The 5th Annual UNM Resilience Colloquium

October 12, 2021

Innovations for Sustainable Transformations

Book of Abstracts
Dear Friends,

It is my pleasure to welcome you back for the 5th Annual UNM Resilience Colloquium!

The UNM Resilience Institute and the world around us have experienced profound changes since we were last together in August of 2019. The Covid-19 pandemic has caused an unprecedented shock to society from local to global scales. The pandemic revealed systemic vulnerabilities in our healthcare systems, food-energy-water supply chains, and our capacity to provide basic needs for the most vulnerable members of our communities. In the American West, record-breaking heatwaves and wildfires have wreaked havoc, while the East and Gulf coasts have weathered a series of Class 4 hurricanes and devastating floods. American society has also continued to reckon with historical and ongoing racial injustices and our politics have grown increasingly divisive.

As these dramatic events were unfolding around us, the UNM Resilience Institute partnered with seven other leading research universities from across the Intermountain West (IMW) to field a winning proposal to the National Science Foundation's Sustainable Regional Systems Program. Together, we are launching a 5-year, $15 million effort to build the Intermountain West Transformation Network (TN). The TN aims to build capacity for guided transformations toward sustainable regional systems.

The agenda we have composed for RC5 provides a window into the countless innovative approaches that are transforming the IMW. Our speakers are change-makers who are building resilience through the application of Indigenous Knowledges and Place-Based Knowledges, developing new technologies, and disrupting the status quo. We welcome the opportunity to share ideas, philosophies, and approaches that can lead to a more sustainable and equitable Intermountain West.

Sincerely,

Mark Stone, PhD, PE
Professor and Regents’ Lecturer
Department of Civil, Construction & Environmental Engineering
Director, UNM Resilience Institute
The University of New Mexico
Tuesday, October 12th

9:00 am–9:05 am  Welcoming Remarks and Comments
Mark Stone, UNM Resilience Institute
Mahmoud Taha, Chair, UNM Civil, Construction & Environmental Engineering

9:05 am–9:10 am  Opening Statement
Melanie Stansbury, U.S. Representative for New Mexico’s 1st Congressional District

Session 1: Indigenous Knowledges and Place Based Approaches to Resource Management

9:10 am–9:30 am  Integrating Indigenous Knowledge in Natural Resource Management
Michael Kotutwa Johnson, Native American Agricultural Fund

9:30 am–9:50 am  Resilience, Innovation and Diné Science Addressing Water Challenges
Ranaldo Tsosie, Montana State University

9:50 am–10:00 am  Coffee Break

10:00 am–10:20 am  Research on Indigenous Cultural Fire Practices
Melinda Adams, University of California, Davis

10:20 am–10:40 am  Regenerative Agriculture on the Palouse
Ty Meyer, Spokane Conservation District

10:40 am–11:00 am  Ngarrindjeri Yannarumi: Indigenous Nation (Re)Building, Water Planning
Risk Assessment and Peacemaking
Steve Hemming & Daryle Rigney, Jumbunna Institute for Indigenous
Education and Research, University of Technology Sydney, Australia

11:00 am–11:30 am  Breakout Discussions

11:30 am–1:00 pm  Lunch Break
Session 2: Emerging Technologies and Approaches for Climate and Health Resilience

1:00 pm–1:20 pm  Atmospheric Water Harvesting: A Decentralized Technology for Water Resilience in the Southwest  
Anjali Mulchandani, University of New Mexico

1:20 pm–1:40 pm  Emerging Technologies for Infrastructure Resilience  
Kenichi Soga, University of California, Berkeley

1:40 pm–2:00 pm  Resilience of Complex Healthcare Networks Subjected to Wildfire and Pandemics  
Hussam Mahmoud, Colorado State University

2:00 pm–2:20 pm  Coffee Break

2:20 pm–2:40 pm  Additive Manufacturing of Affordable, Secure, and Sustainable Housing in Support of a Healthy Global Population  
Maryam Hojati, University of New Mexico

2:40 pm–3:00 pm  Climate Change and Human Health ECHO: Global Telementoring for Health Professionals  
Joanna Katzman, UNM Health Sciences Center

3:00 pm–3:30 pm  Breakout Discussions

3:30 pm  Closing Remarks and a Path Forward  
Mark Stone
INTEGRATING INDIGENOUS KNOWLEDGE IN NATURAL RESOURCE MANAGEMENT

Michael Kotutwa Johnson
Program Officer, Native American Agricultural Fund, Fayetteville, AR, USA
mjohnson@nativeamericanagriculturefund.org

ABSTRACT

Regenerative and Climate Smart agriculture are not new to Indigenous people. Indigenous land management schemes have been used for over millennia. However, most Indigenous practices are not recognized by western practitioners because they have not been scientifically validated. I will attempt to address the issue based on my recently published work, Enhancing integration of Indigenous agricultural knowledge into USDA Natural Resources Conservation Service cost-share initiatives. I will also offer solutions to help integrate Indigenous knowledge into natural resource management.

