erie 30 foot depth water temperature 1927 through 2015; the five Great Lakes water temperature 1955 through 2014; Charleston Harbor highest and lowest water temperatures per year 1950 through 2011 and the Keswick Power Plant Dam, California 1950 through 1964.

Recorded CO₂ concentrations in micro -mol per mole (ppm) from 1958 through 2015 were graphed. Also, an exponential curve of the total U. S. BTU energy consumption from wood, coal, natural gas and petroleum from 1775 through 2009 was created. Exponential curves for the above fossil products were compared to recorded 1958 through 2016 CO₂ ppm concentration data. From this a comparative exponential curve of the CO₂ concentration from 1828 through 2016 was created.

When comparing the CO₂ concentration and fossil fuel usage exponential curves with the gradual linear water temperature increase curves from 1850 (when coal use in the U.S began in earnest) through 2016 (166 years) it is abundantly clear that the relatively flat linear water temperature increase as graphed for the eight bodies of water has no correlation with the recorded exponential increase of fossil fuel usage and CO₂ concentration for the 166 year time period.

For the 77 year span from 1850 to 1927, the fossil fuel usage/CO₂ concentrations grew at an approximate rate of 0.224 Quadrillion BTU per year/ 0.098 ppm CO₂ per year. For the period 1927 through 1958, a 31 year period, the fossil fuel usage/CO₂ concentrations grew at an approximate rate of 0.710 Quadrillion BTU per year/ 0.280 ppm CO₂ per year. A rate change of just over 3 times compared to that of the previous period. From 1958 through 2016, a 59 year period, the fossil fuel usage/CO₂ concentrations grew exponentially at an approximate rate of 2.517 Quadrillion BTU per year/1.521 ppm CO₂ per year or a rate factor increase of approximately 3.5 for total fossil fuel and 5.4 for CO₂ ppm over the previous period. During the entire 166 year time period, 1927 through 2016, the Lake Erie temperature rose at a low constant linear rate of 0.0136 degrees F per year.

When comparing the degree angle slope using the same ordinate and abscissa values of the temperature linear curve slope to that of the total fossil fuel, coal, petroleum, natural gas and CO₂ exponential curve slopes, the ratio of change was from 1.99 to 5.08.

Biography

Warren G. Hahn, P.E. Tampa, Florida 58 years' experience as a Mechanical and Electrical Engineer, Manager of a 100 plus employee engineering and construction firm, VP of 200 plus employee contracting firm and Owner of a mechanical and electrical consulting engineering firm. He is Professional Engineer (PE) at Wisconsin, Florida, North Carolina and Georgia.

Ambient endotoxin and PM₁₀ concentrations on air vents of subway stations

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^cNational Cancer Control Institute, National Cancer Center, 323 Ilsan-ro, Ilsandong-gu, Goyang-si Gyeonggi-do, South Korea

Levels of airborne endotoxins and particulate matter less than 10 µm and 2.5 µm in diameter (PM) were measured in the air vents of subway stations in Seoul, South Korea, and factors affecting both pollutants were analyzed. The measurements were completed from March 2016 to February 2017 for eight air vents situated at the ground level around the subway stations. The results showed significantly different PM levels from the measurements reported by AIRKOREA as part of the comprehensive air quality index. This can be attributed to different sampling sites in the same area. Endotoxin levels tended to be higher in fall compared to summer. Airborne bacteria levels showed a pattern similar to the endotoxin levels, but no significant association was reported between them. The levels of endotoxins around air vents with a glass cover and streets that allowed smoking were significantly higher than those not containing a walled barrier and streets in which smoking was prohibited. Multivariate regression analysis showed that the factors affecting endotoxin levels comprised air vents with a glass cover and season.

Biography

Dr. Hwang is currently Associate Scientist in the Cancer Risk Appraisal and Prevention Branch at National Cancer Center, where he conducts his research on lung cancer caused by environmental factors such as asbestos, radon, volatile organic compound and smoking. He is also interested in the areas of bioaerosol health effects, focusing on the sources, transport, and fate of particles in environment as well as indoor environment.

The Pace of Climate Change in Eastern China and Its Marine Ecological Effects

Rongshuo Cai and Di Fu

Center for Marine Environment Management and Sustainable Development Research, Third Institute of Oceanography, State Oceanic Administration, Xiamen, Fujian, 361005, PR China.

Due to the high sensitivity and vulnerability of ecosystem in eastern China to climate change, based on the CRU (Climatic Research Unit) and HadISST (Hadley Centre Sea Ice and Sea Surface Temperature dataset) global surface temperature reanalysis data from 1960 to 2014, two measurement indexes, i.e. the geographic isotherm shift over time and the seasonal timing of surface temperature, are applied to analyze the velocity of climate change and phenology change across the globe and in eastern China. Results show that the global has experienced a significant warming trend during 1960–2014. The warming is faster in the Northern Hemisphere than in the Southern Hemisphere and on land than in the ocean. Meanwhile, the geographic isotherms basically move to the poles and spring arrives early and fall begins late in both hemispheres. East China also exhibits a prominent warming trend over the decades, the surface temperature on land generally rises faster than in the ocean, and geographic isotherms basically move northward. However, the surface temperatures in the East China seas rise much more rapid than on the adjacent lands, and the shift timing of surface temperature in the ocean is more remarkable than on land. Finally, the biological phenology in eastern China is obviously affected by the pace of climate change, and the movement of geographic isotherms is inhibited by land/sea boundaries, the ability of marine organisms to adapt to climate change is limited, and the marine ecosystem and biodiversity are facing a significant risk induced by climate change.

Biography

Dr. Rongshuo Cai is a Professor and Deputy Director of Center for Marine Environment Management and Sustainable Development Research, Third Institute of Oceanography, Chinese State Oceanic Administration of China. Due to his specific research experiences in marginal sea responses and adaptation to Climate Change, including marine environment and dynamics, air-sea interaction of marginal seas, and climate forcing and marine ecosystem responses in the western Pacific Ocean, he was selected as a Coordinating Lead Author of the Ocean of the Working Group II contribution to the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC-AR5), a Lead Author of the IPCC Special Report on the Ocean and the Cryosphere in a changing climate during AR6 cycle, a member of Editorial Committee of Chinese Journal of Atmospheric Sciences and Journal of Advances in Climate Change Research. He also holds a Ph.D. degree from the Graduate University of Chinese Academy of Sciences.

On the way to the predictability of El Niño-La Niña phenomenon

Hernán F. Astudillo

Departamento de Física, Universidad de Concepción, Chile

In previous research, we applied the Takens's theorem on the climatology of the SOI (Southern Oscillation Index) time series to demonstrate that the climatological component of the signal contains enough information to potentially achieve the predictability of the signal between 2 and 4 years in advance. Now we go deeper into the physical nature of the phenomenon by reviewing the selection criteria (the standard deviation) of the temporal analogs that fit the part of the signal that we want to study. This step is essential to understand the physical and geophysical nature of the gauge amplitude, defined in Astudillo et al, 2017, by which the part of the signal under study and its possible analogues differ.

Biography

Hernán F. Astudillo from 1990 to 1994 carried out a research work at the Max-Planck für Aeronomie Institute, Lindau am Harz, Germany, where the University of Göttingen, Germany, awarded him the degree of Doctor of Natural Sciences. Since then, he works in the physics department of the University of Concepción, in Chile. He has written scientific articles in different subjects such as Plasma Physics of the Solar Corona and the Solar Wind, Climatology, Sociophysics and Didactics in a Complex Classroom. Since its founding, it has been part of the Complex Systems Group of the Physics Department.

Livelihood diversification and climate shocks: Evidence from small-holders in Zambia and Tanzania

Aslihan Arslan, *Romina Cavatassi, Federica Alfani, Nancy Mccarthy, Leslie Lipper and Dieynab Diatta*

Senior Research Economist, Research and Impact Assessment Division, IFAD (International Fund for Agricultural Development), Italy

Food and Agriculture Organisation of the United Nations, Rome, Italy, LEAD

Analytics, Inc., Washington DC, USA, Independent Science Partnership Council (ISPC) Secretariat of the CGIAR, Rome, Italy,

§Food and Agriculture Organization of the United Nations, Zambia Country Office, Lusaka, Zambia

Climate change is posing an increasingly severe challenge to agricultural livelihoods due to increased frequency and intensity of extreme weather events. Livelihood diversification can play an important role in decreasing food insecurity and vulnerability under these challenges. This presentation will combine recent evidence from three separate studies to contribute to the literature and the discourse on the role of livelihood diversification to decrease vulnerability to the impacts of climate change. The studies specifically deal with smallholder agricultural production and livelihood outcomes under various climate shocks based on nationally representative panel data-sets from Zambia and Tanzania to assess the role of various diversification strategies. A number of climate shocks are identified using high resolution rainfall and temperature data from ARC2, including the shocks related to one of the most serious El Nino seasons experienced in Zambia (and most of Sub-Saharan Africa) in 2016. The presentation will specifically focus on the roles of climate shocks and relevant institutions in shaping these linkages to highlight policy insights to improve smallholder resilience.

