University Engagement in Disaster Preparedness, Response, Innovation, Mitigation, & Recovery

ABSTRACTS

January 31 - February 4, 2021
virtual from **TEXAS A&M UNIVERSITY**
College Station, Texas

Hosted by **TEXAS A&M UNIVERSITY** and the **TEXAS A&M UNIVERSITY SYSTEM**

Howdy and Welcome!

On behalf of the *Organizing Committee*, the *Steering Committee*, the *Programing Committee*, and our *Conference Partners*, we are very pleased to welcome you as our guests to **Disaster PRIMR 2021,** a conference on **Preparedness, Response, Innovation, Mitigation, and Recovery,** hosted virtually by ***Texas A&M University*** *(**TAMU**) and the* ***Texas A&M University System*** *(**TAMUS**)*. We are deeply honored and proud to host this inaugural conference. We have been committed to delivering an excellent program of keynote presentations, panel discussions, workshops, interactions, virtual tours, a poster session, and a student competition. The program includes an outstanding roster of speakers, who will speak with deep knowledge and wide experience on a diverse set of topics of critical importance, not only to the State of Texas, but to the Nation and the World. Furthermore, we hope you will take back with you, valuable data, information, knowledge (best practices), experience (lessons learned), and wisdom (insights) from a diverse range of fields, organizations, and perspectives. Finally, we will make every possible effort to ensure that your participation in the conference will be an enjoyable experience.

We sincerely hope that, in addition to enjoying the program that will be delivered at the conference, you will also enjoy our Texas Aggie virtual hospitality!

Welcome and Gig'Em!

Jorge Vanegas
Cory Arcak
Valentini Pappa

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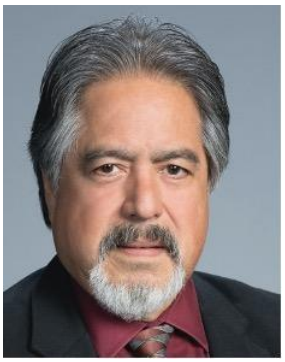
Conference Leadership

Many wonderful hazard and disaster leaders supported the vision and final program you see before you. We are honored to have such great collaborators and send a big thank you to the conference team.

CONFERENCE CO-CHAIRS



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- **Charles White**, Charity Productions
- **Katya Wowk**, Texas A&M Corpus Christi - Harte Research Institute

Conference Access

https://www.accelevents.com/e/DisasterPRIMR2021TexasAM

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Please note – the event platform will not be live until 4:00 PM CST on Sunday January 31st, however you're encouraged to login and establish a password at least 30 minutes prior to the event start date/time.

For a better understanding of how the Accelevents virtual event platform functions, we encourage you to watch the following video: https://support.accelevents.com/en/articles/4045754-intro-to-virtual-events-for-attendees

Please use GOOGLE CHROME as your browser to access the event platform. Internet Explorer will NOT work.

For technical assistance contact:
Nicole Solecki - nicole.solecki@tamu.edu

Schedule Overview

Sunday, January 31				
4:00 pm	Poster Hall and Virtual Tours Available: TEEX Disaster City Training Facility & Houston Ship Channel Neighbors: A Toxic Tour			
Monday, February 1				
10:30 am	Conference Welcome and Opening Statements			
11:00 am	Keynote Presentation: Lessons from 2020: The Critical Role of Preparedness and Response with Nicolette Louissaint, Executive Director of Healthcare Ready			
12:00 pm	Break			
12:15 pm	Breakout Session 1.1 Preparedness for Disaster	Breakout Session 1.2 Response to Disaster	Breakout Session 1.3 Mitigating Disasters	Breakout Session 1.4 Recovery from Disaster
1:45 pm	Break			
2:00 pm	Poster Session 1			
2:30 pm	Workshop: Navigating Disaster Communications: Challenges and Conflicts		Panel: Challenging Resilience: A Multi Perspective Conversation	
4:00 pm	Wrap-up Discussion Day 1			
4:15 pm	Networking Lounges Open			
Tuesday, February 2				
11:00 am	Keynote Presentation: The Case for Diversity, Inclusion and Equity in Disaster Management with Chauncia Willis, Co-Founder and CEO of the Institute for Diversity and Inclusion in Emergency Management (I-DIEM)			
12:00 pm	Break			
12:15 pm	Breakout Session 2.1 Preparedness for Disaster	Breakout Session 2.2 Response to Disaster	Breakout Session 2.3 Mitigating Disasters	Breakout Session 2.4 Recovery from Disaster
1:45 pm	Break			
2:00 pm	Poster Session 2			
2:30 pm	Workshop: Challenges and Opportunities Related to Gender Diversity in Disaster Leadership		Panel: Meeting the Moment: Harnessing the Untapped Potential of Universities in Building Community Resilience	
4:00 pm	Wrap-up Discussion Day 2			
4:15 pm	Virtual Tour – TEEX Disaster City with Q&A and Networking Lounges Open			
Wednesday, February 3				
11:00 am	Keynote Presentation: Convergence: Coming Together to Advance Hazards and Disaster Research with Lori Peek, Director of the Natural Hazards Center and Professor in the Department of Sociology at the University of Colorado, Boulder			
12:00 pm	Break			
12:15 pm	Breakout Session 3.1 Preparedness for Disaster	Breakout Session 3.2 Response to Disaster	Breakout Session 3.3 Mitigating Disasters	Breakout Session 3.4 Recovery from Disaster
1:45 pm	Break			
2:00 pm	Poster Session 3			
2:30 pm	Panel: Behavioral Health and Disasters: A moderated panel discussion of the challenges & interventions for the community,		Panel: The Next Generation of Resilience and Sustainability Leaders: Our Perspectives	

	responders, and self			
4:00 pm	Wrap-up Discussion Day 3			
4:15 pm	Virtual Tour – Houston Ship Channel Neighbors: A Toxic Tour with Q&A and Networking Lounges Open			
Thursday, February 4				
11:00 am	Keynote Presentation: Reimagining Effective Disaster Philanthropy with Patricia McIlreavy, President and CEO of the Center for Disaster Philanthropy			
12:00 pm	Break			
12:15 pm	Breakout Session 4.1 Preparedness for Disaster	Breakout Session 4.2 Response to Disaster	Breakout Session 4.3 Mitigating Disasters	Breakout Session 4.4 Recovery from Disaster
1:30 pm	Break			
1:45 pm	Student Competition Results and Awards & Poster Wrap Up			
2:30 pm	Workshop: Utilizing Community Engagement to Improve Local Resilience to Hazardous Events		Panel: Federal and State Coordination: How We Can Work Better Together	
4:00 pm	Wrap-up Discussion and Thank you			
4:30 pm	Adjourn Conference			

Sunday, January 31, 2021

4:00 pm **Poster Hall Opens**

Monday, February 1, 2021

10:30 am **Welcome** **Jorge Vanegas,** *Dean, College Architecture, Texas A&M University*
MacGregor Stephenson, *Chief of Policy and Research, Texas Division of Emergency Management, Texas A&M University System*

11:00 am **Keynote** **Lessons from 2020: The Critical Role of Preparedness and Response**
Nicolette Louissaint, Executive Director of Healthcare Ready

12:00 pm **Break**

12:15 pm **Concurrent Breakout Sessions**

1.1: Preparedness for disasters - Moderator John T. Cooper, Jr.

The Power of Grassroots Partnerships in a Pandemic *(30-minute Discussion)*

Angela Clendenin, *Department of Epidemiology & Biostatistics, Texas A&M School of Public Health, Texas A&M School of Public Health*

Rebecca Fischer, *Department of Epidemiology & Biostatistics, Texas A&M School of Public Health, Texas A&M School of Public Health*

The COVID-19 pandemic that surges around the globe challenged the healthcare infrastructure in every corner of the world. As a novel disease, and a global society entirely susceptible, researchers and scientists have been challenged to not only discover new therapeutics to reduce severity and new vaccines to protect populations, but also develop innovative ways to protect citizens in communities everywhere while these new vaccines and therapeutics were in progress at warp speed. Locally, two epidemiologists from the Texas A&M School of Public Health led a unique, and possibly first-of-its-kind, interagency partnership with the local health authority to conduct case investigations and contact tracing for the seven-county Brazos Valley region. This effort not only provided much needed surge support for the community, but also formed the foundation of the Texas A&M COVID Operations & Investigations Center. The challenges of literally "building a plane while it is flying" has led to many lessons learned, and more importantly, opportunities to train the next generation of public health professionals as students worked alongside the epidemiologists in this ongoing response to the global pandemic. Drs. Angela Clendenin and Rebecca Fischer will discuss their challenges and their successes in developing a comprehensive and functional pandemic response program from scratch, one that will likely be a model for interagency cooperation and response in the future.

Civic Engagement Asset Blueprint *(30-minute Grassroots Dialogue)*

Charles X. White, *Civic Engagement Asset Blueprint Charity Productions, Practitioner School Safety Consultant, Tekoa Academy*

The scope of this paper is to discover and implement sustainable solutions, matrixes that multiply mitigation practices, particularly with underserved populations. By using Homeland Security/FEMA's mitigation strategies and engage stakeholders, we can augment human resources shortages during a disaster. Strained or depleted resources compounds the cycle of have nots for many of those in the various underserved classifications. Many day-to-day difficulties become elevated to crisis dimensions due to system failure, morphing backward to generational deficient areas with alarming contiguous histories of unmet needs.

Residents in areas labeled underserved have untapped reservoirs of assets to share, as demonstrated after every disaster. We call that untapped wealth social capital infrastructure. This wealth can build capacity bridges that funnel, infuse best practices, and replaces ignorance with knowledge. Achieving goals will afford more transferable actions and assets with mitigation principles embedded in the overarching deliverables in safety concepts. The Resident's added value, skills, and resources become a resource pool of community institutional knowledge and best practices with linkage ports.

• Innovation, Takeaways – Adaptations that inventory community assets, added value, and skills. Utilize stakeholders to augment personnel shortages in government disaster response. Provide training offered by Emergency Management Institute, and the National Institute of Health, and others. Neighborhood Strike Teams.

• Problem Solving, Takeaways – FEMA's Hazard Mitigation formula states for every dollar spent on mitigation saves six dollars in costs. Establish channels of communication containing evidence and participatory based practices. Solutions exist. Increase time spent on implementation and reduce more inequities.

