2020 International Conference on Energy, Resource and Environment

ERE 2020

Conference Program

https://www.ere2020.org

Conference Co-organized by
Shandong University
Asia Pacific Institute of Science and Engineering (APISE)

Dec. 11-13, 2020 ● Qingdao, China

CONTENTS

WELCOME MESSAGE

Due to COVID-19 pandemic, we have decided to change the main conference, **2020 International Conference on Energy, Resource and Environment (ERE 2020)** which was planned to be held in Shandong University (Qingdao), China during Dec.11-13, 2020, to be held online. The conference is co-organized by Shandong University and Asia Pacific Institute of Science and Engineering (APISE).

The change of conference format will not influence on our conference's aim and pursuit. ERE 2020 aims to present the latest research related to **Energy, Resource and Environment** and other related topics. By on-line oral presentations and poster presentation, this conference provides opportunities for the participants to exchange ideas, to establish professional relationships for future collaborations.

We emphasize that the change of conference form will not have negative impact on papers' publication and indexing. All the registered and presented papers of ERE 2020 will be included in the volume of **IOP Conference Series: Earth and Environmental Science (ISSN: 1755-1315),** which will be submitted to **Engineering Village, Scopus, Thomson Reuters (WoS)** and other databases for review and indexing.

We would like to thank our outstanding Keynote Speakers: Dr. Renfei Feng from Canadian Light Source, Saskatoon, Canada, Dr. Jiancheng (James) Zheng from University of Ottawa, Canada, and Invited Speaker: Prof. Xian-Zheng Yuan from Shandong University, China for sharing their deep insights on future challenges and trends.

We would like to thank all the committee members for their great support on organizing the conference and on reviewing the papers submitted to ERE 2020. Special thanks to all the participants of the conference.

Prof. Shuguang Wang & Prof. Gordon Huang

Conference Co-Chair

CONFERENCE SPEAKERS

Keynote Speakers

Dr. Renfei Feng
Canadian Light Source, Saskatoon, Canada

Biography: Dr Renfei Feng is a Senior Scientist and Beamline Responsible in charge of a hard X-ray microprobe facility at the Canadian Light Source – the national synchrotron research center in Canada. He is also an Adjunct Professor in University of Saskatchewan. He obtained his PhD degree in 1993 in Atomic and Molecular Physics, then worked as a Lecturer (Assistant Professor) and Associate Professor in the University of Science and Technology of China (USTC) from 1993-1997. He was the Deputy Director there for Nuclear and Particle Physics Division, and Atomic and Molecular Physics Laboratory. In 1997, Dr Feng moved to Canada. He worked as a Peter Wall Postdoc Fellow and a Research Associate at University of British Columbia from 1997-2002; followed by a Staff Scientist in the Alberta Synchrotron Institute from 2002-2005. In 2005, he took a Staff Scientist position at the Canadian Light Source, leading the development, commissioning, and operation of a hard X-ray microprobe beamline VESPERS. During his time in China, Dr Feng has been awarded a number of awards including National and CAS Advancement of Science and Technology Awards. He is the member of American Physical Society; Minerals, Metals, and Materials Society; International Society for Optics and Photonics; Materials Research Society; Society for Applied Spectroscopy; European Association of Geochemistry. He has authored 100+ peer-refereed publications. His current research interests focus on Synchrotron Instrumentation and Applications, including the techniques of X-Ray spectroscopies, imaging, diffraction, and their applications in the environmental sciences, materials sciences, and life sciences.

Keynote Lecture: Synchrotron Radiation and its Applications in Energy, Resource, Environment Researches

Synchrotron radiation is an accelerator-based light source with extreme brightness and unique properties. It enables the researches and applications by providing a set of techniques which are generally not possible using the regular laboratories and instruments. This presentation will give an overview on the synchrotron radiation principal and properties. As a national synchrotron facility in Canada, Canadian Light Source will be briefly introduced. The techniques available for environmental science will be presented to show the capabilities of X-ray fluorescence spectroscopy, X-ray absorption spectroscopy, X-ray diffraction, and their combinations. Some of the studies will be shared to showcase their applications in energy, resource, and environment researches.

Dr. Jiancheng (James) Zheng
University of Ottawa, Canada

Biography: Jiancheng (James) Zheng is a research scientist (cold regions chemistry) with Geological Survey Canada (GSC), Natural Resources Canada (NRCan) based in Ottawa. He completed his undergraduate program in chemistry in Wuhan University, China, his master program in geosciences with Ottawa University, Canada and his PhD program in Environmental Geochemistry in Heidelberg University, Germany. He is an adjunct professor with the Department of Earth and Environmental Sciences, University of Ottawa.

In his early research career, James worked on marine fouling organism corrosion for a Chinese oceanography institute located in Xiamen, China. James came to Canada to carry out his 2-year scholarship awarded by the Department of Education, China in 1983, working on marine CO2, at the Institute of Ocean Sciences (IOS), Department of Fisheries and Oceans (DFO) in Victoria, BC, under supervision of Dr. C. S. Wong, director of Ocean Chemistry Division. James was later invited to join the ice core research project by Dr. Shier Berman, director of Measurement Sciences at National Research Canada (NRC), Canada. James has been worked with GSC, NRCan since 1999.