Biography

Aslihan Arslan leads multiple research projects related to agricultural productivity, climate resilience, rural out migration and climate change mitigation potential of agricultural practices promoted by IFAD and others. She also leads selected impact assessments of IFAD projects related to these themes, and co-leads the 2019 RDR on Investing in Rural Youth. Prior to joining IFAD in 2017, Aslihan worked as a Natural Resource Economist at the Agricultural Development Economics Division (ESA) of FAO, where she worked primarily on Climate Smart Agriculture. Before that, she worked a Post-Doctoral Research Economist at the Kiel Institute for the World Economy in Germany, where she conducted research on migration, inequality and poverty, as well as the impacts of trademarking on Ethiopian coffee prices. She holds a PhD in Agricultural and Resource Economics from the University of California at Davis, where she specialized on agricultural, development and natural resource economics.

Analysis for risk likelihood to dams and bridges construction on Rift Valley fever ecosystem in River Nile, Sudan: A case study

Mohammed Mansour

Central Veterinary Research Laboratory, Khartoum, Sudan

The current study was aimed at analysis of likelihood of RVF across the River Nile, Sudan. Rift Valley fever is mosquito-borne viral disease. It affects sheep, goat, cattle and camels. Also, human can get infection from infected tissue and organs of animals, beside ingestion of uncooked or /and raw milk. Mosquito is the principle vector of RVF. It followed heavy rain fall and associated with storm of abortion in pregnant female and high mortality in sheep and goats. In human, it is characterized by influenza-like illness, meningoencephalitis, retinitis and hemorrhagic fever illness. RVF outbreak had been reported in Sub-Saharan Africa, Egypt and Madagascar and recently had occurred in Saudi Arabia and Yemen. The study was carried out in Gezira, the White Nile, Sinnar and the Blue Nile states. The study has found that ecosystem of RVF, vector biology and fauna had significant role in the disease epidemiology. Risk factors associated with RVF in this study were states and species. Sero-prevalence was estimated by 0.64 % (n=240) in Gezira, 0.25 % (n=64) in the White Nile and 0.21 % (n=38) in Sinnar and the Blue Nile state, respectively. In addition, mosquito vectors identified were *Anopheles* and *Culex* spp. Encroachment has important role in altering ecosystem of RVF, therefore it does influence the public health and socioeconomic life of population at risk. The study has concluded that impact assessment and risk analysis is essential to understand the epidemiology of RVF, vector habitat and then policies for prevention and management of mosquito borne-disease. Beside sentinel herds and risk-based surveillance could provide early warning system for prediction of RVF.

Biography

Mohammed Mansour is a PhD candidate at Veterinary Preventive Medicine department, faculty of Veterinary medicine, University of Khartoum. He is working at Central Veterinary Research Laboratory, Sudan as a researcher. He published about 11 articles in renowned journals.

Carbon dioxide bio-fixation by *Chlorella* sp. BTA 9031 towards biomass and lipid production: Optimization using Central Composite Design approach

Onkar Nath Tiwari

Centre for Conservation and Utilisation of Blue Green Algae, Division of Microbiology, ICAR-Indian Agricultural Research Institute, New Delhi, INDIA

Depletion in the fossil fuel reserves and the unceasing rise in the greenhouse gas emissions due to excessive use of fossil fuels has become a subject of worldwide concern. Production of microalgal biomass using the carbon dioxide (CO₂) laden flue gas is identified as one of the potent solutions to the trap the excessive emissions of CO₂ from entering into the atmosphere along with the production of renewable and sustainable biofuel thereby, combating both energy crisis and global warming. Understanding and optimizing the parameters affecting the microalgal growth process is crucial prerequisite for effective CO₂ bio-fixation using microalgae in photobioreactors (PBRs). *Chlorella* sp. BTA 9031 was selected as a potential strain for biomass and lipid production under varying temperatures (20-40 °C), light intensity (30-100 μmol m⁻² s⁻¹) and CO₂ % (4-15 %). These three main operating factors were optimized through Central Composite design (CCD) approach of Response Surface Methodology (RSM). The optimal conditions for attaining both maximum biomass and total lipid content were selected to be 28.26 °C, 76.64 μmol m⁻² s⁻¹ and 4.00 % CO₂. Under the optimum conditions, CO₂ bio-fixation rate was observed to 0.235 g L⁻¹ d⁻¹ of *Chlorella* sp. BTA 9031. Confirmatory experiments confirmed that the model predictions were in good agreement with the experimental results.

Biography

Dr. Onkar Nath Tiwari obtained his doctorate degree from University of Allahabad, U.P. INDIA in 1998. He has been working in the field of cyanobacteria and microalgae for past more than twenty five years. He is life member of nine scientific societies and has guided five Ph. D. students. He is a member of different task forces of DST and Ministry of Health and Family welfare, Govt. of India. Dr. Tiwari is in the Editorial Board of different International Journals and is a member of Board of Directors, Algal Biomass Research and Commercialization: Intelligent Biotechnologies, Austin Texas, and USA. Dr. Tiwari worked as Visiting Professor for six months at Culture Collection of Algae, University of Texas at Austin, TX-USA during 2012 under DBT Associate ship program. He has undergone several professional trainings and attended workshops in India as well as abroad. He has participated in more than fifty five National and International conferences and seminars. He has chaired different sessions under different International as well as National conferences and highly empowered task force meetings. Dr. Tiwari is under the faculty of Division of Microbiology at ICAR-IARI, New Delhi and is teaching courses on cyanobacterial morphology, taxonomy, value addition and techniques. He has published more than hundred papers in both National as well as International Journals of high repute and has written nineteen book chapters and six manuals/ catalogues and Data Sheet inventory

Mediating and Moderating Effects in the Process of Drought Impacting Rural Livelihood Vulnerability in China

Professor Jianjun Huai and Meirui Su

Northwest Agriculture and Forestry (A&F) University, China

Understanding the mechanism of reducing livelihood vulnerability matters for rural policy decisions and climate risk management, but quantification is challenging because of the complex interactions and uncertainties between and cross individual, households and villages scales. Current modelling approaches use vulnerability functions to parameterize a simplified relationship between climate variables and economic losses at multiple temporal or spatial scales. Here we use mediating and moderating effects to reflect the interaction of cross-scale variables, provides scientific methods in the empirical research of cross-scale effects, and mechanisms of droughts affecting livelihood vulnerability. Based on the survey data of 218 households in the Loess Plateau, linear regression and hierarchical regression analysis were used to investigate the mediating and moderating effects of cross-scale variables in the impact of drought on livelihood vulnerability. The results show that drought has a significant impact on the livelihood vulnerability of rural households through some mediating and moderating effects. This provides science to formulate policies to reduce the livelihood vulnerability of rural households.

Biography

Dr. Jianjun Huai is a Professor in the Economics departments at the Northwest Agriculture and Forestry (A&F) University in China, where his research focuses on the vulnerability assessments and adaptation managements, resilience building on the climate and sustainable livelihood on the rural sector. He recently has presided over 15 projects including the national natural science foundation and published about 40 papers. Recently, Huai engaged in the interdisciplinary research about vulnerability assessment of climate change, adaptive management and resilience building, focus on the integration of social and economic factors and the natural ecological factors into the impacts of climate change. Huai earned a Master of Science degree in Economics at the Northwest University in China. He also earned a doctorate in Management Science and Engineering at Xi'an Jiaotong University.

A time-stepping scheme to simulate leaf area index and gross primary production via climate variables

Qinchuan Xin^a and Yongjiu Dai^b

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Terrestrial plants alter the physical feature of the land surface and affect the exchange of energy and materials between the atmosphere and the land surface through biogeochemical processes. Understanding of the vegetation-climate interactions requires robust biosphere models to simulate both canopy fluxes such as gross primary production (GPP) and evapotranspiration and time series of leaf area index (LAI) via climate variables. This study proposes a novel method to simulate LAI, leaf phenology, and GPP simultaneously based on the idea that uses vegetation photosynthetic capacity instead of individual or combinations of abiotic factors to track the suitability of environmental conditions for plant growth and leaf allocation. The method applies the MOD17 algorithm to simulate canopy GPP and establishes a linear function between LAI and GPP to form a closed system of equations, which is solved numerically to obtain the steady-state LAI. A time-stepping scheme uses a simple restricted growth model to account for the lag in plant responses to environment variation and simulate LAI time series from the derived steady-state LAI. The simulated LAI time series is then used to derive key phenophases and simulate canopy GPP using the MOD17 algorithm. The method is applied to simulate deciduous broadleaf forest across eastern United States and has found to perform well at both the site and regional scale as evaluated using flux tower data and satellite remote sensing data. The method could capture multi-year variation of LAI, phenology and GPP as well. The developed time-stepping scheme provides a much simplified and improved version of our previous model as a potential basis for global applications in future studies.

Biography

Dr. Qinchuan Xin is now an associate professor and the assistant dean of the School of Geography and Planning at Sun Yat-Sen University in China. He received Bachelor of Science in 2005 from Beijing University in China and took Doctor of Philosophy in 2012 from Boston University in USA. His research interests are focused on the modeling and monitoring of terrestrial ecosystem processes. He has published 27 peer-reviewed papers to date in SCI journals such as Agricultural and Forest Meteorology and Remote Sensing of Environment. He acts as the associate editor of International Journal of Remote Sensing since 2016.