1.2: Mitigation of Disasters - Moderator MacGregor Stephenson

Next Generation Intelligent Information and Communication Systems for Flood Preparedness and Mitigation *(15-minute Presentation)*

Ibrahim Demir, *Civil and Environmental Engineering, University of Iowa*

The National Research Council report in 2012 puts forth a vision of a nation that is resilient to extreme events by the year 2030. The report highlights the importance of data, notes existing gaps in information, and acknowledges the need to address these challenges, suggesting that every individual should have access to the risk and vulnerability information they need to make their communities more resilient. Recent breakthroughs in sensor networks and remote sensing technologies greatly facilitate this process and allow scientists to gather large-scale high-resolution datasets on the environment, water resources, and weather conditions. Most of these datasets are shared through custom interfaces and technical formats for limited stakeholders, making it difficult for the public or other non-targeted groups to effectively access and understand the data. Advancements in novel information and communication technologies are making it possible to manage, analyze, and present large-scale environmental data and modeling results acquired from various sources on the web. This presentation includes the vision and prototypes for next generation information systems utilizing artificial intelligence and intelligent systems, property/asset level data analytics, knowledge generation, visualization and communication systems,

Large Scale Wireless Networks for Disaster Preparedness and Mitigation *(15-minute Presentation)*

Santosh Ganji, *Computer Engineering, Texas A&M University*

Gandhali Prakash Juvekar, *Power Engineer, SEL, Inc*

Mother nature often gives early warning signs of the forthcoming. However, it is often difficult to record, transport, and analyze those signs. Although, we have the most advanced sensors to record the critical warn ings and the experts to predict the imminent disasters, it is challenging to build the appropriate large-scale infrastructure. Several major challenges like availability of reliable electricity, loss of communication links in harsh environments, the lack of large areas to monitor, and the overall costs severely limit our ability to understand the early warning signs. However, recent advancements in cost-effective low power wide area networks along with economical sensors can transport critical data to researchers. This paper focuses on some innovative ideas that provide end-to-end solutions for effective data transfer from the sensors to the scientists. Moreover, it focuses on establishing sustainable communication links that require low maintenance. To present our ideas, we focus on the mitigation of forest fires in a natural forest, however, the architecture applies to any large-scale monitoring. The fundamental goals of this paper are to address the challenges right from the choice of sensors, communication devices and their deployment, and effective data transport in a plug and play manner. These goals are crucial because the main aim is to deploy communication networks in places with scarce to no existing infrastructure.

Ask Me about ReDiReCT: The Disaster Response Toolkit for your Phone *(15-minute Presentation)*

Martin Mufich, *College of Nursing, Texas A&M University and Texas A&M University Health Science Center*

Carlos Ortiz, Jr., *College of Nursing, Texas A&M University Health Science Center*

Sheila Green, *Medical Sciences Library, Texas A&M University*

Background: ReDiReCT: Integrating NLM Resources into Disaster Preparedness and Response Cross Disciplinary Training, funded by the National Network of Libraries of Medicine / South Central Region, disseminates information regarding National Library of Medicine (NLM) disaster-related resources and applications to students, first-responders, and the community at large in the Central Texas region. Using a train-the-trainer approach and student ambassador model, the project focused on enhancing student and responder knowledge and utility of NLM Disaster related resources.

Description: A Disaster Response Toolkit was developed in concert with the Medical Sciences Library linking to resources

from the NLM Disaster Information Management Research Center (DIMRC) by responder role, such as first responder, health care provider, planner or member of the community. Trained student ambassadors interacted with a broad audience during TAMU Health Disaster Week 2020, an inter-disciplinary concentration of 600+ current and future disaster professionals coming together with the community to explore disaster simulation and response. COVID-19 restrictions have forced a pivot of the model to virtual events with community health nursing students as ambassadors.

Conclusions: Students appreciated the responsibility of sharing their disaster toolkit knowledge during the Disaster Week events. Responders learned about resources to help them respond to a disaster. Students will share their experiences with the live events and plans for virtual events in 2021.

Towards an AI-driven Framework for Multi-scale Urban Flood Resilience Planning and Design *(15-minute Presentation)*

Xinyue Ye, *Department of Landscape Architecture and Urban Planning, Texas A&M University*

Shaohua Wang, *Texas A&M University*

Zhipeng Lu, *Department of Architecture, Texas A&M University*

Yang Song, *Department of Landscape Architecture and Urban Planning, Texas A&M University*

Siyu Yu, *Department of Landscape Architecture and Urban Planning, Texas A&M University*

Climate vulnerability is higher in coastal regions that occupy 17 percent of the land and 52 percent of the population in the United States. There have been global trends that more people will live in vulnerable areas (e.g. floodplain), which potentially lead to more development and urbanization in high hazard regions. Urban flooding caused by an increasing number of hurricanes or storms is a national challenge and significant source of property loss, social disruption and inequality. Communities can largely reduce their hazard vulnerabilities and increase their social resilience through design and planning, which could put cities on a trajectory for long-term stability. However, the silos within the design and planning communities and the gap between research and practice have made it difficult to achieve the goal for a flood resilient environment. Therefore, this proposal aims to build an AI (Artificial Intelligence)-driven platform to facilitate the flood resilience design and planning. This platform, with the active engagement of local residents, experts, policy makers, and practitioners, will break the aforementioned silos and close the knowledge gaps, which ultimately increases public awareness, improves collaboration effectiveness, and achieves the best design and planning outcomes. An innovative multidisciplinary collaboration will lead to a more resilient future of the built environment. We will adopt a holistic and integrated approach, bringing multiple disciplines (architectural design, landscape architecture, urban planning, geography, and computer science), and examining the pressing resilient issues at the macro, meso, and micro scales.

1.3: Response to Disasters - Moderator Melissa Shehane

Communities Using Social Media to Partner in Disaster Response *(15-minute Presentation)*

Keri K. Stephens, *Department of Communication Studies, The University of Texas at Austin*

Brett W. Carlson, *University of South Carolina*

Dhiraj Murthy, *School of Journalism, The University of Texas at Austin*

W. Roth Smith, *Department of Communication Studies, Illinois State University and The University of Texas at Austin*

Hurricane Harvey offers many lessons for disaster response, especially when trying to better understand the role of social media and communities. A common misunderstanding is that official emergency response organizations have the resources to manage social media and respond when people share calls for help. As part of our team's National Science Foundation funded project, we identified innovative ways social media platforms were used to rescue people, as well as provide much needed information updates. In this presentation, we will share four exemplars illustrating the breadth of social media being used today as well as how emergency responders effectively partnered with community members. 1. An Emergency Response District effectively partnered with a Community Emergency Response Team Volunteer to respond to social media requests for information and help. 2. A top leader in a school's parent-teacher association used her Facebook contacts to get food donated to feed the National Guard. 3. A running club used social media and various mobile apps to work with the National Guard to help them navigate the streets and rescue people. 4. A neighborhood used Nextdoor to track who had evacuated and who needed rescue. Together these stories open an important dialogue for Texas around the role that community members can and should play when disasters strike. They also reveal the breadth of social media used today, ranging from Twitter, Facebook, Nextdoor, WhatsApp, WeChat, SnapChat, and Instagram, and the role of mobile apps like Zello and even shared GoogleDocs.

Just technological enough: planning for transformative disaster resilience *(15-minute presentation)*

Bethany Cutts, *Department of Parks, Recreation, and Tourism Management, North Carolina State University*

Now, more than ever, there is a need to right-size technology to best support research-centered collaborative inquiry that improves disaster resiliency in rural and racially diverse places. We aim to introduce computer supported collaboration while assuring a user experience robust to differences in technological access and use, an often-underexplored precondition for more equitable natural disaster resilience. We call this approach "just technological enough" where just is intended to imply both an emphasis on achieving gains toward equitable disaster response and to limit the additional investments in technological infrastructure required of either communities or researchers. We will use the boundary object concept to support the development of this technology as a product of a sustainable community- university research to action partnership (CURAP) – that meets the disaster recovery capacity building needs in a rural county, while also building the capacity of resilience scientists to overcome cultural assumptions and biases. A growing literature on CURAPs explores how knowledge systems function in complex political and ecological landscapes. We will extend this literature by training higher education partners on how to ask questions and seek answers that are better aligned to the needs of diverse communities negotiating resilience from a place of disadvantage and that consider the ways that diverse rural places challenge assumptions of resilience science and practice.

A Collaborative Spatial Decision Support System for Flood Emergency Management *(15-minute Presentation)*

Zhe Zhang, *Department of Geography, Texas A&M University*

With the increased frequency of natural hazards and disasters and consequential losses, it is imperative to develop efficient and timely emergency response and relief operations strategies. This project's main goal is to develop and test a human-centered spatial decision support system for informing rapid decision-making during a disaster emergency. The decision support framework will integrate various cutting-edge technologies such as GeoAI, mathematical decision-making models, social media data mining, and Augment Reality to support rescue operation and evacuation in emergency management. Moreover, social media and crowdsourcing data will be used as an additional tool to help the decision-making process. One objective of this project is to analyze the reliability and uncertainty of crowdsourcing data in decision-making. We will test the proposed spatial support system using case studies involving several decision goals (e.g., identifying vulnerable populations and developing best evacuation strategies) generated based on past flood events, including one in Houston, Texas. The proposed spatial decision support system allows collaborative problem-solving and efficient knowledge transformation between decision-makers in the context of disaster emergency management. Using this platform, various emergency responders can formulate their decision objectives, select relevant evaluation criteria, and perform interactive weighting and global sensitivity analyses.

1.4: Recovery from Disasters - Moderator Craig Rotter

Recover Hampton Roads: An Innovative University-Community Foundation Partnership Preparing for Recovery *(15-minute Presentation)*

Joshua G. Behr, *Virginia Modeling, Analysis and Simulation Center (VMASC), Old Dominion University*

Rafael Diaz, *VMASC at Old Dominion University*

The mission of Recover Hampton Roads is to hasten the transition of vulnerable populations towards functional and stable housing through repair and reconstruction of damaged residential homes by way of assessing need and coordinating donated material and volunteer labor. Displaced Low-to-modest income vulnerable and medically fragile populations suffer enormously in the wake of catastrophic severe weather events experiencing lengthy displacements. Lengthy displacements have a direct, deleterious impact upon the health and wellbeing of displaced households and children. Recover Hampton Roads is a housing recovery organization focusing on the recuperation of functional and stable housing for vulnerable households that have suffered storm-induced damage or destruction to the primary residence. The organization aligns the housing recovery needs of impacted and displaced households with the converging available material and volunteer labor flowing into the region. The Recover Hampton Roads effort is about harnessing best practices and developing an organization ahead of time, under blue skies (prior to a catastrophic storm event), that has the tools, knowledge, organizational structure, and leadership necessary to shorten displacement times. Central to Recover Hampton Roads is the Convergence, Inventory, Matching, and Assignment (CIMA) management platform, which performs the centralized management of repair and reconstruction needs relative to the supply of converging donated material and volunteer labor. CIMA is a platform to effectively organize, manage, and allocate resources in a fashion that speeds the transition times from temporary towards permanent housing that may be considered a true home.