James is interested in climate changes and anthropogenic contaminants via studying snow/ice cores and environmental waters. His major research areas include archive reconstruction of inorganic trace metals and paleoclimate variations as well as monitoring of current climate trends with ice and snow in the Canadian High Arctic. James developed his GSC version of ultra clean protocol for snow/ice sampling, processing and sample storage/protection for studies of trace elements with ultra low concentrations. James is also interested in development of methodologies and quality control protocols for practical operation in laboratory and in the filed. He has recently set up a laboratory for tangential flow filtration systems for studying mobility and fate of trace elements in environment waters. James' interest also extends to other contaminants, both inorganic and organic, contaminant source apportionment, the linkage of archives between ice cores and other records as well as ice core drilling in Canadian High Arctic ice caps.

Keynote Lecture: Resources, Climate Change and Environment: Understanding and Thoughts

It is both natural and justified to utilize natural resources. However, when we say we are justified to use them, we should bear in mind to protect our air, land and water, as well as to reduce waste, to lower greenhouse gas emissions.

Climate is changing which causes environment change. Resources that we are utilizing are tightly related to environment and its change. Therefore, understanding climate change and preparing for climate/environment change is so important for human safety and the stability of economical development that attention and efforts paid to the issue cannot be overemphasized.

Most recent IPCC's special report presents that "human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels". Actually observed global mean surface temperature for the decade 2006 to 2015 was 0.87oC warming. For the coming decades, anthropogenic global warming is estimated at ~0.2°C per decade, reaching 1.5°C warmer between 2030 and 2052". Consequences are glacial ice melt, sea level rise, harmful Impact on economy, immerging diseases, et al. Therefore, we are facing challenges of environment/climate change and its impacts. We have to address this issue. To do so, we need to understand climate/environment change and prepare for the change and its impacts that are facing and approaching us.

This talk bases on information from our research results, my learned and my understanding as well as my thoughts about climate and environment change. Talk will focus on ice core studies. Brief introduction of ice core studies, such as why ice core studies, where to get ice cores and how to carry out ice core studies, will be presented.
Discussion on climate/environment change is welcome; especially on what we should do and how we should do, because it is everyone's responsibility to address environmental problems.

Invited Speaker

Prof. Xian-Zheng Yuan
Shandong University, China

Biography: Xian-Zheng Yuan is a professor in School of Environmental Science & Engineering, Shandong University. Prof. Yuan's research mainly focuses on environmental nanotechnology and environmental biotechnology, including fate and behavior of nanomaterials in aquatic and terrestrial environments, environmental impact of emerging contaminants on organisms, etc.

Invited Lecture: Interaction between Nanoplastics and Primary Producers
Recently, in microplastics research, there has been considerable focus towards nanoplastics, especially their fates and ecological impacts in freshwater environments. However, the potential threats of nanoplastics to primary producers in freshwater systems remain unclear. Here, we explore the metabolite profiles and signaling pathways of Synechococcus elongatus in response to a short-term amino-modified polystyrene nanoparticle (PS-NH2) exposure via nontargeted metabolomics and genetic engineering. In addition, we also show that PS-NH2 promote microcystin synthesis and release from Microcystis aeruginosa, a dominant species causing cyanobacterial blooms, even without the change of coloration.

PRESENTATION PROGRAMME OVERVIEW

Date	Time	Programme
Dec. 11th, 2020	9:30-9:40	Opening Ceremony
	9:40-10:20	Keynote Speech 1 Dr. Renfei Feng
	10:20-11:00	Keynote Speech 2 Dr. Jiancheng (James) Zheng
	11:00-11:30	Invited Speech 1 Prof. Xian-Zheng Yuan
	11:30-13:30	Lunch
	13:30-15:45	Technical Session 1 Environmental Science and Technology
	15:45 -15:50	Break
	15:50-18:05	Technical Session 2 Natural Resource Management
	18:05-18:10	Break
	18:10 -18:20	Poster Session
	18:20-18:30	Closing Ceremony

INSTRUCTIONS TO PRESENTATIONS

Materials Prepared and Provided by the Presenters:

Oral Presenter:
PowerPoint or PDF files
Duration of each Presentation (Tentatively 15 minutes)
Laptops (with MS-Office & Adobe Reader)

Poster Presenter:
Poster: color printing; Add Conference Name's Acronym on the top of poster (Such as "ERE 2020" and paper ID)

Minutes of Q&A

Keynote Speech: 35 Minutes of Presentation and 5 minutes' Q&A
Invited Speech: 25 Minutes of Presentation and 5 minutes' Q&A
Presenter: 10 Minutes of Presentation and 5 minutes' Q&A

NOTICE:

- Certificate of Participation will be awarded after the conference finished via fast delivery.
- One best presentation will be selected from each session. The best one will be announced when each session ends, and will be awarded with a "Best Presentation" certificate.