Climate Change and Drought: Potential Health Impact of Wastewater Reuse as Management Strategy for Water Security in South Africa

Olalekan S. Fatoki

Cape Peninsula University of Technology, Cape Town, South Africa

South Africa as a country is water stressed but the growing effects of climate change with its extreme weather conditions and erratic rainfall pattern is aggravating the situation with incidence of droughts in many parts of South Africa. Cape Town is a major tourist centre and the city experienced its major drought recently with attendant water scarcity and the possibility of “Day zero” has been stated by provincial government when taps may run dry in the city. As a result of the impact of drought, water security will be a concern for many years to come in the city with consequent effects on people’s livelihood. One of the water management strategies being effected by government is wastewater reuse both for domestic and agricultural uses. However with the increasing concern on the occurrence of some pollutants of emerging concern many of which are endocrine disrupting chemicals (EDCs), there are concerns that these chemicals can pose a health threat to people especially as current technologies being used by many municipalities for wastewater treatment are not equipped to remove these chemicals. Our studies in the Cape Town environment have indicated the presence of EDCs, such as Brominated flame retardants (BRFs), Perfluorinated compounds (PFCs) and pharmaceutical residues in wastewaters and our health risk bioassay gave indication of slight risk of developing cancer through accidental ingestion via recreational activities. Ames test results revealed clear mutagenic activities from wastewaters from livestock agricultural farms. High levels of oestrogenic activity were also found in some of them. If the waters were used for domestic purposes and sufficient treatment were not made, or if the waters were used for irrigation purposes, greater risk would be expected. Our study also revealed that wastewater treatment technologies like the use of nano materials - lkanite (β -FeOOH), zeolites and biomass could be used to remove some of the EDCs efficiently from the wastewaters before reuse.

Biography

I hold a PhD in Chemistry and my field of research is in analytical environmental chemistry. My expertise lies in trace organic analyses using various analytical tools for their detection in different matrices and on remediation with nanomaterials. My work has focused on endocrine disruptors - organochlorine pesticides (OCPs, e.g, DDTs), phthalates, phenols, PAHs and organotins but recently I have focused on emerging contaminants (ECs) - brominated flame retardants (BFRs), PFOA, PFOS and pharmaceuticals, looking at alternative methods of determination, assessing their levels and health risks and investigating their remediation. EDCs could impact on human health, hence my interest.

Photocatalytic microbial removal and degradation of organic contaminants of water using PES fibers

Buthayna Al-Ghafri

Nanotechnology Research Center, Sultan Qaboos University, Oman

Membrane fouling due to organic contaminants and growth of microbial organisms is a common problem for water pre-treatment units, therefore, fibers have photocatalytic nature with self-cleaning property is needed. Photocatalytic bacterial removal and dye degradation by polyethersulfone (PES) fibers under visible light is reported here. PES fibers were arranged in a random mesh structure using electro-spinning technique that allows utilization of maximum surface area of the fibers. The influence of concentration of PES polymer, type of solvent and surface chemistry of the fibers on their mechanical properties and photocatalytic activities was investigated. Ratio of solvent (DMF (Dimethylformamide) to NMP (N-Methyl-2-pyrrolidone)) while preparing the PES fibers was found to be crucial in terms of the PES fiber thickness, fluid flux, mechanical strength and hydrophobicity of the fibers. The as-prepared PES fibers showed considerable amount of $\text{OH}^\bullet$ radical generation under visible light excitation resulting in efficient degradation of model dye contaminant methylene blue (MB) and disinfection of model bacterium *Escherichia coli* (*E. coli*). However increased hydrophilicity of the fibers using oxidation treatment resulted in reduction in the generation of $\text{OH}^\bullet$ radicals showing less photocatalytic activity by the PES fibers. FTIR investigations confirmed no self-destruction of the PES fibers due to the generation $\text{OH}^\bullet$ radicals indicating potential application of PES fibers as a useful photocatalytic polymer material for bacterial removal and decontamination of water.

Biography

Extensive research expertise despite youth is what has made Buthayna a young outstanding researcher which is proven by having published her first paper in applied catalysis B Journal with the impact factor 9.5. Since shortly after getting her degree in Chemistry from Sultan Qaboos University; she has been massively involved in various research projects in the field of nanotechnology along with her career as a researcher in Nanotechnology research center at Sultan Qaboos University which is being continued beside doing her Master of Chemical and Energy Engineering at UTM Malaysia.

Climate change education and vulnerable groups in southern Africa: The case for utilising the services of frontline human services professionals

Rodreck Mupedziswa PhD and Keitseope Nthomang PhD

University of Botswana, Botswana

The theme of climate change has gained currency across the globe, particularly in the last couple of decades. A key cause of climate change world-wide has been identified as global warming. The African continent is among the regions of the world hard hit by the impact of climate change. Within Africa, one sub-region that has been badly impacted is Southern Africa. There is general consensus that in this sub-region most variables associated with climate had changed in response to warming, resulting in increased vulnerability among ordinary citizens. Numerous conferences, workshops and symposia, have been conducted, and much has been written on the theme of climate change. However, most of these exchanges seem to be happening at an “intellectual level”, meaning there has been a tendency to totally exclude grassroots populations. The paper argues that the discourse on the impact of climate change cannot afford to remain confined to the ‘ivory towers’ of capital cities and urban environs of the various countries in the region. There is evidently need to ensure that the vulnerable groups in the various countries are sufficiently educated on the theme of climate change to enable them to more meaningfully participate in the fight against the devastating impact of this scourge in their own little corners. The mantra, ‘think globally and act locally’ can then cease to be a pipe dream, and begin to make good sense. The paper argues that for this goal to be realised, however, there will be need to rope in frontline human service professionals given that they operate at grassroots level. These include social workers, lifelong learning practitioners, social development workers, community development workers, agricultural extension workers and health professionals, among others. The contention is that since these frontline professionals work with vulnerable populations on a regular basis at community level, much headway could be realised in educating communities on climate change. However, for the frontline professionals to effectively carry out this mandate, they (the professionals) ought themselves to be sufficiently empowered first so they can then play a significant role in terms of mobilising communities in an effort to mitigate the impact of climate change in the region and beyond.

Biography

Rodreck Mupedziswa, PhD is Professor, Department of Social Work, University of Botswana. He was educated at the London School of Economics (University of London) and the University of Zimbabwe. Previous positions held include Director, Forced Migration Studies Programme, University of Witwatersrand (Wits), Johannesburg South Africa. He is author/editor of 9 books and numerous journal articles, book chapters, occasional papers and monographs. He has presented academic papers at over 120 gatherings in 45 countries. He served as Editor-in-Chief of the IBSS accredited *Journal of Social Development in Africa* for 10 years, and served on the Executive Committee of OSSREA. His research interests include social protection issues and also the social impact of climate change

Notes:

Day-3

Scientific Sessions

Large-scale modeling to evaluate stream health vulnerability to climate change

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Background: Freshwater is a limited resource that is vital to both human and natural systems. This has led to the development of water resources management plans that insure adequate water is supplied to both human and natural systems. However, this is often challenging due to the complexity of the interactions between these systems. Furthermore, changing climatological conditions are expected to alter the hydrological cycle, which can have drastic results on freshwater systems that in turn affect both human and aquatic communities. Therefore, the goal of this study is to determine the impacts of climate change on freshwater systems by evaluating changes to commonly used stream health indices including *Ephemeroptera*, *Plecoptera*, and *Trichoptera* taxa (EPT), Family Index of Biotic Integrity (FIBI), Hilsenhoff Biotic Index (HBI), and fish Index of Biotic Integrity (IBI).

Methods: To examine the impacts of climate change on freshwater systems, seven watersheds in Michigan, representing a range of thermal regimes, were simulated through the use of Soil and Water Assessment Tool (SWAT) models. These models were used to calculate streamflow and pollutant loads for each region. These variables were then correlated to the stream health indices (EPT, FIBI, HBI, and IBI) through the use of a Bayesian variable selection method and adaptive neuro-fuzzy inference systems models to develop watershed-wide stream health models. These health models were used to evaluate the stream health of each watershed for the period of 1980-2000. After which, an ensemble of climate models, from the Coupled Model Intercomparison Project Phase 5, were used in combination with the SWAT and stream health models to simulate the stream health for each watershed for the period of 2020-2040. These two sets of stream health scores were then compared using cumulative distribution functions to determine the impacts of climate change on stream health for each region. In addition, a stream temperature regression model was used to determine if there had been any thermal regime shifts in the watersheds, which could drastically impact the composition of the aquatic communities.

Results: Climatological changes in the hydrological cycle were most notable in flow regime variables, such as flow variability, duration of extreme events, and timing. Watershed scale evaluation indicated low magnitude of stream health decline. However, this was most likely due to indicator insensitivity at that scale; since at the reach scale, instances of high risk and large magnitudes of stream health decline were common. Furthermore, analysis of thermal regime shifts indicated that in several cases cold-transitional and cool streams transitioned into warm streams. This confirms that the techniques utilized in this study are able to evaluate the impacts of climate change on freshwater systems.

Conclusions: The techniques used in this study provide a new approach for stakeholders and decision makers to perform climate change impact assessments.