Disaster Recovery Alternative Housing Study *(15-minute Presentation)*

Shonda Mace, *Texas General Land Office*

James Ariail, *Hagerty Consulting*

John Squerciati, *Dewberry*

Ashley Saulcey, *Hagerty Consulting*

Following a disaster, many disaster housing-related questions arise. What funds and resources are available to assist homeowners in rebuilding? How should homes be rebuilt? What materials or methods are more resilient in the wake of future disasters? The state of Texas has endured numerous disasters, on the scale of federally declared disasters, to localized disasters. The topic of disaster housing and resilient homes is ever-present in the recovery operations following each event. Utilizing Community Development Block Grant Disaster Recovery (CDBG-DR) grant funds, the Texas General Land Office's Community Development and Revitalization (GLO-CDR) division procured, through a request for proposals (RFP), a vendor to analyze and evaluate alternative housing options to determine if innovative solutions exist for accommodating disaster survivors, including those with low to moderate incomes, that are cost-effective, prudent, secure, and allow for faster construction. Keeping in mind that there are no one-size-fits all solutions for Texas communities, the Study examined a diverse range of emerging housing technologies, as well as innovative housing solutions that are currently available in the marketplace. The first phase of the study, which took approximately ten months to complete, consisted of research and compilation of existing data, assembling of stakeholders from disaster-prone communities, conducting interviews, and compiling the results. Phase 2 of this study is currently undergoing scope development and is expected to begin early 2021. It will be multi-faceted with several established goals.

The Role of Faith-Based Congregations during Disaster Response and Recovery: A Case Study of Katy, Texas *(15-minute Presentation)*

Julie Elliott, *Emergency Management Coordinator at the University of North Texas*

Gary Webb, *Department of Emergency Management and Disaster Science, University of North Texas*

Abstract: *https://docs.google.com/document/d/1Ai1GgTTPx-wKp3LTbq7DlpzHCYMT_Q_DcFsWs-nAaE0/edit?usp=sharing*[1]

1:45 pm **Break**

2:00 pm **Posters Session and Networking**

2:30 pm **Concurrent Workshops and Panels**

Workshop: Navigating Disaster Communications: Challenges and Conflicts

Risk communication faces numerous challenges in what some call the 'post-truth' era we are living in – a time where 'alternative' facts, political ideologies, and feelings have more weight than objective evidence. In the context of today's extreme political polarization, we've seen: media biases detract from the accuracy and credibility of disaster communication from official sources; risk messages met with skepticism by some who are swayed by partisan rhetoric and/or distrust in science; and conflicts emerge among groups when issues related to risk are politicized, as with COVID-19 and climate change. How do we effectively communicate about disasters in this environment? How do we earn the trust of our citizens who may be confused as to what to believe? Learn from the experiences and expertise of a diverse panel that includes mitigation and recovery specialists and practitioners, a communication researcher, and a community advocate.

Moderator: Christa López, *Deputy Director Community Development and Revitalization at Texas General Land Office*

Panelists: **Rev. Gregory Han,** *Director of Interfaith Relations & Education at Interfaith Ministries for Greater Houston*

Kirby Goidel, *Director of the Public Policy Research Institute and Professor and Fellow in the Department of Communication at Texas A&M University*

Michelle Tubbleville, *Special Projects Coordinator, Orange County Office of Emergency Management and Executive Director for Orange County Disaster Rebuild*

Leslie Chapman-Henderson, *President and Chief Executive Officer of Federal Alliance for Safe Homes (FLASH)*

Panel: Challenging Resilience: A Multi Perspective Conversation

The multi hazard, multi-sectorial, multi-level and multidisciplinary realities of the last decades, from Hurricanes Katrina to Maria, the California wildfires, the Puerto Rico Earthquakes, the Covid -19 Pandemic, the murder of George Floyd and the Black Lives Matter movement, require the deep engagement and understanding of a multiplicity of perspectives. This level of convergence can only be achieved through the design of a new architecture of relationships. In fact, some have called the XXI Century, a time of Relational Science! However, the number of spaces for this much needed multi-sectorial dialogue continues to lag in quantity and quality of supply. This Panel attempts to open that space, joining the perspectives of three different landscapes, sectors and extreme events in an effort to "challenge" current definitions of resilience. This is an effort to encourage critical thinking and the decolonization of resilience knowledge and the innovative redesign of its most important institutions.

Moderator: Joan Asencio, *Community organizer at RISE Puerto Rico*

Panelists: **Duaba Unenra,** *Director at the Confluence Studio, Minneapolis, Minnesota*

Faith Hall, *Cultural Assistant to the President of the Bahamas and Artist*

Fayola Jacobs, *Assistant Professor at University of Minnesota*

Ibrahim Lopez, *RISE student and Community Organizer at Northeastern University School of Planning*

4:00 pm **Closing:** **John T. Cooper, Jr.,** *Assistant Vice President of Public Partnership and Outreach at Texas A&M University*

4:15 pm **Networking Lounges Open**

Tuesday, February 2, 2021

11:00 am **Welcome:** **Valentini Pappa,** *Assistant Director for Education, Texas A&M Energy Institute*

11:05am **Keynote:** **The Case for Diversity, Inclusion and Equity in Disaster Management**
Chauncia Willis, *Co-Founder and CEO of the Institute for Diversity and Inclusion in Emergency Management (I-DIEM)*

12:00 pm **Break**

12:15 pm **Concurrent Breakout Sessions**

2.1: Preparedness for disasters - Moderator Jason Moats

Innovations in Preparedness: A Successful Wildfire Drill in Texas with Community Participation *(30-minute Discussion)*

Keri Stephens, *Department of Communication Studies, The University of Texas at Austin*

Pete Martinez, *Organizer of the Wildfire Drill Committee, Comanche Trail Community Association*

Brigid Shea, *Travis County Commissioner, Pct 2*

Will Boettner, *PG CA, Fire Education Outreach Coordinator/PIO, Travis County Fire Marshal's Office*

Strengthening AgriLife Extension's Response Network in Times of Need *(30-minute Presentation)*

Monty C. Dozier, *Disaster Assessment and Recovery, Texas A&M Agrilife Extension Service*

Rachel Bauer, *Texas A&M AgriLife Extension Service*

Starting in the mid 2000's as a disaster preparedness educator, the Texas A&M AgriLife Extension Service's role regarding disasters has evolved to include elements of response and recovery. This progression has led to the development of the newly formed AgriLife Extension Disaster Assessment and Recovery Unit or the DAR team. The DAR team consists of Extension Specialists and Extension Agents – Disaster Assessment and Recovery. The objective of the DAR unit is to provide support related to disaster preparedness, response, short- and long-term recovery and resiliency to the existing AgriLife Extension network of local county Extension Agents serving communities, in which they live and work. Providing a deployable force during gray sky times and serving, during more blue-sky periods, to provide disaster preparedness education and resiliency and mitigation support to local communities, businesses and agricultural producers are at the core of the DAR unit mission. The State's response to COVID 19 has provided an opportunity for the DAR unit to support first responders, individuals, businesses and communities through completion of a variety health-related deliveries as part of the State Pony Express. Operating since early April, the pony express has delivered PPE, medical testing supplies, collected COVID 19 samples, and therapeutics. The DAR unit has certainly strengthened the AgriLife Extension network to enhance support of individuals, families, and communities across Texas.

2.2: Mitigation of Disasters - Moderator Gary Webb

Planning for Green Infrastructure: An evaluation of 52 comprehensive plans in Gulf Coast region *(15-minute Presentation)*

Trang Le, *Department of Recreation, Park and Tourism Sciences, Texas A&M University*

Tho Tran, *Department of Landscape Architecture and Urban Planning, Texas A&M University*

Flooding continues to pose significant threats to the physical, social, and economic well-being of the communities in the United States and worldwide, especially in urban coastal communities that have increasingly dense development and growing populations. Traditional structural mitigation and protection measures such as flood barriers, levees, and reservoirs, often require extensive investment but sometimes result in unintended consequences caused by interruption to natural processes, inadequate protection, and even failure during disaster events. An alternative approach is green infrastructure (GI) that can combine with the traditional structural measures to effectively mitigate the adverse effects of natural disasters and build capacities for resilience. Many cities in the United States have integrated GI in their comprehensive plans to achieve sustainability and resilience goals. However, limited

studies have examined how local governments have incorporated the key principles of green infrastructure into their planning and regulatory frameworks, in other words, how well local plans incorporated key principles of GI. Therefore, my study aims to fill in the gaps by evaluating Gulf Coast cities' comprehensive plans regarding GI. The evaluation protocol designed by Kim and Tran (2018) was used to assess the quality of 52 comprehensive plans in cooperating key principles of GI. Regression analysis was then applied to examine the factors which influence the quality of the plans. Understand the degree to which local governments incorporate the key principles of green infrastructure into their comprehensive plans can shed a light on how green infrastructure and its elements can be adopted and managed in the future.