ONLINE VIDEO CONFERENCE OPERATION GUIDE VIA VOOV

● (Conference Information):

Time	Theme	Conference ID	Link
9:30 a.m.-18:30 p.m. Dec. 11, 2020 (GMT+8)	ERE 2020	530 805 774	https://meeting.tencent.com/s/pJV4Lj1TrrF7

● Testing:

All the participants can join the conference room during the testing time, the conference secretary will arrange the participants who will do the oral presentation to test one by one. (p.s. Conference ID keeps the same with testing ID)

Testing Time	Participate	Testing ID	Link
15:30 p.m.-17:30 p.m. Dec.07, 2020 (GMT+8)	Oral Speakers	530 805 774	https://meeting.tencent.com/s/pJV4Lj1TrrF7

● Operation Guide:

1. Video meeting software: VooV

Download link:

A.) Chinese Version:
https://meeting.tencent.com/download-mac.html?from=1001&fromSource=1 (Mac OS)
https://meeting.tencent.com/download-win.html?from=1001&fromSource=1 (Windows)

B.) International Version
https://voovmeeting.com/download/darwin（Mac OS）
https://voovmeeting.com/download/windows （Windows）

2. Join the Conference:

Method 1: Click the Conference link (https://meeting.tencent.com/s/ZbAUsY3yGASB), or click "Join the conference", then input the Conference ID: 530 805 774. When you join the conference room, you need to fill in your phone number for authentication, then fill in your "Paper ID +Name" at the "Name" to join the conference.

*Tip: Should you fail to "Join the Conference" as a visitor, we suggest you register an account by method 2, then log in and join the conference.

Method 2: You can register at the APP/ website (https://www.voovmeeting.com/), log in and join the conference by the link or tap the Conference ID.

● Note:

- The conference committee will **call the roll 5 minutes before** our conference, please join the conference in advance for at least 5 minutes. The conference secretaries will be waiting since 9:00.
- Please **wear headphones** during the meeting to block out the outside noise. Keeping the video on and keeping online are suggested.
- Please test the video meeting software in advance.
- During the poster session, we will upload all the poster files in the "meeting room". For learning more about posters, you could download the files to read only. But please note that, all materials have not been published, please **respect the paper originality and copyright.**

  *Note: Since International version does not support the function of file transmission, we recommend you to download Chinese version, then you can upload and download file smoothly. If Chinese version is not available in your country or region, you can download International version; as for e-posters, we could email you via email box once you requested.

- Please follow WeChat for Consultation (**APISE17358663189**) for more information. ERE 2020 Wechat Group will update conference information in realtime.
- Should you have any further questions about this operation guide, please click https://www.voovmeeting.com/ for help. You can also contact the conference secretary at +86-17723329879(China), +852-30506939 (Hong Kong).

TECHNICAL SESSION

Keynote & Invited Speech Session Session Chair: Gordon Huang (University of Regina, Canada) 9:40-11:30, Dec. 11th, Friday | Room ID: 530 805 774			
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10:20-11:00	KN2	Resources, Climate Change and Environment: Understanding and Thoughts ***Dr. Jiancheng (James) Zheng,*** University of Ottawa, Canada	3
11:00-11:30	IS1	Interaction between Nanoplastics and Primary Producers ***Prof. Xian-Zheng Yuan,*** Shandong University, China	4
11:30-13:30	**Lunch**		
Technical Session 1: Environmental Science and Technology **Session Chair: Shan Zhao** (Shandong University, China) **& Rubing Zheng** (North China Electric Power University, China) **13:30-15:45, Dec.11th, Friday | Room ID: 530 805 774**			
13:30-13:45	R1031	Development of a non-deterministic optimization-driven computable general equilibrium model for China ***Mengyu Zhai,*** North China Electric Power University, China	13
13:45-14:00	R1018	Analysis of Wetland Landscape Pattern Evolution and Future Trends: A Case Study of Xiongan New Area, China ***Miao Yang,*** China Institute of Water Resources and Hydropower Research, China	13
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14:15-14:30	R1019	An evaluation and regulation method for stereoscopic spatial connectivity of a wetland system: A case study of the Heilongjiang River Basin in China ***Qin Yang,*** China Institute of Water Resources and Hydropower Research, China / Tsinghua University, China	14
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15:00-15:15	R1030	Losses of natural coastal wetlands by land conversion and driving force analysis in the Yellow River Delta area ***Yong Liu,*** Sino-Canada Resources and Environmental Research Academy, North China Electric Power University, China	15
15:15-15:30	R034	MSW in a Circular Economy: 2020 - 2035 scenarios for the City of Oslo, Norway ***Liang Wang,*** SINTEF Energy Research, Norway	16
15:30-15:45	R1032	Enhanced nitrate removal from decentralized rural domestic wastewater using multi-layer soil systems ***Pei Song,*** North China Electric Power University, China	16
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16:05-16:20	R1035	Projection on climate changes over China using a PRECIS regional climate model ***Junhong Guo,*** North China Electric Power University, China	18