BIOGRAPHY

Dr. Michael Kotutwa Johnson, a member of the Hopi Tribe in Northern Arizona, serves as the Native American Agriculture Fund’s (NAAF) Program Officer. Dr. Johnson holds a Ph.D. in Natural Resources from the University of Arizona. Previously, Dr. Johnson was a Natural Resource District Conservationist assigned to the Hopi Reservation for the Natural Resource Conservation Service (NRCS) of the United States Department of Agriculture (USDA). Throughout his academic and professional career, Dr. Johnson has given extensive lectures on Hopi dryland farming—a practice of his people for over two millennia. Dr. Johnson has also published scholarly papers on Indigenous conservation and agriculture-related issues. He has recently been asked to co-author the Indigenous chapter for the National Climate Assessment Five to be released in 2023.
RESILIENCE, INNOVATION AND DINÉ SCIENCE ADDRESSING WATER CHALLENGES

Ranalda L. Tsosie

Visiting Post-doctoral scholar, Civil and Environmental Engineering, Montana State University, Bozeman, MT, USA ranalda.tsosie@montana.edu

ABSTRACT

Tó Éí láñá Át’lé (Water is life) encompasses not only the essential component of all life, it represents the healing, respect, and restoration. This study utilized a research framework that incorporated the Diné worldview, Diné Science and Western Science. The main motivation was to improve the quality of life of the Diné people.

Moreover, restoring and returning to a balanced and harmonious life by incorporating the principles of Sá’ah Naagháí Bik’éél Hózhóón (SNBH) as the core philosophy to guide the research in a respectful manner, and using this framework to implement Indigenous Research Methodologies for establishing a cohesive and cooperative study that combines western science, traditional knowledge, and community involvement.

Currently, many Diné communities are facing challenges with groundwater contamination, lack of appropriate water resources and infrastructure. This study aims to address the long-standing water contamination issues in unregulated water sources. The findings from this study describe the status of the groundwater quality in the Tsétah area in northeastern Arizona and surrounding communities.

The second aim implements Silica Polyamine Composites (SPC) as a method to remediate contaminated water sources. SPCs are a hybrid porous material that have been used to filter, isolate, and remove unwanted metals by acting as a chelating agent. These materials have demonstrated to be effective for the removal of the elements uranium, arsenic, and vanadium, which are of concern in the study area.

Current research efforts focus on optimizing a point of use filter, SPC-POU, a temporary community solution to confront issues with water sources contaminated with toxic metals.

BIOGRAPHY

Dr. Tsosie is a post-doctoral scholar at Montana State University in Bozeman, MT. She received a Ph.D. in Interdisciplinary Studies with a subject emphasis in the fields of Chemistry, Geosciences and Environmental Science/Studies from the University of Montana. Her graduate research brought together Diné and western scientific perspectives to address water contamination in her home community of Tólíkan, AZ and surrounding communities. She has experience working within Indigenous communities, implementing, and practicing Indigenous Research Methodologies. In her free time, she enjoys beading, sewing, practicing traditional Diné arts and baking.
RESEARCH ON INDIGENOUS CULTURAL FIRE PRACTICES

Melinda Adams
Ph.D. Candidate, Native American Studies, Environmental Policy and Management
University of California, Davis, Davis, CA, USA
mmadams@ucdavis.edu

ABSTRACT
Indigenous peoples and the roles they play in combating climate change is rarely considered in public discourse. Climate change itself is tied to colonial practices, both historically and in the present, as anthropogenic activities have hinged on the dispossession of Indigenous lands. Since time immemorial, Tribes have always conducted cultural fires, as a spiritual and ecological approach to tending and caring for our lands. These low temperature burns not only improve the ecosystem, they provide socio-cultural medicine which strengthens the intergenerational bonds between Tribal members. Recently, the Patwin [Southern Wintun] Peoples have had success in demonstrating community cultural fires. My work will contextualize the socio-cultural and ecological importance of culture fire with Indigenous sovereign Nations in California. This project weaves together Ecology, Environmental Policy and is grounded in American Indian Studies theory. I will address critical questions on environmental stewardship, socio-ecological healing and climate change discourse by employing various methodologies including: oral histories, storywork, embodied knowledges and memory recall. The cross-cultural collaborations demonstrated will provide opportunities to develop a deeper understanding of Indigenous land stewardship and can lay the groundwork for Indigenous peoples to reclaim our ancestral lands.