WC Climate Change 2018: Impacts & Responses

September 13-15, 2018 | Rome, Italy



Biography

Dr. Pouyan Nejadhashemi is an Associate Professor in the Department of Biosystems and Agricultural Engineering at the Michigan State University (MSU). He received his Ph.D. in 2006 in the area of *Bioenvironmental and Water Resources Engineering* from the University of Maryland. Before joining MSU in 2008, he worked as a core member of an interdepartmental-interagency watershed management technical team that guided development of watershed restoration and action plan strategies through collaboration with agencies and other watershed stakeholder groups in dozens of watersheds in Kansas. In his current position, he leads an interdisciplinary research team focused on incorporating an ecosystem approach to address water resource problems including water quantity and quality. He is also leading the Decision Support and Informatics Units and the Climate Change Impact Assessment on Water Resources Group for the MSU Global Center for Food System Innovation, a 25 million dollar initiative funded by the USAID. His specific research interests are in sensitivity and uncertainty analysis of water quality mitigation approaches to address climate change, soft computing applications in water resources, development of Decision Support Systems for human impact evaluation on ecosystem sustainability, and evaluation and development of watershed models.

Place of origin and climatic variations as causes of groundwater contamination by arsenic in Nepal

Barbara Mueller

Bamugeobiochem, Switzerland

Various geological and geochemical prerequisites such as pH, redox conditions, temperature, and solution composition trigger the release of the extremely toxic element arsenic in the lowlands of Nepal (Terai). The thin alluvial aquifers of the Terai with a low redox potential, low SO_4^{2-} , high DOC, PO_4^{3-} and HCO_3^- concentrations in groundwater signify ongoing microbial mediated redox processes favoring As and Fe mobilization into the aquifer. The broadly accepted hypothesis states that reductive dissolution of Fe-bearing minerals releases As-oxyanions from As-containing minerals. Meanwhile there is a clear evidence that As concentration in ground water is weakly variable pre- and post-monsoon whereas the concentration of Fe in ground water is widely variable in both climatic seasons. Even though As is mainly incorporated in iron-hydroxides and iron-oxides, a substantial portion of this element is retained by clay minerals (including micas). During pre-monsoon (dry season) clayey sediments are chemically weathered losing Na and K thus remaining comparatively enriched in immobile compound like Fe and Al. As long as reduced conditions persist, As remains notably mobile. Furthermore, there is a very weak or even negative correlation (decoupling) of aqueous As and Fe in the groundwater. In conclusion, the original reservoir of arsenic being incorporated and released from clay minerals as well as from iron-hydroxides and iron-oxides has to be considered. The very low concentration of Fe and the presence of the lithophile trace elements like Li, B, P, Mn, Br, Sr and U together with As in the groundwater suggest a felsic initial source like metapelites or leucogranites (rich in micas)– all these rocks showing a high abundance of especially B, P and as well as Cd and Pb.

Biography

Dr. Barbara Mueller is a freelance scientist working in cooperation with several university institutions in Switzerland. She accomplished a PhD degree in geochemistry at ETH Zurich, Switzerland, spend several years as a postdoc or scientific collaborator in Canada, Sweden and Germany before returning for a few years to ETH Zurich. Her field of expertise includes analytical and experimental geochemistry, biogeochemistry and clay mineralogy. Her main research interests include: Geochemistry of natural waters, contamination of groundwater with poisonous substances (eg. arsenic) and mitigation of those consequences, dynamics of human waste deposits (e.g. mine tailings, acid mine drainage). Analysis of minerals, mineral surfaces and rocks concerning trace elements using a variety of analytical techniques: LA ICP-MS, ICP-MS, XRF, XRD. Biogeochemistry: Interaction between bacteria and clay minerals. Biomineralization: Formation of ore minerals and clay minerals by bacteria

Do changes in boreal forest understory vegetation reflect climate change?

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We discuss applicability of short- and long-term vegetation inventory data to indicate climate change. The study is based on inventories in frames of a whole country: National Forest Inventory in Finland (NFI) since 1953, and a MONTA study of the response of understory vegetation and lichens in mature boreal Norway spruce forests to five felling treatments in southern Finland since 1995. The MONTA stand level treatments were: clear felling (CF), retention felling (RF) (7 % of stand volume retained), gap felling with site preparation (GFs) (50 % retained), gap felling (GF) (50 % retained), and selection felling (SF) (67 % retained).

NFI results show a remarkable change in understory vegetation during the studied period, mainly due to forestry activities. In MONTA, the dynamics of plants depended on the forest felling intensity and site preparation. Local extinctions of mosses and liverworts were caused especially by CF and RF. However, even with 67 % retention, 18 bryophyte species were lost during the study period. Loss of bryophyte species was higher after SF than after GF treatments, suggesting that aggregated retention is better for maintaining bryophyte species in felling areas. The resilience of understory vegetation increased in the order CF < RF < GFs < GF < SF. The abundance of mosses, liverworts and dwarf shrubs had not recovered ten years after treatments. This allows us to conclude that in intensively managed forest landscapes, GF and SF can be recommended as alternatives to CF to better maintain understory diversity on the stand level.

We discuss possibilities to use the datasets for developing best forest management practices in view of climate change. Changes in understory vegetation in Finland are related to intensive forest management, changes in tree species composition and age structure etc. However, possible effect of climate change cannot be excluded.

Biography

Vanha-Majamaa is a senior researcher at Natural Resources Institute Finland. His research focuses on forest and mire vegetation, fire ecology, forest management, restoration and biodiversity. His current special interests are the effects of disturbances (various forest management methods, including site preparation, fire etc. and natural disturbances) on boreal forest understory vegetation and coarse woody debris dynamics in a changing climate.

Intrinsic water use efficiency after fertilization Douglas-fir plantation in the Oregon Coast Range

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Many hectares of intensively managed Douglas-fir (*Pseudotsuga menziesii* Mirb. Franco) stands in western North America are fertilized with nitrogen (N) to increase growth rates, but only about 2/3 of all stands respond. Understanding the mechanisms of response facilitates prioritization of stands for treatment. The primary objective of this study was to test the hypothesis that the short-term basal area growth response to a single application of 224 kg N ha⁻¹ as urea was associated with increased intrinsic water use efficiency (WUE) in a 20-yr-old plantation of Douglas-fir in the Oregon Coast Range, USA. WUE was estimated using earlywood and latewood stable carbon isotope concentrations in tree-ring holocellulose starting seven years before fertilization in early 2009 and ending seven years after treatment. A significant treatment x year interaction was found for WUE in earlywood and latewood. Fertilization significantly increased earlywood WUE in the first and second growing seasons after fertilization. Only a marginally significant fertilization effect was detected for latewood WUE in the second growing season after treatment. Previous studies of N fertilization of Douglas-fir forests have reported consistently increased growth and WUE on low productivity sites treated with relatively high fertilization rates. This study suggested that these responses can also be observed on highly productive sites despite their lower frequency and apparently shorter duration. Other key mechanisms driving growth responses appear to be less important than WUE, including an increase in LAI and shift from belowground to aboveground carbon allocation.

Biography

Dr. Eladio H. Cornejo-Oviedo is a Professor and Researcher at the Universidad Autónoma Agraria Antonio Narro (UAAAN) Saltillo, Coahuila, México, where his research focuses on forest mensuration, dendrochronology, and ecophysiology of pines. He was recently in a sabbatical stay at Oregon State University, Corvallis OR, USA, where he worked with the Center for Intensive Planted-forest Silviculture (CIPS) studying the efficiency of basal area growth, carbon isotope discrimination, and water use efficiency after fertilization in Douglas-fir plantations. He earned a Master of Science degree in Plant and Soil Science at the Texas A&I University, Kingsville, TX, USA. He also earned a doctorate in Forest Science at Oregon State University, Corvallis OR, USA.

Climate change during Holocene in Northwestern Mexico based on geochemical, magnetic and palinological evidence

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³Centre Européen de Recherche et D'enseignement des Géosciences de L'environnement, Aix-en-Provence, France

Several peatbogs ("Cienegas") located in the Sierra Madre Occidental in Northwestern Mexico have been analyzed to reconstruct past climate changes at this region. A multiproxy record (magnetic susceptibility, loss-on-ignition, chemical and pollen analysis) was reconstructed from a peat bog (28°N; 108°W, 1700 m.a.s.l.) dated at 12,860 cal yr BP inside the pine-oak forest. The results of a geochemical study of major and trace elements indicates the sources and processes related to environmental changes of local and regional paleo-precipitation. Three climatic periods were identified: cold and dry period during early Holocene with a mixed conifer forest distributed in the actual open oak forest, low contents of terrigenous/organic material from local volcanic sources were detected; the last can be interpreted as an absence of wind inputs or torrential rainfall. The second climatic period during middle Holocene shows an increasing tendency and variability for all the concentrations of the major elements and a more open pine forest distribution. The increase in the Al/Ti and Si/Ti ratios are evidence of processes associated with substrate erosion and/or the increase of wind inputs, probably caused by a higher frequency of more severe precipitation events as a characteristic of a monsoon system. The third period, during the late Holocene, shows an increase in geochemical variability, again indicating that the deposition of wind dust was also important at this time. Finally, the changes registered in this site can be placed in a more regional and global context, in correlation with other records in North America such as a winter rainfall regime that was dominant during the Last glacial in the early Holocene and its subsequent variation to a dominant regime of summer rain during middle Holocene. Understanding past vegetation changes related to climate will be useful for actual policy decisions related to future climate change.