16:20-16:35	R1016	Optimized Configuration of a Hose Reel Traveling Irrigator ***Ge Maosheng,*** Northwest Agricultural and Forestry University, China	18
16:35-16:50	R1027	Development of a boundary-impact heterogeneity analysis approach ***Feng Wang,*** Beijing Normal University, China	18
16:50-17:05	R1017	Forecasting of Atmospheric-hydrological Models in Mountainous Areas of North China Based on WRF Coupling Different Hydrological Models ***Wei Wang,*** China Institute of Water Resources and Hydropower Research, China/Hohai University, China	19
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17:35-17:50	R1023	Visible light driven hydrogen evolution using external and confined CdS: Effect of chitosan on carriers separation ***Yizhong Zhang,*** Tianjin University, China	21
17:50-18:05	R1033	The applications in energy-saving technology based on cascade reaction ***Xu-Heng Yang,*** National University of Defense Technology, China	21
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Poster Session **Session Chair: Yanfeng Li** (North China Electric Power University, China) **18:10-18:20, Dec. 11th, Friday | Room ID: 530 805 774**	
R002	Study on the Preparation and Application of Chitosan/Silica Cu(Ⅱ) Imprinted Microspheres ***Min Zhang,*** Dalian Ocean University, China
R028	A sulfur modified Fe_3O_4@ ZnO Fenton-like catalyst for efficient degradation of ofloxacin in a wide pH range ***Xiang Wang,*** China University of Geosciences, wuhan, China
R029	Accurate detection of multiple metal ions in groundwater using multi-channel fluorescence sensor array ***Linfeng Chen,*** China University of Geosciences, Wuhan, China
R035	Optimization of var-voltage regulation control strategy for grid-connected inverter of photovoltaic power ***Tao Quanlin,*** NARI Techonlogy CO., LTD, China
R036	Does the Energy Internet improve the efficiency of resource allocation? ---Theoretical mechanism and case analysis ***Guoqiong Long,*** Yunnan University of Finance and Economics, China
R040	Forecast of China's future nuclear energy development and nuclear safety management talents development ***LI Xiao-ding,*** Nuclear and Radiation Safety Center, China

ABSTRACT

Technical Session 1: Environmental Science and Technology	
Time	**Content**
13:30-13:45	**R1031:** Development of a non-deterministic optimization-driven computable general equilibrium model for China **Presenter:** ***Mengyu Zhai,*** North China Electric Power University, China **Abstract:** China's commitment at the Paris Climate Conference in terms of economy-wide carbon mission intensity mitigation is causing tremendous pressure on the nation's socio-economic and environmental (SEE) systems. Such pressure is exaggerated due to the volatile international situation. The goal of this research is to investigate a number of critical issues in SEE systems for analyzing the relevant impacts on SEE systems under the dual pressures of trade war and carbon mitigation. A non-deterministic optimization-driven computable general equilibrium (NOCGE) modeling system to evaluate the SEE impacts under given scenarios of trade war and carbon mitigation. The modle could facilitate i) investigating the effects of different initiatives (e.g., changes in import and export taxes); ii) evaluating the global impacts of China's measures and the counter feedback from other countries. By integrating the optimization into the CGE, short- and long-term impacts of carbon mitigation on the entire economy can be investigated under given policy scenarios. The link between local equilibrium model and global equilibrium model will give us a deeper understanding of the SEE systems. It is expected that a number of robust decision alternatives would be generated to support policy formulation within a Chinese context.
13:45-14:00	**R1018:** Analysis of Wetland Landscape Pattern Evolution and Future Trends: A Case Study of Xiongan New Area, China **Presenter:** ***Miao Yang,*** China Institute of Water Resources and Hydropower Research, China **Abstract:** The analysis and research on the evolution mechanism of wetland landscape pattern and the trend of future changes are of great significance to the restoration and improvement of wetland ecosystem function and the maintenance of regional ecological environment security. Xiongan New Area is a national-level new district established in 2017 in China. One of the key tasks of the new area is to create a beautiful ecological environment and build an ecological city that integrates water cities. However, as the main body of the new area wetland-Baiyangdian Lake, the wetland area has shrunk sharply in recent years, the degree of fragmentation has increased, and the landscape pattern has changed greatly. At present, there are many research results on the Baiyangdian wetland, but there is still a lack of analysis on the evolution of wetland landscape pattern in the whole new area. Based on the land use landscape types from 1980 to 2017, this study uses the land use transfer matrix, landscape pattern analysis index, and principal component analysis to analyze the landscape pattern evolution and driving factors of different types of wetland in Xiongan New Area. On the basis of