Wind Hazard Risk Assessment and Mitigation for Residential Construction to Support Community Decision-Making *(15-minute Presentation)*

Fatemeh Orooji, *School of Engineering and Applied Sciences, Western Kentucky University*
Arash Taghinezhad, *Bert S. Turner Department of Construction Management, Louisiana State University*
Carol J. Friedland, *Bert S. Turner Department of Construction Management, Louisiana State University*
Shifat P. Mithila, *Department of Computer Science and Engineering, Louisiana State University*
Jiyoung Lee, *Department of Geography and Anthropology, Louisiana State University*

Wind hazards cause significant damage and economic losses for communities in the wind prone areas. Community resilience to wind impact is enhanced if homeowners continuously put into practice and effective mitigation before and after events. Although several studies have been conducted to suggest building code improvements, a widespread, generalized study has been overlooked to serve as the basis for the selection of beneficial building code revisions. The optimal strategy of resilient residential construction should consider multiple objectives, such as avoiding financial losses and mitigation costs, considering the hazard spatial domain, building configuration, and economic aspects. In a step toward addressing this need, the current study was conducted to determine the effectiveness of mitigation strategies in different wind contours for various residential constructions. A mathematical formulation was applied to facilitate the generation of comprehensive tabular average annual loss (AAL) libraries for multiple loss functions, building types, and hazard exposures. Net benefit (NB), defined as the difference between the life-cycle wind loss before and after implementation of the mitigation strategy, was calculated for almost 3,400 building types categorized into twenty-four residential building type (e.g., wood frame- single Family, wood-frame multi-unit Housing) and the combination of nineteen mitigation options (e.g., shutter, garage door) across the nine wind speed contours. The developed methodology provides a practical approach for wind hazards risk assessment that can be implemented to support an individual building- and community-level wind mitigation decision-making. These conclusions simplify the mitigation decision-making process, ultimately enhancing reliability and reducing risk in wind-prone communities.

Building Code Research and Public Awareness Initiative – No Code. No Confidence. – Inspect2Protect.org *(15-minute Presentation)*

Leslie Chapman-Henderson, *Federal Alliance for Safe Homes (FLASH)*

Building Code Research and Public Awareness Initiative – No Code. No Confidence. –Inspect2Protect.org . If building codes are the foundation of disaster resilience, and they are, then why don't consumers demand them when they buy or build homes? Why do some, but not all, local and state leaders adopt and enforce codes to ensure the safety, welfare, and resiliency of the communities they serve? These are the perennial questions because we know that one cannot reliably protect families and homes without using current codes and standards. As more costly disasters occur, irrefutable proof of building code value is offered into the policy debate. The cycle of "Build-Destroy-Rebuild" persists; why isn't there an outcry by consumers? At the nonprofit Federal Alliance for Safe Homes (FLASH), we believe it's simple. There is no outcry because they do not know. We have worked with consumers before and after disasters for more than 20 years. Our experience teaches us that consumers are not worried about codes because they assume, incorrectly, that leaders would not allow anyone to build them a home without using a playbook of minimum safety standards. They trust that, as with automobiles, the government would never abandon consumer protections when safety is on the line. That is why we designed and conducted the Building Code Research and Public Awareness Initiative, now known as No Code. No Confidence. – Inspect2Protect.org. We wanted to understand and validate consumer attitudes and beliefs regarding building codes and use the insights to bring transparency to the issue once and for all.

Using Environmental Justice to Think About Equity in FEMA HMA Participation: A Survey of State Hazard Mitigation Officers (SHMOs) *(15-minute Presentation)*

Olivia Vila, *Parks, Recreation, & Tourism Management, North Carolina State University*

Gavin Smith, *Department of Landscape Architecture, North Carolina State University*

Samata Gyawali, *Department of Landscape Architecture, North Carolina State University*

Samiksha Bhattarai, *Department of Landscape Architecture, North Carolina State University*

As part of this presentation, I will highlight the results of a national survey conducted with State Hazard Mitigation Officers (SHMOs) that explored the ability of the state to facilitate distributional, procedural, and recognition equity in their jurisdictions in relation to FEMA HMA programs. The results will highlight state-level shortcomings, however more importantly, it will yield insight which can guide improvement of state-level policies and practices that govern the state's interaction with local communities that are least equipped to effectively apply for and implement FEMA HMA grants.

Yearly, FEMA provides hundreds of millions of dollars for hazard mitigation through their Hazard Mitigation Assistance (HMA) grant programs. Unfortunately, this funding is most accessible to already resource-rich communities that have the means necessary to complete complex applications and implementation processes, leaving communities that are known to be more vulnerable to disasters, for example communities of color, low income communities, and rural communities, the least able to leverage federal mitigation funding. This *distributional inequity* is consistent with decades of environmental justice research. While distributional equity is the most recognizable dimension of environmental justice, there are two other important dimensions that contribute to environmental justice: recognition and procedural equity. *Recognition* is a concept that refers to the acknowledgement and respect of difference, whereas *procedural equity* refers to fairness in policy- and decision-making processes. These dimensions are interrelated, and if equity in FEMA mitigation funding is to be nurtured, special attention must be paid to addressing inequities associated with distribution, procedure, and recognition.

2.3: Response to Disasters - Moderator Christa López

Disaster Research Response (DR2) for Characterization Exposure Pathways after Environmental Emergencies *(30-minute Discussion)*

Ivan Rusyn, *Department of Veterinary Integrative Biosciences, Texas A&M University*

Transdisciplinary Post-Disaster Research in a Quarantined World *(30-minute Discussion)*

Samuel Reed, *Forest Ecology at the University of Minnesota Twin Cities*

Jesann Gonzalez Cruz, *Natural Resources and Environmental Sciences at the University of Illinois Urbana Champaign*

Michael Stablein, *Agricultural and Biological Engineering at the University of Illinois Urbana Champaign*

Raine Walters, *Water Resources at the University of Idaho*

Interdisciplinary teams are uniquely suited to traverse emerging challenges in the wake of a disaster, but there is a paucity of applied research that leverages transdisciplinary skill sets and evaluates virtual collaboration in a post-disaster setting. Communities affected by disasters (e.g. hurricanes, earthquakes, and COVID-19) are key sources of information that can serve as models for recovery. Transdisciplinary teamwork uniquely empowers communities with tools and resources, thereby allowing investigators to build context and capacities for addressing multi-hazard challenges. An interdisciplinary team of emerging scholars collaborated with *Caras con Causa, a* grassroots organization in Cataño, Puerto Rico, to strengthen the accessibility and usefulness of their data generated through citizen science. The team's objective was to develop online methods for improving community-based disaster resiliency through participatory mapping and story mapping, specifically highlighting local knowledge and preferences. This enhanced research process was then evaluated in a series of post-engagement interviews, thereby providing a deeper understanding of community-scale perspectives on disaster in the final methodological approach. These transdisciplinary methods and qualitative data outcomes are ultimately developed for and turned over to the communities and local organizations for their use, while simultaneously making meaningful contributions to disaster studies and providing tangible pathways for developing community resilience efforts. We are prepared to host a panel discussion on our innovative framework of transdisciplinary disaster research, which provides a novel understanding of disaster resilience and will inform disaster planning and response policy in multiple contexts within the Gulf and Greater Atlantic's vulnerable coastal communities.

2.4: Recovery from Disasters - Moderator Noel Estwick

Stories of Resilience - Leading the Way on Innovative Disaster Collaboration *(30-minute Discussion)*

Damian Morales, *Disaster Services, OneStar Foundation*

Courtney Goss, *Texas Division of Emergency Management*

With each passing year, local disaster resilience networks are being asked to do more with less. There is no starker example of this than the devastating impact that COVID-19 has had on mission-driven organizations and the communities they serve. Come learn about local communities that are successfully navigating these uncharted times through building relationships that create new pathways to innovation and recovery.
This session will be co-facilitated by Courtney Goss (Texas Division of Emergency Management) and Damian Morales (OneStar Foundation & Texas VOAD) and will highlight stories of resilience from those in the disaster recovery trenches.
Participants will hear examples of how local resilience practitioners from across the state have supported vulnerable populations within their disaster-impacted communities through creativity and resourcefulness. These inspirational stories (told through short video spots) highlight the success that can be had when lemons are turned into lemonade, silos are broken-down, and bridges are built across sectors. Each of these stories highlights a unique form of cross-sector collaboration involving nonprofit, governmental, philanthropic, and/or corporate partners. In addition to lessons learned from the field, participants will learn how the capacity and sustainability of these local resilience networks are being supported by innovative and collaborative processes at the state-level.

#INSPIRE: Integrating Science and Practice to Improve Resilience *(15-minute Presentation)*

Michelle Meyer, *Department of Landscape Architecture and Urban Planning, Texas A&M University*

Josh Roberts, *Texas Division of Emergency Management*

The INSPIRE Coalition (described in the project section below) held three researcher and practitioner workshops in Texas, with 43 participants, about the integration gap between science and practice. The report, made public in March 2020, identifies eight Aims that emerged from the workshop discussions and activities. The Aims include: 1) Identify integration "buddies" from the other side; 2) Build and maintain relationships across the aisle; 3) Capitalize on universities' educational missions; 4) Attend and host diverse events for different integration purposes; 5) Improve bi-directional knowledge translation (research to practice AND practice to research); 6) Open up access to each other's worlds and work; 7) Do more participatory action research; and 8) Adapt institutional structures to support and honor integration activities. With each Aim, there are specific Activities to move it forward that individuals or organizations can begin doing. Together these eight Aims and their attached Activities laid a road map for the newly formed INSPIRE Coalition to follow. INSPIRE Coalition is working to foster integration champions, more specifically understand the integration gap, and create physical and virtual "integration garages" where all the tools for integration are accessible to both researchers and practitioners. This session includes panel discussion by workshop participants.

INSPIRE (integration of science and practice to improve resilience) is a coalition of disaster professionals, like-minded about the importance of reducing disaster loss, working together to converge science and practice to improve resilience. Texas Division of Emergency Management invited researchers and local practitioners to workshops on the "integration gap" between hazard research and practice. These professionals met three times in 2019 to discuss the challenges to integration and brainstorm solutions. Based on written and verbal feedback in these sessions, the group reported out eight Aims for improving integration and a framework for the INSPIRE Coalition in Texas. From finding a cross-aisle integration "buddy" to adapting institutional structures, the Aims and Activities foster ownership and provide clear benchmarks for improving integration. This session will discuss the background of INSPIRE, how the sessions operated, and the next steps. This project embodies "active hope." We assessed challenges and barriers to integration and read literature on the issue (clear view of reality). We brainstormed ways to close the integration gap and developed a report that thematically reviews these ideas (identify solutions). Now we are formalizing the INSPIRE Coalition with specific tasks and fostering individual and collective ownership to address this issue (take action).