Biography

Dra. Carmen Isela Ortega Rosas is a Principle investigator in Past vegetation and climate changes at the "Universidad Estatal de Sonora", where she belongs to "Academic Group of Natural Resources" and is a member of Academic Committee of Postgraduate. Her research focuses on the implications of climate change on vegetation dynamics through time. As well she focuses on the effect of climate change on air biological quality. Since 2013 she developed research on urban ecosystems, resiliency and vulnerability related to climate change. Her doctorate was developed in "Environmental Geosciences" at the "Centre Européen de Recherche et D'enseignement des Géosciences de L'environnement (CEREGE)" at Aix-en-Provence, France. She also earned a Master of Science degree in Environmental Biology at "Universidad Nacional Autónoma de México (UNAM)". Her doctorate dissertation examined the response of vegetation communities during Last Glacial Maximum, Holocene and present time through the analyses of several paleo-climatic indicators. As well she applied several climatic models of PMIP project to simulate future scenarios of vegetation change related to climate.

Increasing concurrent drought and heat during the summer maize season in Huang-Huai-Hai Plain, China

Qingfeng Meng, Lijun Wang and Pu Wang

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Although an individual climate event may not be severe, the concurrence of climate events could have a significant impact on crop production. Investigating concurrent climate extremes during crop growth is important to formulate corresponding strategies for crop production. To assess the occurrence risk of concurrent drought and heat events in the Huang-Huai-Hai Plain, China during the summer maize season, we analyzed the temporal and spatial patterns of precipitation, standardized precipitation evapotranspiration index, drought frequency, and extreme degree days (EDD) during the critical growth period. We used daily data from 41 meteorological stations in the region from 1980 to 2015. We determined that concurrent drought and heat events increased from northeast to southwest. The combined events mainly occurred during the vegetative period, and they significantly increased in 2006–2015 relative to 1981–1990. The spatial distribution of precipitation increased from northwest to southeast, while drought displayed no significant trends. The EDD displayed a rising trend and was intensified after 2000 in different growth periods. Its spatial distribution increased from east to west during the vegetative period and from northeast to southwest during the reproductive period. Although we focused on the combined extreme events for maize in Huang-Huai-Hai Plain, similar phenomenon should receive more attention in globally important crop areas and other ecosystems.

Biography

Dr. Qingfeng Meng is an associate professor in College of Agronomy and Biotechnology of China Agricultural University where his research focuses on the climate change and food security in China. He got his PHD degree in College of Resources and Environment Sciences in China Agricultural University. His dissertation examined the climate change, crop yield potential and yield gap assessment and how to improve both crop yield and resources use efficiency through agronomic management in the warming world. Focusing this topic, he then took one year in Stanford University as a visiting scholar and postdoc before he came back to China Agricultural University.

Old-growth forests in view of climate change

Ekaterina Shorohova^{1,2,3} and Ekaterina Kapitsa²

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We review and synthesize evidence on the carbon (C) pools and fluxes in old growth (OG) forests, aiming at understanding potential responses of those forests to forest management and ecological restoration actions and climate change. The role of OG forests in the global C cycle remains inconclusive. They are reported to act as C sinks, sources or be C neutral. These discrepancies are related to OG concepts, research methodologies used and an extent to which the impact of natural disturbances is acknowledged. OG forests harbor both large C storages and unique biodiversity, as well as maintain socio-ecological resilience. Thus, protecting them may benefit biodiversity and multiple ecosystem services alike. However, natural disturbances that drive C dynamics at the OG phase should be taken into account in forest management, conservation and conservation planning on a regional scale.

Biography

Dr. Shorohova is a senior researcher at the Forest Research Institute of the Karelian Research Centre of Russian Academy of Science and an Associate Professor at the Saint-Petersburg State Forest Technical University. Her research and teaching focuses on forest ecology and nature conservation. Her special interests are in old-growth forests and multiple ecosystem services provided by them.

The slick dairy cow as an adaptive asset for resilient dairy operations upon the uncertainty of climate change

Guillermo Ortiz-Colón¹, Rafael López-López², Claudia G. Ríos-Solís¹, Jaime Curbelo-Rodríguez¹, Esbal Jiménez-Cabán¹ and Melvin Pagán-Morales¹

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Heat stress is a great challenge to dairy production in tropical and subtropical regions. Climate change may also expose dairy cattle in temperate regions to chronic heat stress, lowering dairy productivity worldwide. The Spanish conquest brought European cattle to the archipelago of Puerto Rico in 1511. For over 500 years farmers in Puerto Rico selected the more adaptable animals to the hot and humid environment. *Criollo* cattle in Puerto Rico carry the Slick gene that results in short lustrous hair and thermo-tolerance. The slick gene has been part of the Puerto Rican dairy cattle pool long enough that we have dairy herds in Puerto Rico with registered Holstein cattle that carry the *Slick* gene. We documented the productive behavior of *Slick* registered Holstein cows in *El Remanso Dairy Farm*, in Camuy, Puerto Rico (18.48383 -66.8449). Official production and reproductive data from the *Dairy Records Management System* was obtained during 18 months and used to compare the production of 19-26 *Slick* hair registered Holstein cows against 61-96 *Non Slick Holsteins* (animal numbers varied depending on test date). All dairy cows were on a semi-intensive rotational grazing system based on *Cynodon nlemfuensis*. All dairy cows were milked twice a day when animals were supplemented with 4.54 kg of an 16% crude protein commercial dairy concentrate at each milking. On average, *Slick* Holsteins produced 20.6 kg of milk per day while *Non Slick* Holsteins produced 18.5 kg. On average, *Slick* Holsteins presented a calving interval of 13.8 months, while *Non Slick* Holsteins presented a calving interval of 15.8 months. Under the hot and humid conditions of Puerto Rico *Slick* Holstein dairy cows seem to perform better than their *Non Slick* contemporaries. Therefore, the *Slick* gene may be an appropriate adaptive strategy to support an efficient dairy industry within a warmer global climate.

Biography

Guillermo Ortiz-Colón completed his PhD at Michigan State University in ruminant nutrition. He holds an M.S. in ruminant nutrition and B.S. in animal science from the University of Puerto Rico at Mayagüez (UPRM). He is the extension dairy nutrition specialist at UPRM, where his work focuses on promoting adaptive strategies that minimize the carbon footprint of dairy production, while helping dairy farmers been more resilient to climate change challenges. He is a member of the American Registry of Professional Animal Scientists where he is part of the editorial board of the scientific journal *The Professional Animal Scientist*.

Impacts of Sectoral Emissions in China and the Implications: Air Quality, Public Health, Crop Production, and Economic Costs

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China has experienced considerable economic losses from a severe deterioration in air quality. To solve this, a comprehensive understanding of the impacts and sources of air pollution is necessary. This study aimed to quantify the environmental and human health impacts of PM_{2.5} and O₃ pollution from the six major emission-producing sectors in China. We utilized a chemical transport model to simulate the air quality impacts engendered by sectoral emissions. The consequent impacts on public health and crop production, as well as the corresponding collateral economic costs, were quantified by concentration-response functions. The results show that the sectoral emissions in 2010 caused approximately 1 143 000 (95% confidence interval [CI]: 168 000–1 796 000) premature mortalities and a 20 035 (95% CI: 6776–32 166) Gg crop production loss. Of the six sectors, the industrial sector was the largest contributor of air pollution, accounting for 36% of the total impact on health, as well as 41% of crop production loss due to O₃ exposure. The impacts attributable to sectoral emissions in China were estimated to cost ~267 (95% CI: 180–360) billion yuan (0.66% of the annual GDP). Our findings suggest an urgent need to reduce anthropogenic emissions in China, particularly those of the industrial sector. The varying characteristics of impact due to emissions of various sectors highlight the importance of evaluating cobenefits when formulating emission control policies.

Biography

Prof. Steve H.L. Yim's research focuses on interactions between climate and air quality, and the impacts on public health and ecosystem. His on-going research is to advance and utilize state-of-the-art multi-scale atmospheric models, along with measurement and statistical approaches, to understand the mechanisms that drive the climate-air quality interactions, and to also evaluate the impacts on human exposure, mosquito abundance and soil acidity. Particular interests are in investigating air quality impacts of sectoral emissions and trans-boundary air pollution at multiple spatial scales, and studying regional climate change due to land-use changes and global climate change. His research also assesses and develops emission control scenarios to provide scientific- and evidence-based policy solutions for a sustainable environment in present and future years.