	clarifying the main driving factors of wetland pattern evolution, this paper analyzes the influence of future climate conditions and human activities on wetland landscape pattern evolution, and evaluates the future development trend of different wetland types in Xiongan New Area. The research results are of great significance to the management of wetland and the promotion of "harmony between human and water".
14:00-14:15	**R1034:** An integrated gravity-driven ecological treatment systems for domestic sewage in the rural areas of the Yangtze River Delta in China **Presenter:** ***Rubing Zheng,*** North China Electric Power University, China **Abstract:** With the promotion of Rural Revitalization Strategy in China, more and more people are aware of the environmental problems in the process of rural development, such as the rapid increase of garbage, sewage discharge, black and odorous water body, which seriously threaten people's health and community sustainbility development. During the 13th Five Year Plan period, a large number of rural sewage treatment projects have been implemented. However, the problem of water pollution in rural areas has not been effectively solved due to the phenomenon of sewage treatment facilities shutdown appears in some areas,because of adaptability of technology and high operating costs such as energy consumption. Considering the high cost of construction and operation, the traditional wastewater treatment is not suitable in the rural area. In this research, natural materials such as soil, gravel, plants and microorganisms are more commonly used to construct the ecological treatment technology of domestic sewage, which reduces the construction cost, operation cost and secondary pollution, and improves the efficiency and stability of water environment protection in the process of rural development.
14:15-14:30	**R1019:** An evaluation and regulation method for stereoscopic spatial connectivity of a wetland system: A case study of the Heilongjiang River Basin in China **Presenter:** ***Qin Yang,*** China Institute of Water Resources and Hydropower Research, China /Tsinghua University, China **Abstract:** The weakened connectivity of wetland systems is the key factor leading to the destruction, degradation, and disappearance of wetlands. The study of the change of wetland system connectivity enables understanding the hydrological process in wetland system and providing significant support for the study of ecological water demand. In this study, an innovative method was applied to evaluate and regulate the stereoscopic spatial connectivity (SSC) of the wetland system in the Heilongjiang River Basin in China (HRBC). A regulation mode for improving the stereoscopic spatial connectivity index (SSCI) was proposed. The results revealed that over the past 35 years, the wetland system in the study area shrank significantly, with the SSCI decreasing from 41.30% in 1980 to 35.08% in 2015. By comparing the correlation among temperature, precipitation, agricultural land, construction land, and the wetland system during the same period, it was proven that human activity is the major driving force behind the observed wetland system shrinkage. Subsequently, the key protected areas required to maintain the SSC of the wetland system were clarified, and the key recovery areas were determined according to the three scenarios of ‘high–medium–low’ feasibility,

	which greatly improved the SSCI and generalization route (GR) after regulation. In general, the proposed SSC evaluation methods can fully reflect the ecohydrological process of wetland systems. The methods also scientifically quantify the significant effects of the regulation mode, which has certain relevance for the evaluation and regulation of wetland systems in other regions.
14:30-14:45	**R1028:** Unveiling carbon emission attributions along sale chains **Presenter:** ***Jizhe Li,*** Beijing Normal University, China **Abstract:** Substantial anthropogenic emissions have resulted in series environmental problems in China. Direct emissions and demand-pulled emissions along the supply chains have been extensively investigated. However, understanding the mechanism of how the sectoral emission is transferred through production activities along the sale chains at different production layers remains a challenge. In this paper, a Top-down Multi-layer Emission Attribution Model is developed to unveil the metabolism of multi-layer input-driven emissions. For the first time, diagramming approach enables the exhaustive depiction of the connections between primary input attributions and final production attributions, which allows accurate reallocation of the emission responsibilities to sectors at different production layers. Individual sale chain paths and supply chain paths have been extracted and ranked according to the contributions of emissions. A four-perspective comparison of sectoral emissions (i.e. direct emissions along sale chains, enabled emissions, direct emissions along the supply chains, embodied emissions) are assessed with the highest participation among all provinces in China. We find that at multiple production layers, sectoral direct emissions along the sale chains differ greatly from direct emissions along the supply chains. By comprehensively considering providers, consumers and producers within a metabolic system, policy-makers should encourage upstream sectors to improve their cleaner production technologies and downstream sectors to adjust their industrial structures.
14:45-15:00	**R1021:** Regional climate monitoring and assessment in the Belt and Road **Presenter:** ***Fangfang ZHONG,*** Jiangxi University of Science and Technology, China **Abstract:** The countries along the Belt and Road are generally highly sensitive and vulnerable to climate change, so it is urgent to establish a service platform for climate change prediction and monitoring. This paper analyses the demand for the Belt and Road climate service capacity and the measures to improve the meteorological service capacity. It is proposed that satellite remote sensing should be the main method, and aerial remote sensing should be the supplement method, and the ground observation network was used to verify that the real-time monitoring and prediction of sky and ground integration, and provided scientific basis for the countries along the routes, and improved the construction progress and personnel safety along the Belt and Road.
15:00-15:15	**R1030:** Losses of natural coastal wetlands by land conversion and driving force analysis in the Yellow River Delta area **Presenter:** ***Yong Liu,*** Sino-Canada Resources and Environmental Research