The REDDy Model to Online Disaster Directory Creation *(15-minute Presentation)*

Marcia L. Montague, *Special Education, Texas A&M University*

Laura M. Stough, *Department of Educational Psychology, Texas A&M University*

Kayla S. Sweet, *Special Education Teacher, Hays CISD*

Isabella Miracle, *Center on Disability and Development, Texas A&M University*

Access to accurate, up-to-date information about resources and services is essential if survivors are to recover following disasters. Long-term recovery committees and case managers rely on resource directories to design recovery plans with survivors. Emergency

managers also need information about community resources to effectively plan for the recovery phase. Research finds individuals with disabilities typically face more barriers and take longer to recover from disasters. The Center on Disability and Development and the Texas Center for Disability Studies originally developed the REsources for Disasters and Disability (REDDy) Directory to support Hurricane Harvey survivors. The REDDy Directory has since expanded to address needs of people with disabilities affected by the Covid-19 pandemic. The REDDy Directory is an online searchable database with disability-related resources, services, and information that can be searched by keyword (e.g., medical equipment) or resource type (e.g., housing). Utilized by emergency management, disaster case managers, and individuals with disabilities, REDDy bridges disability- and disaster-related resource needs to speed disaster recovery. This presentation describes a replicable five-phase process- the REDDy Model - which can be used to swiftly create and maintain an online resource directory following disaster. Across the first year, REDDy contained 178 resources/services. In evaluating the REDDy model we found: (a) finding resources/services post-disaster is challenging as resources fluctuate quickly, (b) organizations typically do not have time to update their own resource information, (c) disability-related resources decreased within months post-disaster, and (d) Directory maintenance entailed 40 hours a week for the first two months post-disaster.

1:45 pm **Break**

2:00 pm **Posters Session and Networking**

2:30 pm **Concurrent Workshops and Panels**

Workshop: Challenges and Opportunities Related to Gender Diversity in Disaster Leadership

Emergency management is not diverse. Specifically, 82% of leaders in emergency management are white and male. As disasters worsen and society changes, this crucial field remains unknown. Research indicates that disasters disproportionately affect persons with access and functional needs, increase poverty rates, widen the racial wealth gap, and push women back into traditional gender roles. More holistic resilience and equity may be possible if disaster management leadership would more closely resemble the demographics of the country and include diverse perspectives. Yet, how do we get there? This participatory workshop will gather audience thoughts and ideas on four questions specifically about increasing gender diversity - specifically attending to women of color and women with access and functional needs - in emergency management professional roles: 1) What are the barriers to more women, people of color, and those with different abilities to becoming leadership in emergency management?; 2) What is going well in this regard?; 3) What needs to change; and 4) What do we do immediately? The result will be a summary identified barriers, opportunities, and next steps to promote more diversity in the field.

Organizer: Michelle Meyer, *Director of the Hazard Reduction and Recovery Center at Texas A&M University*

Panelists: Christa López, *Deputy Director of the Community Development and Revitalization, Texas General Land Office*

Jaimie Masterson, *Associate Director of Texas Target Communities at Texas A&M University*

Elyse Zavar, *Assistant Professor of Emergency Management and Disaster Science at University of North Texas*

Panel: *Meeting the Moment: Harnessing the Untapped Potential of Universities in Building Community Resilience*

With more than 1,700 universities in the United States, and an estimated 28,000 worldwide, the Global Council for Science and the Environment (GCSE) recognizes an underutilized opportunity to engage the university-based scientific enterprise to enhance community resilience. At this moment in time, accentuated by the devastating impact of the COVID-19 pandemic, stronger linkages between the university knowledge enterprise and decision-makers can lead to mutual benefit. This panel discussion will highlight examples of university engagement in community resilience, bringing together pairs of university leaders with community partners from three different regions, to explore the conditions that make such partnerships possible to begin to map a path toward replicability and durability across higher education.

Moderator: Erica Goldman, *Deputy Director, Global Council for Science and the Environment*

Panelists: Patricia Solis, *Executive Director, Knowledge Exchange for Resilience at Arizona State University*

Marty Matlock, *Executive Director, University of Arkansas Resiliency Center*

Erica Smithwick, *Director of the Ecology Institute and Center for Landscape Dynamics, Penn State University*

Peter Nierengarten, *Environmental Director, City of Fayetteville, Arkansas*

Nathan Smith, *Chief Program Officer, Phoenix Rescue Mission*

Christopher Caldwell, *Interim President, College of the Menominee Nation*

Nathan Fregien, *College of the Menominee Nation*

4:00 pm **Closing:** **Michelle Meyer,** *Director, Hazard Reduction & Recovery Center, Texas A&M University*

4:15 pm **Virtual Field Visit and Live Interviews**

Location: TEEX Disaster City and Training Facility followed by Q&A with Jason Moats

4:15 pm **Networking Lounges Open**

Wednesday, February 3, 2021

11:00 am **Welcome:** **Michelle Meyer,** *Director, Hazard Reduction & Recovery Center, Texas A&M University*

11:05 am **Keynote:** **Convergence: Coming Together to Advance Hazards and Disaster Research**
Lori Peek, *Director of the Natural Hazards Center and Professor in the Department of Sociology at the University of Colorado Boulder*

12:00 pm **Break**

12:15 pm **Breakout Sessions**

3.1: Preparedness for disasters - Moderator Craig Rotter

Moving Flood Preparedness and Education Forward for Texas *(15-minute Presentation)*

Keri K. Stephens, *Department of Communication Studies, The University of Texas at Austin*

Nancy Carlson, *Department of Communication Studies, The University of Texas at Austin*

Kendall P. Tich, *Department of Communication Studies, The University of Texas at Austin*

Floods impact all parts of Texas and they are our most costly disaster. Yet surprisingly, there are very few systematic, evaluated programs focused on flood preparedness. While many people have heard of NOAA's program Turn Around Don't Drown, and organizations like FEMA provide information on flood insurance and community incentive programs, we still struggle to help people plan and take protective actions for floods. In this presentation, our team shares the early results from research conducted by The University of Texas Moody College of Communication in partnership with the Texas Water Development Board. Specifically we share a model that depicts the complexity involved in identifying audiences to receive flood education and their varying needs. For example, urban flooding is quite different from riverine or coastal flooding, and flash floods require different forms of communication than advance-notice hurricanes. We also discuss the particular need for flood education in colonias and the key vulnerability flood impact indicators. We highlight the unique aspects of several programs in Texas that focus on flood education and communication such as Harris County Thrives, The San Antonio Flood Emergency SAFE System, and ATX Flood Safety. We also share some exemplars at the national and international levels. We hope this discussion will raise awareness of both the great ideas developed in our state as well as key gaps in understanding how to communicate about flood preparedness in Texas.

Lessons from Emergency Response for IT and Cybersecurity *(15-minute Presentation)*

Andrew Jarret, *Program Manager, Cyber Readiness Center (CRC)*

For years, Information Technology and Cybersecurity departments within organizations have been struggling to develop plans and procedures for mitigating, responding to, and recovering from cybersecurity events. Although some strides have been made at the federal and state government level to integrate cybersecurity into the "all hazards approach" to incident management, many organizations outside of traditional emergency management are struggling to develop incident response, recovery, and mitigation/preparedness procedures.

Andrew Jarrett of the TEEX Cyber Readiness Center is a former firefighter, current member of a Type II/Type III Incident Management Team (IMT) and has recently been deployed as a member of Texas Division of Emergency Management (TDEM) Incident Support Teams (ISTs) for COVID response. As the Cyber Enterprise Program Manager at the TEEX CRC he helps organizations assess their cybersecurity risk posture, develop pre-incident plans for cybersecurity, and organize their resources for response and recovery. He has also developed and delivered a number of FEMA-certified cybersecurity courses focused on the FEMA mission set of preparedness, mitigation, response, and recovery.

In this presentation, Mr. Jarrett will discuss a brief history of NIMS/ICS, federal and state doctrine that has been developed to coordinate cybersecurity incident response in the public sector, and how organizations in both the public and private sector can implement a model inspired by the core tenants of incident command and other lessons in emergency response to manage cybersecurity risk and organize for the response and recovery from cybersecurity disasters.

3.2: Mitigation of Disasters - Moderator Katya Wowk

Collaborative Partnerships as a Strategy for Improving Disaster Education Programming at 1890 Land-Grant Universities *(15-minute Presentation)*

Noel M. Estwick, *Department of Agriculture, Nutrition and Human Ecology, Prairie View A&M University*
Jerrel V. Moore, *School of Nursing, Prairie View A&M University*

1890 Land-Grant Universities' (LGUs) are Historically Black Colleges and Universities established under the Morrill Act of 1890. This presentation will highlight results from a project to strengthen the engagement of 1890 LGUs in the national Extension Disaster Education Network (EDEN). The objectives were to: 1) Identify barriers to 1890 LGUs participation in EDEN, 2) Assess mechanisms available in USDA-NIFA that can promote 1890-EDEN growth and 3) Make recommendations to EDEN and NIFA about how to further engage 1890 LGUs in EDEN.

A critical component of the project was the formation of the 1890 Advisory Group (AG). The AG works with the project team to provide guidance on how to successfully engage 1890s in EDEN. In 2017, one hundred and forty-seven extension Administrators and personnel from 1890 LGUs responded to a nationwide survey. Factor analysis was used to analyze the data and create domains which will influence the creation of a framework for collaboration among the 1890 LGUs. Key findings from the survey are that in addition to collaboration within the 1890 community, extension personnel at 1890s are interested in collaborating with their 1862 counterparts, and 1890 LGUs are not taking advantage of EDEN resources to disseminate information about disaster programs they are conducting. The study has enabled the AG to propose an action plan that includes short, medium, and long-term actions for involving 1890 LGUs in EDEN and improving disaster education programming targeting limited resource clientele across the USA.