BIOGRAPHY
Melinda belongs to the N'dee, San Carlos Apache Tribe in Arizona and is from Albuquerque, New Mexico. She holds her Bachelor of Science in Environmental Science from Haskell Indian Nations University, her Master of Science in Ecology and Environmental Science from Purdue University and is currently a Ph.D. candidate in the Department of Native American Studies at the University of California, Davis.
REGENERATIVE AGRICULTURE ON THE PALOUSE

Ty Meyer

Production Ag Manager, Spokane Conservation District
Spokane Valley, WA, USA
Ty-Meyer@SpokaneCD.org

ABSTRACT
The Spokane Conservation District is working with a dedicated group of progressive farmers working to transition land from industrial agriculture systems to regenerative farming practices. The group, called the Bio-Farming Group, is working to implement regenerative trials using special biological inputs to stimulate the soil and rebuild microorganisms that have been destroyed over the last 50 years of industrial fertilizer and chemical use.

BIOGRAPHY
Ty has been the Production Ag Manager for the Spokane Conservation District for 17 years running their direct seed loan program and overseeing the implementation of the Bio-Farming program. He is the past Executive Director of the Pacific Northwest Direct Seed Association and now serves as an Ex-Officio member of their board. He grew up on a dry land farm and cattle ranch in Eastern Washington and received an Ag-Business degree from Washington State University.
NGARRINDJERI YANNARUMI: INDIGENOUS NATION (RE)BUILDING, WATER PLANNING RISK ASSESSMENT AND PEACEKEEPING

Steve Hemming & Daryle Rigney

Associate Professor, Indigenous Nations and Collaborative Futures Research Hub, Jumbunna Institute for Indigenous Education and Research, University of Technology Sydney, Sydney, Australia, steven.hemming@uts.edu.au

Professor and Director, Indigenous Nations and Collaborative Futures Research Hub, Jumbunna Institute for Indigenous Education and Research, University of Technology Sydney, Sydney, Australia, daryle.rigney@uts.edu.au

ABSTRACT

Risk assessment underpins decision making for vast aspects of society, and is at the core of Natural Resources Management (NRM) activities such as Australia’s Murray-Darling Basin Plan. Based on an International Standard, risk assessment approaches in NRM emerge from western concepts of nature that consider people as separate and superior to a perceived ‘nature,’ which in turn provides services to humans. This western framework fails to engage with First Nations worldviews and aspirations that focus on reproduction, interconnected benefit and justice. For decades Ngarrindjeri leaders and their supporters have challenged the South Australian government and its NRM bureaucracy over questions of justice, agency and sovereignty. Ngarrindjeri use a form of decision making and risk assessment called Yannarumi to conduct wellbeing assessments based on Ngarrindjeri principles and philosophies. The Ngarrindjeri Nation have recently led a Goyder Institute for Water Research project that has translated and connected Ngarrindjeri Yannarumi risk assessments into water resource risk assessments. The team developed changes to the Government’s Risk Management Framework for Water Planning and Management that includes a new multi-layered category of ‘Risk to First Nations’. Crucially this category takes into account the quality of the relationship between First Nations and non-Indigenous governments.

BIOGRAPHY

Steve Hemming’s work with Indigenous communities began in the early 1980s. He worked on community-based projects focusing on social histories, heritage, family history and arts. Steve has worked at a number of Australian universities and, over the last few decades, his community engagement and research has focussed on Indigenous nation (re)building, environmental management, cultural heritage management, and Indigenous environmental studies. In 2015 he was part of the Ngarrindjeri team that won the Australian Riverprize for best practice in integrated river management (River Murray). As part of the Jumbunna Institute, he is contributing to the development of strategic and collaborative Indigenous research programs in Australia and internationally aimed at increasing self-determination, justice and wellbeing for First Nations.