	Academy, North China Electric Power University, China **Abstract:** Coastal wetlands, having experienced serious losses of area and ecological function, are currently facing worldwide challenges due to coastal development and global climate change. With the region forecast to be a hotspot of urbanization, this study attempted to explore patterns and possible factors driving loss of natural coastal wetlands in the Yellow River Delta (YRD), China in the period of 1970 to 2015. In total, YRD has lost 32.5% of its natural coastal wetlands in the study period, where tidal flat wetland suffered the biggest reduction with a rate of 49.78%. Estimated natural coastal wetland loss before 1990 is greater than that after 1990 at the same time. The natural coastal wetland area was substantially lost due to land conversion highly related to regional economic development such as fishery, salt industry, and agriculture. Natural coastal wetlands loss due to direct human activities counts for 39.33%, 59.52%, 73.24%, 83.05%, 88.37% of the total loss in different periods among 1970 to 2015 respectively. Reclamation of coastal wetlands is likely to intensify, owing to the increasing scarcity of land in coastal areas and the low cost and rapid pace at which these areas can be developed. The conclusion obtained may provide coastal development strategies that minimize wetlands loss and protect remaining coastal wetlands.
15:15-15:30	**R034:** MSW in a Circular Economy: 2020 - 2035 scenarios for the City of Oslo, Norway **Presenter:** ***Liang Wang,*** SINTEF Energy Research, Norway **Abstract:** The unfolding of Circular Economy principles will have consequences on the generation rate, amount, and composition of Municipal Solid Waste (MSW) as well as the preferred methods to treat them. In this work, four plausible scenarios on the future of MSW for the period 2020 – 2035 have been developed for the City of Oslo, Norway. The scenario's consequences on (1) MSW amounts and properties and (2) the treatment methods, i.e. Waste-to-Energy (WtE), material recycling and biogas production have been evaluated. The main results can be summarized as such: (1) the evolution of both population and consumption (i.e. waste generated per inhabitant) will have a large impact; (2) meeting EU material recovery target (65% for MSW in 2035) means that several waste fractions have to be recycled at high levels, and this will be challenging without significant logistical and/or treatment capacity changes and/or technological breakthroughs, (3) in 2 out of 4 scenarios, the biogas production capacity must be expanded with a new plant to reach the 65% recovery target, (4) a "business as usual" approach is not sufficient to reach the recovery targets, (5) the combustion properties of MSW to WtE will be affected by increasing recycling, probably towards lower energy contents and higher ash contents and (6) "what-if scenario" studies should be carried out at the city/regional level as specific constraints must be included to bring valuable information.
15:30-15:45	**R1032:** Enhanced nitrate removal from decentralized rural domestic wastewater using multi-layer soil systems **Presenter:** ***Pei Song,*** North China Electric Power University, China **Abstract:** Recently, the discharge of untreated rural domestic wastewater into water body has been paid more attention. It is urgent to develop the cost-effective

	treatment strategies for resolving the decentralized wastewater problems. Multi-layer soil (MLS) system is proposed as a cost-effective and eco-friendly method for treating decentralized domestic wastewater under complex conditions. The outstanding MLS system is attributed to the novel brick-wall pattern structure with permeable layers (PLs) and soil mixture blocks (SMBs), which are corresponding to the aerobic and anaerobic functional areas, respectively. It is important role of SMBs in treatment process, especially in the denitrification. However, the removal of nitrate nitrogen is still not satisfied in most MLS studies. To address this challenge, a modified MLS system was developed to treat rural domestic wastewater to increase the NO3--N removal. A factorial design was applied to investigate the significant factor and their interactions in nitrate removal process by MLS system. Activated sludge in SMBs played a key role in improving the nitrate removal in MLS system. Slow-release poly (butylene succinate) (PBS) had the significantly positive effect on nitrate removal. Submersion had significantly positive effect on nitrate removal. They were favorable for denitrification and ensuring a better removal efficiency of nitrate and total nitrogen. Under the optimal condition, the highest degradation rates of NO3--N, TN could reach 96.15% and 69.86%, respectively. The results of factorial analyses provide a new insight into nitrate and removal especially nitrogen removal in MLS systems.
Technical Session 2: Natural Resource Management	
15:50-16:05	**R026:** Rule-based Object-oriented Water Resource System Simulation Model for Water Allocation **Presenter:** ***Pengfei Lin,*** China Institute of Water Resources and Hydropower Research, China **Abstract:** Simulation is a basic method to analyze water resources system and provide information for decision-making. In this study, a framework is presented that describes the basic elements in a water resource system and a modelling technique integrating conceptual simulation and rule control. To formulate the process of the water cycle and water exploitation with a mathematical model, the water system is described based on adjustable relevant rules and respective parameters with experiences and pragmatic demands in the framework. The rule set describes the principles required to design conceptual networks and control the concrete processes of movement and conversion of different water flows. Combined with object-oriented programming, different calculation functional modules are classified based on the characteristics of water source layers, and the processes that occur in the networks are realised in the computation. The influence of the South-to-North Water Diversion project on the Haihe River basin is analysed by the rule-based object-oriented water resource allocation simulation model. According to the simulation results, groundwater extraction will be reduced by 6,181 million m3. At the same time, the relationship between water source replacement and water layer exchange in the Haihe River basin is analysed, and the feasibility of the model is verified. Based on the rule-based model, the user requirements can be taken into account conveniently, and the rules are flexible to adjust with experiences and real conditions. This model can be used to simulate