Preservation at the Intersections: Patterns of Disproportionate Multi-Hazard Risk and Vulnerability in Louisiana's Historic African American Cemeteries *(15-minute Presentation)*

Jennifer Blanks, *Department of Landscape Architecture and Urban Planning and Hazard Reduction and Recovery Center, Texas A&M University*
Joy Semien, *Department of Landscape Architecture and Urban Planning and Hazard Reduction and Recovery Center, Texas A&M University*
Alexander Abuabara, *Department of Landscape Architecture and Urban Planning and Hazard Reduction and Recovery Center, Texas A&M University*
Andrea Roberts, *Department of Landscape Architecture and Urban Planning and Hazard Reduction and Recovery Center, Texas A&M University*

Cancer Alley is an 85-mile stretch of chemical and industrial plants along the Mississippi River between New Orleans, Louisiana, and Baton Rouge, Louisiana. Since 2005, the area has experienced over two dozen hurricanes with major rainstorms in between. Cemeteries, though just as vulnerable to storms and cancer-causing chemicals as the local population and natural environment, are overlooked casualties of frequent hurricanes and plant siting. During hurricanes and annual flooding, cemeteries in South Louisiana sustain significant damage such as dislodged coffins, difficult to reintern remains, and burial records damaged or destroyed. African American cemeteries are vulnerable to climate change impacts such as flooding, are often inaccessible, undocumented, and rarely recognized as environmental justice concerns. Until now. Recently, environmental justice activists have mobilized to resist a Formosa plant's siting close to a historic Black cemetery in St James Parish. The authors hypothesized that the Formosa siting is not an isolated case but instead reflects a pattern of racialized multi-hazard exposure of African American people and cemeteries. They created a database of cemetery locations—many of which were previously unmapped—based on the race or ethnicity of those interred in two parishes. Then, they performed a spatial analysis comparing cemeteries' exposure to flood hazards and proximity to hazardous chemical sites based on racial makeup. Findings show that Black cemeteries have more multi-hazard exposure than other cemeteries due to accessibility and flooding. Results indicate that racialized multi-hazard exposure of cemeteries should be an emerging concern of Gulf Coast disaster recovery planners and researchers.

3.3: Response to Disasters - Moderator Monica Sanders

The Impact of Hurricane Harvey on the Retail Gasoline Industry *(15-minute Presentation)*

Eric Lewis, *Bush School of Government and Public Service, Texas A&M University*

Ben Klopack, *Department of Economics, Texas A&M University*

Fernando Luco, *Department of Economics, Texas A&M University*

In this study we examine the effect of Hurricane Harvey on the retail gasoline industry. We combine data on gas station locations in the Houston and Corpus Christi area with locations where FEMA reports water damage to impute whether any given gas station was likely to be damaged by Hurricane Harvey. We also incorporate cell-phone location data from SafeGraph to approximate gas station demand, OPIS data on gas station pricing, and data from a large payment card company on transactions.
We define those stations that were "affected" by Hurricane Harvey as those that were either within 100 meters of a structure that FEMA listed as destroyed by Harvey or 50 meters from a structure that FEMA listed as severely damaged by Harvey. "Unaffected" gas stations are those that did not satisfy that criteria. Using this measure, 53 gas stations in Houston and Corpus Christi were affected by Harvey. This choice of cutoffs is designed to strike a balance between having a sufficiently large sample of affected gas stations while excluding stations that likely had little to no damage. Our empirical results are qualitatively similar when using other cutoffs to define affected versus unaffected stations.
Our preliminary examination of these rich data suggests that Hurricane Harvey had a temporary albeit significant effect on gas station demand and pricing. Future research will focus on incorporating additional data such as demographic information and road flooding, as well as econometric estimation of consumer demand and firm profits to examine the welfare consequences of Hurricane Harvey across heterogeneous locations.

Food Access and its relation to Critical Infrastructure after Hurricane Harvey *(15-minute Presentation)*

Nathanael Rosenheim, *Hazard Reduction and Recovery Center and Department of Landscape Architecture and Urban Planning in the College of Architecture at Texas A&M University*

Maria Watson, *Hazard Reduction and Recovery Center and Department of Landscape Architecture and Urban Planning in the College of Architecture at Texas A&M University*

John Casellas Connors, *Department of Geography in the College of Geoscience at Texas A&M University*

Mastura Safayet, *Department of Geography in the College of Geoscience at Texas A&M University*

Natural Disasters have the potential to exacerbate food insecurity through the disruption of critical infrastructure such as electricity, water, gas, internet, and road networks. This is a particularly salient issue for southeast Texas, which experiences chronic hurricane risk and has historically scored low on measures of food security. This study conducted surveys with food suppliers within Harris, Orange and Jefferson Counties to understand the role of pre-event vulnerabilities and damage to the built environment in the disruption of food suppliers. This research, therefore, examines social, economic, and physical systems in order to understand how to better prepare for future food-related disruption and improve day-to-day food access for vulnerable populations. We present some of the survey findings and their implications for resilience as it pertains to food access after 2017 Hurricane Harvey.

Characteristics of Texas Communities Frequently Impacted by Flash Flooding *(15-minute Presentation)*

Shi Chang, *Department of Civil & Environmental Engineering, Texas A&M University*

Rohan Singh Wilkho, *Department of Civil & Environmental Engineering, Texas A&M University*

Nasir Gharaibeh, *Department of Civil & Environmental Engineering, Texas A&M University*

Garett Sansom, *Department of Environmental and Occupational Health, Texas A&M University*

Francisco Olivera, *Department of Civil & Environmental Engineering, Texas A&M University*

Michelle Meyer, *Hazard Reduction & Recovery Center, Department of Landscape Architecture and Urban Planning, Texas A&M University*

Flash flooding is one of the most lethal natural hazards, measured by the ratio of fatalities to people affected. This type of flooding is generally characterized by high runoff flow velocity, short warning lead-time, and small affected area. This presentation will discuss the characteristics of Texas communities that have been impacted by flash flooding in the past 20 years (2000-2020). The community characteristics include location, building age (as a proxy for the age of the built environment), socioeconomic status,

household composition, minority status, and housing type. The flash flood impacts include fatalities, injuries, and economic damage. Bayesian Network analysis was used to assess the causal-relationship between these community characteristics and the flash flooding impacts. The dataset used in this analysis was assembled by merging three publicly available datasets: NOAA's Storm Events, CDC's Social Vulnerability Index and associated variables, and the U.S. Census Bureau's American Community Survey. The analysis results could shed light on identifying communities vulnerable to flash flooding and inform preparedness and mitigation strategies to reduce flash flooding impacts.

Disaster Resilient Food Energy Water Nexus Systems *(15-minute Presentation)*

Sengupta, Debalina, *TEES Gas and Fuels Research Center, WEF Nexus Coordinator, Texas A&M Energy Institute, Artie McFerrin Department of Chemical Engineering, Texas A&M University/Texas A&M Engineering Experiment Station (TEES)*

Efstratios Pistikopoulos, *Texas A&M Energy Institute, Artie McFerrin Department of Chemical Engineering, Texas A&M University/TEES*

Mahmoud El-Halwagi, *Chemical Engineering, Bryan Research and Engineering Chair in Chemical Engineering, Managing Director, TEES Gas and Fuels Research Center, Texas A&M University/TEES*

Bassel Daher, *Convergence Research Incubator, Adjunct Assistant Professor, Biological and Agricultural Engineering, Texas A&M University/TEES*

Arkasama Bandyopadhyay, *Mechanical Engineering Texas A&M University/TEES*

Debjyoti Banerjee, *Mechanical Engineering, James J. Cain '51 Faculty Fellow II, Texas A&M University/TEES*

Valentini Pappa, *Texas A&M Energy Institute, USA, AdjunctAssistant Professor of the Biological and Agricultural Engineering Department at Texas A&M University, USA, Texas A&M University/TEES*

Shelly Tornquist, *PK-12 Engineering Education Outreach, Workforce Development, Office of Vice Chancellor and Dean, Texas A&M Engineering Experiment Station, TEES*

Lucy Mar Camacho, *Department of Environmental Engineering, Texas A&M University-Kingsville/TEES*

C. Elizabeth Stokes, *Department of Sustainable Bioproducts, Mississippi State University*

Damien Ejigiri, *Nelson Mandela School of Public Policy & Urban Affairs, Southern University*

Onyumbe B Lukongo, *Nelson Mandela School of Public Policy & Urban Affairs, Southern University*

Seth Blitch, *The Nature Conservancy*

William Grieco, *RAPID Manufacturing Institute*

Paul Yelvington, *RAPID Manufacturing Institute*

Troy Hawkins, *Fuels and Products Group, Argonne National Laboratory*

Anamitra Anurag Danda, *Visiting Senior Fellow, Energy and Climate Change Programme, Observer Research Foundation; Expert Faculty, LLM Programme on Environmental Law, Energy & Climate Change; WWF India and OP Jindal Global University*

Vilas Mujumdar, *Independent Consultant*

2019-2020 has witnessed an outbreak of the COVID-19 pandemic, a public health disaster. Multiple countries have been affected over a short period of time and millions of lives worldwide have been impacted. In recent years, more localized natural disasters such as hurricanes and floods have also seen an increase in variety, complexity and intensity. Disasters of such magnitude were unprecedented, and still continue to impact the lives, economies, and related systems around the world. Even though natural disasters have been increasing in the recent past, 2020 has been extremely unusual due to the impacts faced from multiple disaster disruptions.

Poor and marginalized populations tend to be the most affected by disasters. When disaster conditions prevail, food, energy, and water systems (basic needs) are severely challenged, sometimes even hindering the ability of rescue workers to respond to the needs of people. Effective disaster management requires rigorous science- and engineering- driven solutions with inputs from all disciplines. Decentralized, distributed, modular systems have been gaining importance in recent years due to the ability to provide services in areas of need when required. While much focus has been on discrete on-purpose manufacturing systems, which bypass

the need for products transportation and storage, lesser emphasis has been given on low-cost solutions that address basic human needs.
Disaster management has four stages: response, recovery, mitigation, and preparedness. There is a pressing need to conduct research in the four disaster management stages with direct improvement to the impacted areas of food, energy and water through engineered solutions that will decrease the time of impact, thereby increasing the resilience to disasters. This paper is a perspective article for describing and quantifying disaster resilience and provide a framework for synthesizing engineered solutions in the context of the food, energy, and water nexus. Using current concepts of resilience from various engineering and social domains, the basic attributes required for intervention approaches are identified. Then, a new class of integrated conceptual design is presented and each of the attributes of resilience addressed by this design are discussed. Following this, the interactions of the technological system with ecosystem services, human systems and governance areas are discussed for designing the operation of these technological systems. Planning is specifically targeted towards the alignment of these highly interconnected system with the disaster management cycle of preparedness, response, recovery, and mitigation.