Daryle Rigney, a citizen of the Ngarrindjeri Nation in South Australia, is Professor and Director of the Indigenous Nations and Collaborative Futures Research hub in the Jumbunna Institute for Indigenous Education and Research, University of Technology Sydney. He is a board member of the Australian Indigenous Governance Institute, a member of the Indigenous Advisory Council, Native Nations Institute, University of Arizona, and a Senior Fellow, Atlantic Fellows for Social Equity, Melbourne & Atlantic Institute, Oxford University, UK. Daryles academic and community work currently focus on developments in Indigenous nation building and governance following colonisation.
ATMOSPHERIC WATER HARVESTING: A DECENTRALIZED TECHNOLOGY FOR WATER RESILIENCE IN THE SOUTHWEST

Anjali Mulchandani
Assistant Professor, Department of Civil, Construction & Environmental Engineering
University of New Mexico, Albuquerque, NM, USA
anjalim@unm.edu

ABSTRACT

Limited access to clean water due to natural or municipal disasters, drought or contaminated wells is driving demand for point-of-use and humanitarian drinking water technologies. Atmospheric water harvesting can provide clean drinking water off the centralized water grid by capturing water vapor present in ambient air and condensing the vapor to a liquid. Widespread application of atmospheric water harvesting is currently limited because production potential, energy requirement, best technology, and water quality as a function of climate and season are not parameterized. This presentation will address these research challenges and present a path to advance the technology readiness level. I will present geospatial maps of locations where water harvesting may be feasible, bench-scale design of novel adsorbent materials, and pilot-scale outdoor testing of water harvesting units to benchmark temporal water production, water quality and energy efficiency.

BIOGRAPHY

Dr. Anjali Mulchandani leads the Environmental Resource Sustainability Group at University of New Mexico. Her research converges environmental engineering, materials science, nanotechnology, thermodynamics, and data analytics to design and predict feasibility of novel water treatment and resource recovery technologies. Her passions include designing hands-on learning tools and leading public outreach initiatives for STEM awareness and engagement among all levels of learners.
EMERGING TECHNOLOGIES FOR INFRASTRUCTURE RESILIENCE

Kenichi Soga

The Donald H. McLaughlin Professor, Department of Civil and Environmental Engineering
University of California, Berkeley, CA, USA
soga@berkeley.edu

ABSTRACT

Technologies are currently being developed for enhancing the resilience of the built environment, and particularly for establishing resilient features across different types of infrastructure. For example, recent advances in sensor systems offer intriguing possibilities to radically alter the methods of infrastructure condition assessment. Rich data obtained from such systems can act as a catalyst for new design, construction, operation and maintenance processes. The quantification of system resilience is a challenge for both stakeholders and service providers in the civil engineering industry. However, describing the contributions in a way that brings the provider and consumer together is critical to the widespread adoption of emerging technologies developed for improving infrastructure resilience. This talk discusses a methodology that systematically explores how emerging technologies can contribute to systems resilience.

BIOGRAPHY

Kenichi Soga is the Donald H. McLaughlin Professor and a Chancellor's Professor at the University of California, Berkeley. He is also a faculty scientist at Lawrence Berkeley National Laboratory. He obtained his BEng and MEng from Kyoto University in Japan and PhD from the University of California at Berkeley. He was Professor of Civil Engineering at the University of Cambridge before joining UC Berkeley in 2016. His current research activities are infrastructure sensing, performance based design and maintenance of infrastructure, energy geotechnics, and geomechanics. He is a Fellow of the UK Royal Academy of Engineering, the Institution of Civil Engineers (ICE) and American Society of Civil Engineers (ASCE).
RESILIENCE OF COMPLEX HEALTHCARE NETWORKS
SUBJECTED TO WILDFIRE AND PANDEMICS

Hussam Mahmoud
Associate Professor, Civil and Environmental Engineering
Colorado State University, Fort Collins, CO, USA
hussam.mahmoud@colostate.edu

ABSTRACT
The COVID-19 pandemic has graphically underscored the limitations and weaknesses of the ability of healthcare systems to effectively deal with a novel virus outbreak. Natural disasters in the U.S. further compound the effect of pandemics with conflicting mitigation strategies. Considering the compound impact of natural disasters and pandemics is particularly important given the predicted increase in intensity and frequency of climate-driven natural disasters and the increasing frequency of novel infectious diseases. This can have dire consequences on infrastructure and healthcare as well as social and economic institutions within communities, requiring prompt and timely prevention and control measures. To date, frameworks for quantifying the collective impact of the two events on hospitals are nonexistent. Moreover, analytical methods for capturing the dynamic spatiotemporal variability in capacity and demand of the healthcare system posed by different stressors are lacking. In this presentation, the combined effect of wildfire and pandemic on a network of hospitals will be investigated using a newly developed framework. Wildfire data will be combined with varying courses of the spread of COVID-19 to evaluate the effectiveness of different strategies for managing patient demand. The results show that losing access to medical care is a function of the relative occurrence time between the two events and is substantial in some cases. By applying viable mitigation strategies and optimizing resource allocation, patient outcomes could be substantially improved under the combined hazards.