	complex water resource systems.
16:05-16:20	**R1035:** Projection on climate changes over China using a PRECIS regional climate model **Presenter:** ***Junhong Guo,*** North China Electric Power University, China **Abstract:** Previous studies have suggested that dynamical downscaling to global climate models can produce improved climate simulations at regional and local scales. In this study, the PRECIS regional climate modeling system is employed to simulate the regional climate over China from 1950 to 2099 with a fine resolution of 25 km, driven by the HadGEM2-ES model. Historical simulation of the PRECIS is first compared to the observations to validate its performance in capturing both the spatial and temporal patterns. Then, the projection from the PRECIS for future periods (i.e., 2020s, 2050s, and 2080s) are then analyzed to help understand how the regional characteristics of temperature and precipitation will be affected in the context of global warming.
16:20-16:35	**R1016:** Optimized Configuration of a Hose Reel Traveling Irrigator **Presenter:** ***Ge Maosheng,*** Northwest Agricultural and Forestry University, China **Abstract:** This study aims to identify the optimal configuration of a hose reel traveling irrigator based on a multi-objective evaluation. We identified nine evaluation indicators (two empirical: irrigation efficiency, yield increase; two technical: spray uniformity, application rate; two economic: initial investment, annual operating costs; three social and environmental: labor intensity, productivity, greenhouse gas emissions) were selected from aspects of technology, economy, society and the environment. We evaluated a primary set of seven technical, economic, and social and environmental indicators and a smaller subset of only the technical and economic indicators. The multi-objective evaluation ranked 144 alternatives using Principal component analysis and Data envelopment analysis methods. The optimal scheme was exactly the same for both analysis methods, and the number of schemes within a deviation of five reached 88.2% of all alternatives. The comparison results support the accuracy of the evaluation and the results were not affected by the evaluation methods. The influence of a single configuration parameter on the comprehensive evaluation efficiency of the hose reel traveling irrigator was discussed. A 200 m pipe length, 0.45 MPa operating pressure of the sprinkler, 0.2R overlapping distance and 65 mm pipe diameter was preferred under the working conditions of the case study. The impacts of social and environmental indicators on the overall evaluation were significant, which can help designers/users make cleaner and more user-friendly configuration schemes of the hose reel traveling irrigator.
16:35-16:50	**R1027:** Development of a boundary-impact heterogeneity analysis approach **Presenter:** ***Feng Wang,*** Beijing Normal University, China **Abstract:** Impacts analysis of multiple factors is a necessary prerequisite for developing reliable models for hydrological projections. This study introduces a computational framework: the boundary-impact heterogeneity analysis (BIHA)

	approach, for quantifying the impacts of boundary conditions on ensemble prediction system through the multi-level factorial analysis. The proposed computational approach can diagnose and quantify the individual and their multi-level combined effects from multiple factors. In this approach, Copula function is applied for reintroducing residuals into simulated responses systematically, in a stochastic manner, to refine residual distributions. After that, the impacts of out-of-scope influencing factors on modeling results and reliabilities are also investigated through model residual analysis. Taken the rainfall-runoff response over China as an example. The results of statistical inference and factorial analysis have revealed the temporal and spatial heterogeneity of rainfall-runoff response in China. In detail, the monthly climate factor is the main influencing factor (57.73%-61.63%) of streamflow in south China. However, in north China, the pre-climatic conditions have a great influence (28.43%-65.65%) on the runoff change. The main finding is that as the watershed area increases, the influence of out-of-scope influencing factors (e.g., other climate factors, underlying surface, human activities, etc.) on runoff decreases linearly ($p<0.01$) by 0.12%/10000km2, ranging from 1.91% to 24.70% over China. This study has revealed the boundary response heterogeneity of rainfall-runoff relationship over China, which is of great significance to the management and optimization of the water environment system.
16:50-17:05	**R1017:** Forecasting of Atmospheric-hydrological Models in Mountainous Areas of North China Based on WRF Coupling Different Hydrological Models **Presenter:** ***Wei Wang,*** China Institute of Water Resources and Hydropower Research, China / Hohai University, China **Abstract:** The atmospheric-hydrological model can adapt to the areas without data and prolong the lead period of rainfall-runoff, but the simulations brought by different atmospheric-hydrological models are not consistent, hence it is necessary to explore the combination of different hydrological models. In this study, the lumped Hebei model, semi-distributed Hebei model and WRF-Hydro model are analysed for six typical storm events in two mesoscale mountain catchments of northern China. Firstly, to overcome the parameter compensation effect of input (forcing data) caused by WRF, the combination of ensembles and WRF data assimilation is used to strengthen the spatio-temporal precipitation. Optimized rainfall series are put to the above three models after parameter calibration and validation. Results demonstrate that the semi-distributed Hebei model of 3km resolution has the best flood simulations among the three. While the lumped model is slightly worse, it is better for the even temporal and spatial events. WRF-Hydro is not desirable for its small discharge process compared to observation. It may be that WRF-Hydro increases infiltration due to frequent integration, and it should be changed to conform to the local runoff generation and the confluence mode as well.
17:05-17:20	**R1029:** Impacts of climate change on photovoltaic energy potential in China **Presenter:** ***Xiaohu Zhao,*** Beijing Normal University, China **Abstract:** The worldwide pressure of greenhouse gas (GHG) emission mitigation calls for explosive growth in the research and development of renewable energies. At the same time, from a long-term point of view, the renewable energy sector may