3.4: Recovery from Disasters - Moderator Ashley Ross

Disaster Recovery for Senior Officials *(90-minute Professional Development Workshop)*

David Spruiell, *Texas A&M Engineering Extension Service (TEEX)*

David Pointon, *Texas A&M Engineering Extension Service (TEEX)*

Frank Patterson, *Texas A&M Engineering Extension Service (TEEX)*

Texas A&M Engineering Extension Service (TEEX) Infrastructure Training and Safety Institute (ITSI) would like to deliver a 90-minute presentation titled "Disaster Recovery for Senior Officials". It is an introductory/awareness course that provides an overview of the disaster recovery process and focuses on those responsible for planning for, applying, and delivering the response core capabilities defined in the National Preparedness Goal. This includes community leaders, emergency management practitioners, first responders, and other government officials who must collectively understand and assess the needs of their respective communities and organizations and determine the best ways to organize and strengthen their resilience prior to a disaster.
Upon successful completion of this course, participants will be better prepared to lead and manage jurisdictional recovery efforts by raising their awareness of the Federal disaster recovery programs and processes and the importance of pre-disaster planning and preparation for recovery. Topics covered will include recovery planning and preparation, public assistance process overview to include funding, procurement and contracting.

1:45 pm **Break**

2:00 pm **Posters Session and Networking**

2:30 pm **Concurrent Panels**

Panel: Behavioral Health and Disasters: A moderated panel discussion of the challenges & interventions for the community, responders, and self

This 90-minute panel session focuses on the disaster-based behavioral health challenges and practical strategies to mitigate them. While the focus is on disasters in general, our session will carefully address issues identified by the ongoing COVID pandemic. The session panelists are professionals who are actively engaged in behavioral health research and practice. The goals of the session are to 1) Provide participants with a general overview of the types of behavioral health challenges associated with disasters, 2) Discuss specific behavioral health challenges observed as a result of the SARS-CoV-2 global pandemic (e.g. pandemic fatigue, compassion fatigue, moral injury, etc), 3) Provide participants best practices for interventions and strategies that can help them cope with behavioral health challenges brought on by disasters.

Moderator: Jason Moats, *Director, TEEX Testing and Innovation Center, Texas A&M Engineering Extension Service*

Panelists: Lisa Sullivan, *Consultant at Texas Suicide Prevention Center*

Jay Maddock, *Interim Director, Institute for Improving Health through Agriculture, Chief Wellness Officer, Texas A&M University*

Carly McCord, *Director of Telebehavioral CareDepartment of Psychiatry,Texas A&M University College of Medicine*

Iris Carillo, *Assistant Director, Director of Diversity and Inclusion, CAPS - Counseling & Psychological Services, Texas A&M University*

Richard Costa, *Clinical Associate Professor of Psychiatry, LSUHSC School of Medicine, Department of Psychiatry*

Panel: The Next Generation of Resilience and Sustainability Leaders: Our Perspectives

Current students and recent alumni will reflect on their university experiences and how these experiences shaped their capacity as future leaders in resilience and sustainability. They will address questions such as: How did/do you contribute to resilience or disaster or sustainability as a student? What does your participation in these efforts offer you and other students? How can universities do better to encourage more students to engage in resilience and sustainability efforts?

Moderator: Natalie Coleman, *Urban Resilience.AI Lab, Zachry Department of Civil and Environmental Engineering, Texas A&M University*

Panelists: Rebekah Manon, *Operations Analyst at AC Disaster Consulting*

Asia Dowtin, *Urban and Community Forestry, Michigan State University*

Paige Wirth, *Environmental Geoscience, Texas A&M University*

4:00 pm **Closing Remarks: John T. Cooper, Jr.** *Assistant Vice President of Public Partnership and Outreach at Texas A&M University*

4:15 pm **Virtual Field Visit and Live Interviews**

Location: Houston Ship Channel Neighbors: A Toxic Tour

4:15 pm **Networking Lounges Open**

Thursday, February 4, 2021

11:00 am **Welcome:** **Cory Arcak,** *Director, MSC L.T. Jordan Institute at Texas A&M University*

11:05 am **Keynote:** **Reimagining Effective Disaster Philanthropy**
Patricia McIlreavy, *President and CEO of the Center for Disaster Philanthropy*

12:00 pm **Break**

12:15 pm **Concurrent Breakout Sessions**

4.1: Preparedness for disasters - Moderator Christa López

Assessing the Effects of Climate Change on Cryptosporidiosis: Integrating Soil Quality, Natural Disasters, and Infectious Disease Using a One Health Approach *(15-minute Presentation)*

John Carew, *U.S. Fulbright Student Researcher at Ibn Zohr University,*

Benjamin Clark, *School of Engineering and Applied Sciences, University of Virginia*

Resilient Texas Geodesign Game: Co-creating a Market-Driven Adaptation Plan for Climate Extremes *(15-minute Presentation)*

Hope Hui Rising, *TAMU Department of Landscape Architecture and Urban Planning*

Ryun Jung Lee, *TAMU Department of Landscape Architecture and Urban Planning*

Abimbola Olorode, *TAMU Department of Landscape Architecture and Urban Planning*

Hrishikesh Ballal, Founder, *Geodesignhub*

Doug Wunnerburger, *TAMU Department of Landscape Architecture and Urban Planning*

The two geodesign games intend to engage participants in generating a consensus-based vision for climate-proofing the Texas Gulf water resources region. The geodesign game outcomes will be used to inform a regional climate adaptation plan as a market-based framework that informs the siting, design, and phasing of adaptive design interventions for a more resilient, livable, and prosperous Texas. We will also examine how this plan coordinates with the climate adaptation plan for all the contributing watersheds of the Gulf.

Climate change has resulted in rising sea levels, more sustained droughts, longer periods of extreme temperatures, and a greater frequency of superstorms. Urban heat island effects in coastal cities have also been found to contribute to rainfall redistribution along the coastal-inland transects, resulting in more severe thunderstorm-related upstream flash flooding in locations downwind of coastal cities.

Before each geodesign game, we will showcase contextual analyses and evidence-based best practices for siting and designing blue and green infrastructure at varying scales for climate adaptation. In addition, suitable types of blue and green infrastructure will be identified based on distinct intervention zones located along east-west precipitation gradients and north-south coastal-inland watershed transects.

Participants will be organized into small groups to generate a consensus-based climate adaptation framework to help identify priority intervention sites within each zone and optimal interventions for transforming the weaknesses and threats of those sites into strengths and opportunities. During each design game, each participant will take turns to propose or remove a design move. Each design move will entail locating a suitable intervention on a priority implementation site using a strength-weakness-opportunity-threat (SWOT) analysis. The geodesign game is structured in a way to enable participants from all age groups, levels of education, and expertise areas to collaborate in a democratic process of collective creativity.

The discussions of geodesign game outcomes will focus on ways to coalescence alternative frameworks into an optimized system of decentralized design strategies that 1) reduce the impacts from the amplified frequency of precipitation events, 2) minimize the urban heat island effect in cities, 3) mitigate the convergence of runoff in areas vulnerable to flash flooding, and 4) instigate the proactive relocation of populations from coastal areas threatened by sea level rise. Participants will also be invited to brainstorm possible directions for fine-tuning this framework into a decision-support system to inform blue-green infrastructure planning and design for climate adaptation at the nexus of water, food, energy, jobs, and amenities.

A Comprehensive Approach to Identify Shoreline Change: A Study of Kuakata, Bangladesh *(15-minute Presentation)*

Nazla Bushra, *Department of Oceanography and Coastal Sciences, Louisiana State University*

Rubayet Bin Mostafiz, *Department of Oceanography and Coastal Sciences, Louisiana State University*

In recent years, shoreline determination has become an issue of increasing importance and concern, especially at the local level, as sea level continues to rise due to climate change. This study identifies the areas of erosion, accretion, and shoreline stabilization along the coast of Kuakatam a vulnerable coastal region in southeastern Bangladesh. The shoreline change was detected by applying remote sensing and geographic information system (RS-GIS) techniques for the years of 1989, 2003, and 2010 by comparing Landsat Thematic Mapper (TM) satellite images at 30 m resolution. Band combination (BC), ratio transformation (RT), Normalized Difference Vegetation Index (NDVI), and Normalized Difference Water Index (NDWI) algorithms were used to extract the shoreline (i.e., land-water boundary) to compare the results. BC was used to quantify the changes due to its proficiency in detecting the land-water interface. This study also used participatory rural appraisal (PRA) tools to compare and verify the results, which also revealed the impacts due to the changes. Results show that from 1989 to 2010, a total of 11.81 $km^2$of coastal land was eroded and 2.34 $km^2$of land was accreted, suggesting that land is retreating at about 4.7 km^2 $decade^{-1}$. Results from the PRA tools also support this finding and demonstrate that fisheries and tourism are affected by the shoreline change. These results are important in Kuakata, a major tourist spot in Bangladesh, because of its impacts on fisheries, resource extraction, land use planning, and coastal risk management. Key words: Shoreline Change, RS-GIS technique, Landsat TM, Participatory Rural Appraisal, Kuakata, Bangladesh

4.2: Mitigation of Disasters - Moderator Katya Wowk

Disparities in Disaster Preparedness Actions and Accessibility Relating to Critical Lifeline Services *(15-minute Presentation)*

Natalie Coleman, *Urban Resilience.AI Lab, Zachry Department of Civil and Environmental Engineering, Texas A&M University*

Amir Esmailian, *Urban Resilience.AI Lab, Zachry Department of Civil and Environmental Engineering, Texas A&M University*

Ali Mostafavi, *Urban Resilience.AI Lab Zachry Department of Civil and Environmental Engineering, Texas A&M University*

Natural hazards inevitably cause disruptions in critical lifeline services such as power, medical, and grocery systems. Though previous research has studied the culture of preparedness in communities to mitigate the impact of natural hazards, few have examined the direct relationship between preparedness and disaster-induced service disruptions. There is little empirical understanding about the protective actions and adjustments available to and taken by affected residents to mitigate upcoming service disruptions. For instance, residents may respond to potential service disruptions by stockpiling food and water, purchasing necessary supplies, tolerating the disruption, or evacuating the area. These choices may be magnified due to influencing characteristics such as different income levels, age groups in the household, perceived expectation of service disruption, and length of forewarning for the impending disaster. Using descriptive and statistical analysis on survey data collected from individual households along with access to grocery stores, the research aims to establish a framework on the protective actions and adjustments related to infrastructure service disruptions. It will examine the disruptions in infrastructure services caused by Hurricane Harvey (2017), Hurricane Florence (2018), and Hurricane Michael (2018). The research will assist invested stakeholders such as community leaders, emergency planners, and utility companies in understanding which households are most prepared and which are most vulnerable for potential service disruptions. Such findings will also reveal the underlying social impacts in order to prioritize the investment and restoration of

An examination of the social-psychological drivers of homeowner wildfire mitigation *(15-minute Presentation)*