Assessment of the Iberian Peninsula bioclimate (1950-2017)

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^b Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), University of Trás-os-Montes e Alto Douro, Vila Real, Portugal; ^c University of Aveiro, CESAM, Aveiro, Portugal

The bioclimatic classification plays a relevant role in establishing relationships between ecosystems and climate. On a regional scale, this assessment allows a better understanding of the impact of climate change in the agroforestry systems. Furthermore, the climate of a region plays a significant role not only for the developmental stages of plants, assessed in agroclimatological studies, but also in the implementation of environmental policies. The worldwide bioclimatic system (WBCS) establish relationships between the worldwide vegetation types and several quantitative bioclimatic indexes. The Iberian Peninsula is considered a climatic hotspot therefore the assessment of the impact of climate in the ecosystems is highly relevant. Towards this aim, gridded precipitation and air temperature datasets are used on a daily basis for a period between 1950 and 2017. Detailed maps of the four major bioclimatic divisions according to Rivas-Martinez, such as, macrobioclimate, bioclimate, thermotype and ombrotype for the Iberian Peninsula are going to be presented. Changes observed namely in the northwestern and southeastern regions of Iberia between 1950 and 2017 are also going to be discussed.

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Biography

Cristina Andrade graduate from the University of Coimbra in Geographical Engineering, holder of 2 master's Degrees in Geophysical Sciences (specialisation in meteorology) and Mathematics from the University of Lisbon and Coimbra respectively and PhD in Environmental Sciences (specialisation in large-scale dynamics of the atmosphere) from the University of Évora. Professionally professor in the Physics and Mathematics Department of the Polytechnic of Tomar since 1998 and Director of the Natural Hazards Research Center, NHRC.ipt of the Polytechnic Institute of Tomar. Author of several papers on extreme events, climate predictive modelling and simulation scenarios, and member of several relevant associations such as European Geosciences Union (EGU), Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB) of the University of Trás-os-Montes e Alto Douro and Centre for Environmental and Marine Studies (CESAM).

Response to climate change of cropping system from plant to field managements

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Climate change can bring positive and negative effects on Chinese agriculture, but negative impacts tend to dominate. The presentation introduces the effects of climate change on crop production system, from plant-self response to technique roles. The context more principally emphasize on the elevated CO₂ on winter wheat growth and yield, various irrigation regimes effects on wheat yield, the crop yield response under climate change scenarios etc, then recommend various coping patterns from policies to technologies for cropping system to climate change. The results denoted higher [CO₂] enhance yield of winter wheat and has obvious positive interactions with nitrogen and water, same response with the modeling results as future CO₂ fertilization enhance production of crop yield, while water and nitrogen maybe the limitation for CO₂ effects fully used. Higher [CO₂] could increase yield verse high grain number per spike and grains weight which could be considered for wheat breeding. At field management level, change timing of cultivation and select other crop species and cultivar are commonly adopted by farmers. Other observed adaptations include water saving techniques, improving ability on disaster prevention etc. Although China had made great progress on knowledge of impacts and adaption to climate change, but still need more work to do, not just infrastructure construction, but also non-structural building as public awareness, research capacity, adaptive skill training, and climate risk management etc.

Biography

Dr. JU Hui is a principle investigator in the Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agricultural Sciences. She has been working on the issue of climate change impacts on agriculture and how to adapt to nearly 15 years, and have long and good cooperation with other relative Chinese institutes researching on climate, water resources, ecosystems, agricultural economy etc. Many times went to rural communities to explore potential adaptations for agriculture, which mainly focus on how to explore current technology to achieve win-win adaptation effect to climate change. Recent works mainly focus on the impacts of climate extreme to agriculture and how to adapt them, to assess local adaptive capacity for ensuring food security in China.

Vulnerability Assessment of Groundwater to Contamination Using Electrical Resistivity Method at the Open Dumpsite in Gosa, Abuja, Nigeria

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Groundwater is a vital resource in almost all parts of the world. It is, however, under threat, not least from contamination and Climate Change. Improving the quantitative prediction of the movement of contaminants in groundwater systems has therefore become a contemporary goal of applied water science in Nigeria and everywhere. In this research electrical resistivity method was used to investigate the open dumpsite at Gosa, Abuja in order to determine the vulnerability of the groundwater to contamination in the area as well as the surrounding environment to leachate contamination. A total of sixteen (16) vertical electrical sounding points with maximum current electrode of 100 m were investigated. The acquired data were analyzed and used to establish the parameters required to fulfill the objectives of this research. A maximum of four geoelectric sections were identified in the area. They included sandy topsoil, clayey sand, weathered basement and fractured/fresh basement. Apparent resistivity values obtained for the four layers delineated were between 64.6 Ωm and 215.5 Ωm for the first layer; 19.0 Ωm and 295.6 Ωm for the second layer; 66.9 Ωm and 1003.7 Ωm for the third layer; and 438.0 Ωm and 1719.9 Ωm for the fourth layer. Furthermore, the ranges of the thickness of the layers were found to be 0.7 m and 12.9 m for the first layer; 1.3 m and 9.8 m for the second layer; and 1.6 m and 11.6 m for the third layer. The depths of water table in the area were estimated to range between 2.1 and 21.6 m. The parameters used in characterizing the aquifer protective capacity of the overburden units were layer thickness and their corresponding resistivity values. Accordingly, the total longitudinal layer conductance of the overburden of the area was generally found to be low, ranging between 0.014 mhos and 0.063 mhos, implying that the aquifer protective capacity of the area is poor. The 1D resistivity cross section for the three profiles investigated exposed the movement of contaminants toward the aquifer, further validating the fact that the aquifer is not protected. The low protective capacity of the area aided the conclusion that the water aquifer in the area was highly vulnerable to leachate contamination from the dumpsite.

Biography

Dr. Abdulsalam Nasir Naeem is a Senior Lecturer in the Geophysics research group at the Department of Physics University of Abuja, Nigeria where his researches focuses on Groundwater Contamination and the environmental effects and potential theory geophysics. He holds a Bachelor of Science degree in Physics, Master of Science degree and a doctorate all in Applied Geophysics. He has been the Head of the department of Physics, University of Abuja, since 2016. He has also served as the University of Abuja Coordinator of Students Industrial Work Experience Scheme (SIWES). He did a postgraduate foundation course in astronomy and astrophysics in 2007 at the National Mathematical Centre, Nigeria. He is a member of some professional bodies which include; Nigerian Institute of Physics (NIP), Nigeria Mining and Geosciences' Society (NMGS) and Society of Exploration Geophysics (SEG), USA. He has published his well research articles of more than thirty (30) and still counting in both local and international reputable journals. He has linkages with many scientists across Asia and Africa.

Modeling potential redistribution of life zones and plant species communities under climate change in Puerto Rico

Azad Henareh Khalyani

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The potential effects of climate change on ecological life zones and plant species communities were studied in Puerto Rico. Two climate change model selection strategies were used: the average of all available GCMs and the average of the models that are able to reproduce the observed large scale dynamics that control precipitation over the Caribbean. Five, island-wide and multi-decadal, averages of daily precipitation and temperature were estimated by way of a climatology-informed interpolation of the site-specific downscaled climate model output. Holdridge life zone classification was used to map the possible ecological effects of climate change. The potential effects of climate change on 200 plant species were analyzed in the same periods based on ensemble bioclimatic modeling using eight modeling algorithms and community richness analysis. Precipitation is predicted to decline in both model ensembles, but the decrease was more severe in the 'regionally-consistent' models. The warming from the 1960-1990 period to the 2071- 2099 period was larger than the projected warming at the global scale. Life zones may shift from wetter to drier zones. The probabilities of environmental suitability decline for wet climate species and increase for drier and warm climate species in the future periods under both emission scenarios. Expansion of dry climate species to higher elevations appears to be a prominent response of species to climatic change in the island based on changes in environmental suitability.

Biography

Azad is a research scientist at the Natural Resource Ecology Laboratory (NREL), Colorado State University. He was previously a postdoctoral scholar with North Carolina State University based at the USFS International Institute of Tropical Forestry in Puerto Rico where he worked on the climate change effects on island life zones. Azad received his PhD in Forest Science from Michigan Technological University. His research involves using GIS, remote sensing, and spatial models to examine the potential impacts of climate change and land management strategies on future social-ecological systems.

Causes of groundwater contamination using geochemical approaches and fuzzy logic on GIS platform: A case study of Busan Metropolitan City, Korea

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Geochemical approaches (Gibbs Plot, Saturation Index) and a fuzzy technique on GIS platform were used to identify the causes of groundwater contamination in Yeonje-gu district of Busan Metropolitan City, Korea. Suyeong River and Oncheon Stream flowed along the eastern part and the northern part of the study area, and they were influenced by the seawater intrusion. Major groundwater flows from the high mountain in the southern part to the plain in the center of the study area, and finally moves to the Oncheon Stream. Piper's trilinear diagram showed that groundwater quality was classified into 5 types of CaHCO_3 , NaHCO_3 , NaCl , CaCl_2 , and CaSO_4 types in the order. CaHCO_3 type was the most predominant (42%) in the study area. Gibbs plot exhibited that major ions were derived from the rock weathering condition. Ionic relationship and saturation mineral indices indicated that evaporation, dissolution and precipitation processes controlled the groundwater chemistry. The higher concentrations of major ions were mainly related to the local geology. The seawater intrusion and municipal contaminants were the secondary contamination sources of groundwater. Fuzzy membership values of all chemical components indicated the areas of high values in the chemical components. The overlay map of fuzzy membership values for all chemical components found highly contaminated groundwater areas in the study area. It was concluded that groundwater quality was influenced by local geology, seawater intrusion, and municipal contamination materials in the study area. This research demonstrated that geochemical analyses and fuzzy GIS method were very useful for the investigation of contamination sources and groundwater with good quality.