	also be affected by climate change. In this study, the impacts of climate change on photovoltaic (PV) energy potential are evaluated based on the downscaled climate projections in China. The climate projections for the 21st century of China under two Representation Concentration Pathways (RCPs) will be generated through the ERA-Interim reanalysis and three global climate models from the Coupled Model Intercomparison Project Phase 5 (CMIP5). Then the projections of PV-power-related climate variables and PV-energy potential can be obtained for three periods, i.e., the 2030 s (2020–2039), 2050 s (2040–2069), and 2080 s (2070–2099). The results indicate that PV-energy potential is likely to have a slight decrease of up to 6% in most of the study regions under RCP4.5 and RCP8.5. Variations in PV-energy potential are further investigated through examining the contributions from changes in temperature, total radiation, and sunshine duration. The results indicate that the dominant contributions are from the changes in total radiation and sunshine duration.
17:20-17:35	**R008:** A novel CO_2 responsive viscoelastic surfactant based clear fracturing fluid for high temperature unconventional reservoir **Presenter:** ***AZIZULLAH SHAIKH,*** China University of Petroleum (East China), Qingdao China **Abstract:** An unconventional reservoir is a term to describe a hydrocarbon resource that could not be technically or economically recoverable without stimulation. Unconventional oil and gas resources are 4-5 times over conventional oil and gas resources. Currently, there is a limitation for using slick-water volume fracturing and gas (water) injection adding energy for drainage and displacement individually. Also, the efficient hydrocarbons production from high temperature unconventional reservoir is the main challenge. In the current study, a CO_2 based viscoelastic surfactant fracturing fluid with a specific molar ratio of erucic acid, 2,6,10-trimethyl-2,6,10-triazaundecane, potassium hydroxide, and carbon dioxide (EA-TMTAD-KOH-CO_2) was developed as a good candidate for high temperature and water alternating treatment for high temperature unconventional reservoirs. The fracturing fluid will play a role of “one with multi-purpose” by proppant-carrying, CO_2 energy supplementary displacement, and surfactant imbibition drainage displacement. The fracturing fluid (EA-TMTAD-KOH-CO_2) performance evaluation method for determination of shear and heat resistance, viscoelasticity, proppant carrying capacity, gel breaking ability, and salt tolerance is employed as evaluation indices by using HTHP rheometer. The rheological results of steady shear viscosity of the fracturing fluid system confirm that the EA-TMTAD-KOH-CO_2 was observed in the properties of a wormlike micelles structure, micelles assembly, and the intermolecular interactions. The steady shear viscosity above 41 mPa.s at a shear rate 170 s-1 and temperature 95 °C validates the excellent proppant carrying capacity as per national industry standards of the fracturing process. Further, the gel structure breaking at temperature 135 °C and 170 s-1 bears the shear viscosity less than 5 mPa.s, which results in a rapid flow back from the well after the fracturing process. Moreover, the fluid system has high salt tolerance against different inorganic salts such as NaCl, KCl, $CaCl_2$, and $MgCl_2$ using different concentrations. By retaining the desirable qualities such as; easy to prepare, environment friendly, commercially available, high in viscoelasticity, and thermally stable; the fracturing fluid system

	(EA-TMTAD-KOH-CO_2) will be the outstanding candidate in industrial applications like water-alternating and high temperature unconventional reservoirs.
17:35-17:50	**R1023:** Visible light driven hydrogen evolution using external and confined CdS: Effect of chitosan on carriers separation **Presenter:** ***Yizhong Zhang,*** Tianjin University, China **Abstract:** Both fast recombination of photogenerated electron-hole pairs and quick photocorrosion limit CdS's application in hydrogen production. To address this dilemma, herein, we designed and synthesized a millimetre-sized chitosan-CdS xerogel bead photocatalyst (CXB@CdS) to expound the mechanisms of photocorrosion resistant and enhanced photocatalytic H2 production. -NH2 and -OH groups of chitosan contribute to the spatial separation of photogenerated electron-hole pairs lead to inhibition of CXB@CdS photocorrosion, which guaranteed stable HER performance for 55 h. Directional migration of photogenerated holes from valence band (VB) of CXB@CdS to the highest occupied molecular orbital (HOMO) of chitosan was demonstrated due to the existence of lone pair electrons on -NH2 and -OH groups. This work can shed some light on the mechanism of natural polymers with rich functional groups modifying metal sulfides for effective photocorrosion inhibition and highly enhanced photocatalytic activities.
17:50-18:05	**R1033:** The applications in energy-saving technology based on cascade reaction **Presenter:** ***Xu-Heng Yang,*** National University of Defense Technology, China **Abstract:** Cascade reaction is a reaction in which the reactants are added for two or more steps in a row without new operations in the same reaction environment. Because of it can not only reduce the reaction steps, but also effectively reduce the use of solvents and heating time. Thus, the development of new cascade reaction to access medium-sized N-heterocycles from readily available ynamide precursors remains highly desirable in the field of energy conservation.

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