BIOGRAPHY
Hussam Mahmoud is the George T. Abell Professor in Infrastructure at Colorado State University (CSU). He obtained his BSc and MSc in civil engineering from the University of Minnesota and his Ph.D. from the University of Illinois at Urbana-Champaign.
ADDITIVE MANUFACTURING OF AFFORDABLE, SECURE, AND SUSTAINABLE HOUSING IN SUPPORT OF A HEALTHY GLOBAL POPULATION

Maryam Hojati

Assistant Professor, Department of Civil, Construction & Environmental Engineering
University of New Mexico, Albuquerque, NM, USA
mhojati@unm.edu

ABSTRACT

Today, over one billion people are living in slums and other unhealthy, sub-standard living conditions. Another 2.5 billion people worldwide are projected to migrate gradually into urban areas by 2050. With rapid urbanization, climate change, and resource shortages, the number of individuals and families needing safe, affordable, and dignified housing will only increase. Interestingly, over the last few decades, the world has experienced a new digital revolution in the fast manufacturing/fabrication of products and goods. New technologies, using computerized design and rapid production and communication, are facilitating industrialization, bringing about significant changes in most sectors of the economy including enhancing productivity and effectiveness and reducing costs. Additive manufacturing (AM), also known as 3D-printing, is enabling the production of industrial products and, in part due to its flexibility, is claimed to be the next industrial revolution. AM also holds great potential to assist engineers and architects in the production of fast and economical, yet complex, representational models during the design phase, and to stimulate the study of designed objects. 3D-printing freeform structures in the building industry result in higher precision, safer working conditions, faster construction, and significantly lower costs, since they avoid the expense associated with formwork and labor. This presentation will introduce recent advances in digital construction for the construction of Earth projects and make new advancements for construction outside the Earth, such as on the Moon or Mars.

BIOGRAPHY

Dr. Maryam Hojati is an assistant professor in the Department of Civil, Construction and Environmental Engineering at the University of New Mexico. She received her Ph.D. in 2017 from the Pennsylvania State University. During her academic experience, she has worked on a variety of research studies that equipped her with the skills to conduct diverse research in materials and structures in the civil engineering discipline.
CLIMATE CHANGE AND HUMAN HEALTH ECHO:
GLOBAL TELEMENTORING FOR HEALTH PROFESSIONALS

Joanna G. Katzman, MD, MSPH

Professor, Department of Neurosurgery; Secondary Appointments: Departments Psychiatry, College of Population Health and College of Nursing
University of New Mexico Health Sciences Center, Albuquerque, NM, USA
jkatzman@salud.unm.edu

ABSTRACT

Scientific data across the globe demonstrates that climate change causes health-related illness and death from a multitude of effects, such as temperature increases, air pollution, extreme weather events, and sea level rise. Additionally, these climate change health threats are more likely to affect vulnerable and impoverished populations. Fortunately, health professionals are perfectly suited to communicate vital information to their patients, colleagues, and community members. Project ECHO (Extension for Community Healthcare Outcomes) created the Climate Change and Human Health (CCHH) ECHO to prepare health professionals to meet the needs of their patients. During the 8-week CCHH ECHO pilot series, 625 unique participants represented 45 U.S. states and 25 countries. This talk demonstrates how Project ECHO has the capability to effectively engage with an interprofessional audience of health professionals on many climate change topics to increase knowledge, self-efficacy and their communication skills with patients and communities.

BIOGRAPHY

Joanna G. Katzman directs the Public Health Initiatives at Project ECHO including the weekly Climate Change and Health ECHO series. She is collaborating with the Global Consortium for Climate Change and Health Education, along with the National Oceanic and Atmospheric Administration (NOAA) to produce weekly Climate and Health ECHO sessions to improve climate related health effects, and Climate Change Responder courses aimed at teaching health professionals to deliver climate education at their own institutions.
Thank you to our speakers and attendees for advancing our shared understanding of the innovations that are contributing to sustainable transformations.

RC5 is supported by a grant from the Sustainable Regional Systems Program with the National Science Foundation (Grant #211169).