Biography

Prof. Sang Yong Chung has completed his Ph.D. from the University of Nevada at Reno, U.S.A. He is interested in the variation of groundwater quantity and quality according to the climate change. He worked in the Dept. of Earth & Environmental Sciences, Pukyong National University, Korea for 35 years, and is an Emeritus Professor now. He served as a President of Korean Society of Soil and Groundwater Environment (KOSSGE) 14 years ago and is an advisor of KOSSGE now. He published over 80 articles and presented over 150 academic conference proceedings. He also registered 3 domestic and 1 international patents.

Winter atmospheric circulation anomaly associated with recent Arctic winter warm anomalies

Bingyi Wu

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Winter Arctic atmosphere in the mid- and lower-troposphere has shifted to a warmer stage since the winter of 2004/2005 relative to the winter mean averaged from 1979/1980 to 2003/2004. Recent Arctic warm anomalies are concurrent with warm anomalies over the North Pacific, marginal seas of the Arctic Ocean, and the North Pacific, with weakened SLP in the low-latitudes from Africa eastward to the central Pacific. Correspondingly, winter 500 hPa height anomalies exhibit wave train structures over Eurasia, the North Pacific, and North America. These major features frequently reappear since the winter of 2004/2005. A regionally averaged winter SLP in 30°-180°E-150°W, 40°-65°N can be regarded as the intensity index to characterize interannual variability of the atmospheric circulation anomaly associated with recent Arctic winter warm anomalies. This atmospheric circulation anomaly is different from the Arctic dipole anomaly and displays a closer association with atmospheric variability over the mid- and low-latitudes relative to the Arctic. It directly connects Arctic warm anomalies in the mid- and lower-troposphere to increased frequencies of extreme cold events in the mid- and low-latitudes of Eurasia and western North Pacific, and western North America, with decreased frequencies of extreme cold events in the Arctic and from the Okhotsk Sea to the North Pacific. This study also implies that SST cooling in the tropical central and eastern Pacific would also contribute to recent Arctic winter warm anomalies though its impact mechanism is not clear yet.

Biography

Dr. Bingyi Wu is a principle investigator in the Meteorology and Atmospheric Environmental Group at Institute of Atmospheric Sciences, Fudan University where his research centers on climate variability, monsoon, and extreme weather events over East Asia and their associations with Arctic sea ice and atmospheric circulation anomalies. He earned a doctorate in synoptic dynamics at Institute of Atmospheric Physics, Chinese Academy of Sciences.

Thermal Tolerance of Fishes from Tropical Rivers in Thailand: Global Warming Implications

Sampan Tongnunui¹, F.W.H. Beamish², Thanasit Punkumsing¹ and Patitta Kritjirakorn¹

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Critical thermal maxima (CT_{max}) were measured for 17 indigenous and relatively common and uncommon fishes from small rivers in western Thailand after acclimation to 25.0°C. CT_{max} of western fish species were found at 35.6±0.2°C of the lowest for *Batasio fluviatilis*, and at 38.5±0.5°C of the highest for *Myatacoleucus chiloferus*, respectively. Four loach species were acclimated from 20°C to 35°C. CT_{max} correlated positively with thermal acclimation temperature between 20°C and the CT_{max} that varied with the four species, i.e. *Schistura aurantiaca*, *Schistura sexcauda*, *Homalopteroides smithi* and *Pseudohomaloptera sexmaculata* between 30°C and 35°C. The highest and lowest CT_{max} were 38.2±0.2°C at 35°C acclimation for *Pseudohomaloptera sexmaculata* and 35.7±0.2°C at 20°C acclimation for *S. aurantiaca*, respectively. Currently, some monthly maximum temperatures of some Thai rivers approach or exceed these CT_{max} values. For global climate change models predicted for ambient temperatures in Southeast Asia, the temperatures will be increased by 3.0°C to 5.0°C in the coming decades. They are mainly subjected from economic intensities and industrial activities. Expected temperature changes are likely to impose severe losses in fish species diversity in Thailand.

Biography

I Sampan Tongnunui was born in Satun Province, Thailand. I am Lecturer in Conservation Biology, Mahidol University, Thailand. I have been studied ecology of freshwater fishes in Thailand for 2002 to recent. It is approximately 16 years for fish ecology research. I have been working with Professor Dr. F.W.H. Beamish who are scientist in the fisheries research of Canadian Institute, have suggested and commented to me for all. Now, I hope that our research will be useful for helping the world for protecting the global warming.

Historical Development of the National Climate Change Policy and the Role of the Climate Change Secretariat in Sri Lanka

Vindya Hewawasam and Kenichi Matsui

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Faculty of Life and Environmental Sciences, University of Tsukuba, Japan*

Being both an island nation and developing country, Sri Lanka is highly vulnerable to the adverse impacts of climate change. In order to respond to the natural disaster impacts and the global environmental management concerns, the government of Sri Lanka ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1993. Accordingly, the Ministry of Mahaweli Development and Environment (MMD&E) named as the National Focal Point (NFP) to the UNFCCC in Sri Lanka. In March 2008, in the midst of rising interests in and concerns about climate change impacts in the world, the Ministry established the Climate Change Secretariat (CCS), signalling its increased political recognition and concerns about the importance of an institutional mechanism for climate change policies. Accordingly, the CCS adopted the National Climate Change Policy (NCCP) in 2012 with an aim to minimize adverse consequences. The CCS coordinates and implements climate change related activities, including NCCP. The NCCP provides guidelines for policy makers to efficiently and effectively address adverse impacts of climate change. This study examines the historical development of climate change policies in Sri Lanka under three different timeframes: namely, ratification of UNFCCC and Kyoto Protocol (1993-2003); establishment of the CCS and adoption of the NCCP (2004-2014) and ratification of the Paris Agreement (2015-2018). The main objectives of the study is to examine the role of the CCS to implement the NCCP and find out the historical trends, strengths and gaps of the NCCP.

Biography

Vindya Hewawasam has completed her Master in Development Studies from the University of Colombo, Sri Lanka and currently reading for her Master of Environmental Science from the University of Tsukuba, Japan. She also work as the research assistant of the Policy Planning & Monitoring Division, Ministry of Mahaweli Development and Environment, Sri Lanka. She has published 3 research papers. Currently, her research is focus on an analysis of Climate Change Secretariat initiatives to achieve the National Climate Change Policy in Sri Lanka.

Simulation of snowmelt-runoff under climate change scenarios in a data-scarce mountain environment

Muhammad Yasir, Adnan Ahmad Tahir, Samreen Abdul Hakeem, Tiesong Hu and Huma Hayat

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Pakistan is an agriculture-based economy where main share of irrigation water for its cultivated lands is derived from the Upper Indus Basin (UIB). UIB water supplies, most significantly the mighty Indus River, are mostly contributed from the high-altitude snow and glacier fields situated in the Hindukush-Karakoram-Himalayan ranges. Any change/disruption in the flows of these river catchments due to climate variability may result in the form of catastrophic occasions like floods and droughts and resultantly distressing the economy of Pakistan. With this thought, here it is aimed to simulate snowmelt runoff in a mountainous sub-catchment (Shyok River basin) of the UIB under different climate change scenarios. Snowmelt Runoff Model (SRM) coupled with remotely sensed snow cover product (MOD10A2) is used to simulate the snowmelt runoff under current and future climate scenarios in the study area. The study specifies SRM's appreciable proficiency in simulating the flow in Shyok River with a cooperating average Nash-Sutcliffe coefficient value of 0.8 (0.63–0.93) for time span of six years (2000–2006) for basin-wide and zone-wise simulations. Investigating climate change impacts under different scenarios using SRM has also produced some noteworthy findings, hence attesting that SRM equipped with remotely sensed snow cover products is an active tool to estimate snowmelt runoff in high mountain data-scarce environments.

Biography

Muhammad Yasir, currently Ph.D. Researcher at State Key Laboratory of Water Resources and Hydro-power Engineering Sciences, School of Water Resources and Hydro-power Engineering, Wuhan University, Wuhan, Hubei, PR of China, working on my doctoral dissertation with a focus on hydrological modeling for water resources as well as reservoir management taking the long term impacts of climate into special consideration. During the course of earning a Master of Science degree in Environmental Sciences, my research focused on the climate change impacts on snow and glacial water resources located in high elevation inaccessible terrain, making use of advanced technology of Remote Sensing for investigating the status of glacial water reserves. I've been an active participant in different courses, conferences and summer schools organized with the theme of climate change, remote sensing, Glacial Mass Balance Measurement. I've been able to publish research articles in renowned journals regarding water resources and reservoir management.

Quantifying green water deficit for wheat production in different climatic zones of Iran

Abdullah Darzi-Naftchali

Assistant professor, Water Engineering Department, Sari Agricultural Sciences and Natural Resources University, Iran

Limited water resources and enhanced competition of various sectors in the use of these limited resources, made it necessary to take into consideration appropriate management measures to reduce the negative impacts of water scarcity, particularly effects of climate change. Green water deficit (GWD) defined as the difference between crop water requirement and effective precipitation is an appropriate measure to find suitable cropping calendar in water scarce regions. In this research, the contribution of green water to supply wheat water requirement in four climatic zones of Iran was studied. The climatic data of Gorgan, Sanandaj, Shiraz and Ahvaz weather stations were analyzed for the base (1980-2010) and future (2010-2100) periods under RCP 4.5, RCP 8.5 and RCP 2.6 scenarios. Increase in temperature, cause wheat cultivation calendar to be shifted forward to winter season. However, delayed planting dates in the study regions will increase irrigation water requirement. Climate change would result decrease in green water in the study regions unless during autumn and winter seasons in Gorgan and winter season in Sanandaj. The findings of this research demonstrated that the increase in atmospheric demand in rainy months could threaten both rainfed and irrigated agriculture through increasing the GWD in autumn cultivations. The issue requires planning for coping with this global challenge by selecting a suitable calendar to sustain agriculture in the study regions.

Biography

Dr. Abdullah Darzi-Naftchali is currently assistant Professor at the Sari Agricultural Sciences and Natural Resources University, Sari, IRAN. He is interested in the areas of Irrigation and drainage, Climate change, Environmental Impact Assessment of Irrigation and Drainage projects.

Land use projections in China under global socioeconomic and emission scenarios: Utilizing a scenario-based land-use change assessment framework

Na Dong and Hui Lin

Institute of Space and Earth Information Science, The Chinese University of Hong Kong, Shatin, NT, Hong Kong, China

Land-use changes under the shared socioeconomic pathways (SSPs) and the representative concentration pathways (RCPs) have been analyzed globally, but how regional and national land use respond to the global mitigation policies is seldom explored, which poses difficulties in regional environmental adaptation and decision-making. China, as a major food consuming and biofuel production country, would suffer great uncertainties in future land-use dynamics under the global scenarios. Here, we present a scenario-based land-use change assessment framework, integrating Global Change Assessment Model and Future Land Use Simulation Model, to evaluate the potential land use projections of China from 2010 to 2100. Eight scenarios with different combinations of SSPs and radiative forcing targets of RCPs are designed, to analyze the impacts of the global socioeconomic and emission assumptions on regional mitigations and land-use changes. We recalibrated the historical land use data and urban dynamics of China to improve the consistency of modeling results with the actual regional changes. Meanwhile, differences in land use dynamics are demonstrated by spatial downscaling, which are jointly affected by the global assumptions and local driving factors, showing a fierce competition between the crop and forest. We find that the regional crop changes are sensitive to the socioeconomic dynamics as well as the bioenergy production, while different carbon regimes drive the forest changes in unexpected ways. Besides, overall heterogeneous landscape patterns and similar spatial suitability maps are found in distributions of land-use change between the emission and socioeconomic scenarios. The results indicate that this framework embedded with the consideration of anthropogenic managements as well as the detailed interactions of local environments provides an effective way to investigate regional land use response to a range of alternative future pathways.

Biography

Na DONG received her Msc degree from Peking University in 2014 and got the PhD. from the Chinese University of Hong Kong in 2018. Her major research interests are in land-use change simulation, interactions of human activities and land-use change and climate change, and temporal-spatial GIS and land surface dynamics. The related paper are published and submitted on Global Environmental Change and Earth's Future. She has participated in the National Natural Key Basic Research Program "Simulation and assessment of the interaction between human activities and global change" and Hong Kong RGC programs.

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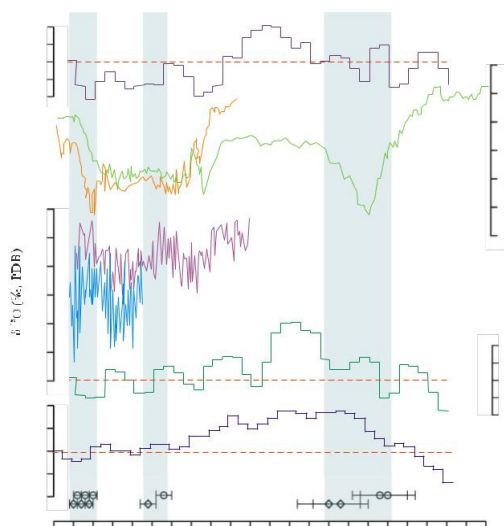
Posters

Response of flood to regional climate change in North China

Junping Wang, Mingjian Wei, Baolin Pan and Xiaohong Zhao

College of Resource, Environment and Tourism, Capital Normal University, Beijing 100048, China

Floods are one of the most important natural disasters. It is a serious threat to human survival and social development. During the historical period, floods occurred frequently in Yongding River. It is necessary to understand the flood law and mechanism of the river but its ancient flood data is scarce. Many periods of paleoflood sediments are kept on the tread of the fluvial terrace, which differs significantly from terrace facies deposition. Six periods of paleo-flood events were determined by the profile deposition. The chronology of paleoflood sediments was established by optically stimulated luminescence (OSL) dating technology. Both the single-aliquot regenerative-dose (SAR) protocol and standard growth curve (SGC) method are applied to the recovery of equivalent doses. At the same time, the equivalent doses of different sizes and the corresponding ages were used to compare. The results show that the SGC method is suitable to get the equivalent dose in Yongding River, and the results of the large and small measuring tablets are basically the same. These results show that the degree of the sample is relatively consistent and the samples are well bleached. Six episodes of paleoflood events occurred in 8.0-7.0 ka, 8.5-7.3 ka, 2.8-2.4 ka, 1.0-0.9 ka, 0.8-0.7 ka and 0.6-0.5 ka respectively in Yongding River. The ancient floods mainly occurred in Holocene, concentrated in the 8.5-7.0 ka, 2.8-2.4 ka and 1.0-0.5 ka. Compared with the continuous high-resolution climate records in Eastern China, the ancient floods occurred mainly in the climate transition period. High-frequency paleofloods and climate change are closely related. The pure flood-prone periods of the last 2000 years coincide with the above results.



Biography

Junping Wang has completed his PhD from Lanzhou University. He is mainly engaged in paleoclimate and fluvial landform research and has published more than 30 papers in reputed journals and has been serving as an associate Prof. in Capital Normal University now.

Holocene climate change records from sand wedge at Linggo Co, Qiangtang Plateau

Baolin Pan¹, Chaolu Yr², Mingjian Wei¹ and Junping wang¹

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²A Laboratory of Tibetan Environment Changes and Land Surface Processes, Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing 100085, China

As a type of periglacial landform, the sand wedges, usually form during dry and cold periods. One sand wedge was found, about 1.5 m high and 0.7 m wide, in the east lakeshore of Linggo Co in the central Tibetan Plateau (TP). Three optically stimulated luminescence (OSL) samples were collected from this sand wedge (SW) section, from the top, the middle, the bottom of the SW. In addition, one OSL sample was collected from the sand layer which overlies the sand wedge, about 30cm thick. We obtained ages of 0.4 ± 0.0 , 1.5 ± 0.2 , 1.5 ± 0.1 and 6.5 ± 0.5 ka for one sand layer and three sand wedge samples from top to the bottom of the section, respectively. The age obtained from the sand layer sample indicates that the sediments have been deposited during the Little Ice Age (LIA). The three ages from the SW from that it was active about 1.5 and 6.5 ka ago, i.e. during Middle and Late Holocene. During sand wedge activity, the lake level was lower than the bottom of the sand wedge and indicates a cold-dry period.

Biography

Baolin Pan has completed his PhD from Institute of Tibetan Plateau Research, Chinese Academy of Sciences. He is mainly engaged in ancient environment and paleoclimate research and has published more than 30 papers in reputed journals and has been serving as lecturer in Capital Normal University now.

Using statistical model to simulate the impact of climate change on maize yield with climate and crop uncertainties

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Assessment of the impact of climate change on crop productions with considering uncertainties is essential for properly identifying and decision-making agricultural practices that are sustainable. A clear understanding of the influence degree of each source of uncertainty in ensemble simulations is important for determining their relative importance under limited conditions when assessing the impact of climate change on crop production with uncertainties. Statistical model, in which historical data on crop yields and weather are used to establish relatively simple regression equations, effectively avoid the extensive input parameter uncertainty in process-based model. In this study, we employed 24 climate projections consisting of the combinations of eight GCMs and three emission scenarios representing the climate projections uncertainty, and two crop statistical models with 100 sets of parameters in each model representing parameter uncertainty within the crop models. The goal of this study was to evaluate the impact of climate change on maize (*Zea mays* L.) yield at three locations (Benxi, Changling, and Hailun) across Northeast China (NEC) in periods 2010–2039 and 2040–2069, taking 1976–2005 as the baseline period. The multi-models ensembles method is an effective way to deal with the uncertainties. The results of ensemble simulations showed that maize yield reductions were less than 5 % in both future periods relative to the baseline. To further understand the contributions of individual sources of uncertainty, such as climate projections and crop model parameters in ensemble yield simulations, variance decomposition was performed. The results indicated that the uncertainty from climate projections was much larger than that contributed by crop model parameters. Increased ensemble yield variance revealed the increasing uncertainty in the yield simulation in the future periods.

Biography

Yi Zhang is an Associate Professor in Chinese Academy of Meteorological Sciences. Her research focuses on climate change and agriculture production, adaptation and yield gap analysis, uncertainties in projections of climate change on crop production. She has published more than 25 SCI papers in reputed journals.

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