Benjamin Ghasemi, *Human Dimensions of Natural Resources Lab., Department of Rangeland, Wildlife, and Fisheries Management, Agriculture and Life Sciences, Texas A&M University*

Gerard T. Kyle, *Human Dimensions of Natural Resources Lab., Department of Rangeland, Wildlife, and Fisheries Management, Texas A&M University*

Wildfire events have been impacting many parts of the United States. Of particular importance are the Wildland-Urban Interface (WUI) areas, where residential development exposes residents to increased risk from the threat of wildfire. However, evidence shows that WUI homeowners do not adequately mitigate risk through participation in programs such as Firewise USA®. In this investigation, we examined social-psychological factors that influence homeowners' intentions to adopt Firewise activities. Data were collected from a random sample of 1633 households in three wildfire-prone WUI areas of southern California. Structural

equation modeling results illustrated that homeowners' perceived effectiveness of Firewise activities, along with their perceived risk of wildfire, significantly influenced their intentions to adopt suggested activities. We also found that respondents' past experience with wildfire and home attachment increased their intentions to adopt Firewise activities. Furthermore, the congruence between agency's and individuals' values (i.e., salient value similarity) increased homeowners' trust in agency management and information, and, subsequently, their perceptions of the effectiveness of wildfire risk mitigation activities. Alternately, past experience with wildfire diminished trust in agencies responsible for wildland fire mitigation. Our findings shed light on the ambiguities surrounding the role of past experience, risk perception, and place attachment in hazard preparedness. In addition to risk communication and promoting action effectiveness, our findings illustrate the importance of integrating cognitive heuristics and emotional bonds along with existing rational, evaluative models of decision-making to encourage homeowners' wildfire risk mitigation behavior.

4.3: Response to Disaster - Moderator Kelly Wellman

The 2020 Atlantic Hurricane Season Lived up to predictions and Shattered Records! *(15-minute Presentation)*

Ali Fares, *Water Security & Water-Food-Energy Nexus, College of Agriculture and Human Sciences, Prairie View A&M University*

With about 1 trillion dollars in damage, $21 billion per event, and 164 death annually during the past 40 years, tropical cyclones have caused the most damage and also have the highest average event cost are responsible for the highest number of deaths in the U.S. Texas is ranked first in the U.S. in the variety and frequency of natural disasters. Damage costs related to tropical cyclones represents 68% of the total costs of natural disasters in Texas. Florida and Texas have higher chances of getting a tropical cyclone than any other state in the region because of their extended coastal areas; as such, Texans paid attention to the Atlantic Hurricane season. The main goal of this presentation is to give an overview and an analysis of the 2020 Atlantic Hurricane Season (AHS). NOAA predicted an above-average hurricane season for 2020. This outcome did not fall this prediction. Several records were broken; there were 30 named storms higher than the record set in 2005. Also, 13 out of those 30 named storms made landfall in the continental U.S. to set a new record that was set over 100 years ago in 1916. In addition, the 2020 AHS had 6 major hurricanes double the average number of major hurricanes 3. It is only the second time the Greek alphabet was used to name hurricane for the second part of the season. Eight of the storms impacted the Gulf of Mexico, and six of which made landfall and/or went through Louisiana. Beta and Hanna are the only storms that impacted Texas. A warmer ocean surface resulting from the Atlantic Multi-Decadal Oscillation (AMO) that existed during the last five years favors an increase in the number and intensity of tropical storms. The AMO is a series of extensive fluctuations in sea surface temperatures in the North Atlantic Ocean that last for decades. Climate change and a stronger West African monsoon, along with much weaker vertical wind shear and wind patterns coming off of Africa, impacted this year's AHS. The total aggregated damages of the 2020 AHS in the U.S. is expected to exceed $41 billion, and more than 400 lost their lives. There was a substantial increase in the accuracy of the forecasters to help decision-makers and communities make the appropriate decisions on-time.

Evaluation of Performance of Multi-Radar Multi-Sensor (MRMS) product in Monitoring Extreme Precipitation in Harris County, Texas *(15-minute Presentation)*

Ripendra Awal, *College of Agriculture and Human Sciences, Prairie View A&M University*

Ali Fares, *Water Security & Water-Food-Energy Nexus, College of Agriculture and Human Sciences, Prairie View A&M University*

Hamideh Habibi, *College of Agriculture and Human Sciences, Prairie View A&M University*

Integration of high-resolution precipitation is key for the accuracy of hydrologic modeling for flood prediction and flood mitigation. The Multi-Radar Multi-Sensor (MRMS) system has been developed by the National Severe Storms Laboratory (NSSL) to produce high-resolution spatio-temporal precipitation data. While the MRMS data are available at relatively high spatial (1 km) and temporal (2 min) resolutions across the continental United States (CONUS), MRMS's accuracy in measuring actual precipitation needs to be investigated across flood prone areas such as Harris County, TX. Therefore, the objectives of this study are to evaluate i) the performance of the MRMS system compared to other precipitation products (rain gauge network, Multisensor Precipitation Estimator (MPE)) at different spatial (5, 10, 15, 30 km) and temporal (5, 10,15, 30, 60 min) aggregations during four major flooding events: May 2015 (Memorial Day flood), April 2016 (Tax Day Flood), August 2017 (Hurricane Harvey), and September 2019 (Tropical Storm Imelda) in Harris County, Texas; and ii) the effects of temporal and spatial aggregations on the performance of the MRMS system using a suite of statistical parameters. Point-to-grid comparisons were conducted between 142 rain gauges and MRMS system data during four extreme flood events. Overall, the MRMS system captured precipitation reasonably well with a coefficient of determination (R^2) of 0.78, correlation coefficient (CC) of 0.88, root mean square error (RMSE) of 1.21 mm, critical success index (CSI) of 0.65, probability of detection (POD) of 0.98, and false alarm ratio (FAR) of 0.34 at 15 min and 15 km temporal and spatial resolutions. The results indicate that MRMS product tends to underestimate higher precipitation rates

and overestimate light precipitation. Coarser temporal resolutions from 5 min to 1 hour resolved some of the overestimation issues. Temporal aggregation increased R^2, CC, CSI, and error variances and decreased FAR. However, increasing spatial resolution from 1 to 30 km increased R^2, CC, and CSI and reduced RMSE and FAR. A comparison of MPE QPE and MRMS products at the hourly temporal resolution with gauge observations showed that both products estimate rainfall accurately for the four events. On average, the MRMS product has a slightly better agreement with rain gauge observations at 1-hr temporal resolution.

Evacuation Planning for Alternative Fuel Vehicles *(15-minute Presentation)*

Denissa Sari Darmawi Purba, *Civil and Environmental Engineering, University of Illinois*

Eleftheria Kontou, *Civil and Environmental Engineering, University of Illinois*

Chrysafis Vogiatzis, *Industrial and Enterprise Systems Engineering, University of Illinois*

The economic, energy, and environmental benefits of alternative fuel vehicles incentivize transitions to decarbonized transportation and contribute toward fighting climate change in the United States. However, limited efforts are in place to improve the emergency management policy for these emerging technologies. Alternative fuel vehicles may pose challenges in evacuation and emergency planning due to limited driving range and sparse refueling or charging infrastructure networks, as the evacuation distances become longer. Such limitations make alternative fuel vehicle travelers extremely vulnerable during emergency states. This study focuses on determining optimal evacuation routes that consider alternative fuel vehicles' recharging and refueling requirements due to such vehicles' limited driving range. In this study, we construct an evacuation route problem using ◆◆ minimum spanning trees and hop constraints to model the charging needs of each vehicle type on their way to reach a shelter. Then, we perform numerical experiments using the transportation network of Sioux Fall, South Dakota.

4.4: Recovery from Disasters

Mapping and Communication of Flood Risk with Computer Vision and Community Science *(30-minute Discussion)*

Amir H. Behzadan, *Department of Construction Science, Texas A&M University*

Courtney Thompson, *Department of Geography, Texas A&M University*

Zhe Zhang, *Department of Geography, Texas A&M University*

Michelle Meyer, *Department of Landscape Architecture and Urban Planning, Hazard Reduction and Recovery Center, Texas A&M University*

Ms. Bahareh Alizadeh, *Department of Landscape Architecture and Urban Planning, Texas A&M University*

Diya Li, *Department of Geography, Texas A&M University*

Julia Hillin, *Department of Geography,Texas A&M University*

1:45 pm **Break**

2:00 pm **Student Competition Results and Awards**
Cory Arcak, *Director, MSC L.T. Jordan Institute for International Awareness*

Poster Session Concluding Remarks
Valentini Pappa, *Assistant Director for Education, Texas A&M Energy Institute*

2:30 pm **Concurrent Panels**

Workshop: Utilizing Community Engagement to Improve Local Resilience to Hazardous Events
There have been calls to increase the quantity of pre and post-disaster research in recent years from both the academic and applied public health community. Rapid and credible hazard research is now seen as an essential step for protecting the wellbeing of communities and necessary for increasing trust of governmental response agencies among affected populations. This research is especially needed for communities of color, which traditionally experience higher negative public health outcomes and disaster impacts. Conducting meaningful research requires community engagement at all stages of research to properly conclude and disseminate research findings. In order to accurately and swiftly understand the environmental conditions and public health needs within fence line communities, the Texas A&M Superfund Center (SRP) has partnered with numerous non-profit organizations

within Houston Ship Communities to collect (a majority of the communities we work with are marginalized, minority demographically, or are lower income) and synthesize data and co-learn with communities about the risks associated with hazardous events. This session will highlight specific hazardous events that occurred, the role community engagement played, as well as steps that are being taken to increase local resilience. Further, an emphasis will be placed on some best-practices and bi-directional communication pathways that have been developed when working with community/academic partnerships as well as some potential pitfalls.

Galen Newman, *Associate Professor and Director of the Center for Housing and Urban Development in the Department of Landscape Architecture and Urban Planning at Texas A&M University*

Garett Sansom, *Research Assistant Professor*, *Department of Environmental and Occupational Health School of Public Health, Texas A&M University*

Leanne Fawkes, *Graduate Research Assistant*, *Department of Environmental and Occupational Health, School of Public Health, Texas A&M University*

Conversation: **Federal and State Coordination: How We Can Work Better Together**
Anthony Semento, *Director of Contingency Operations, Southwestern Division, U.S. Army Corps of Engineers*

4:00 pm **Closing:** **Jorge Vanegas,** *Dean, College of Architecture at Texas A&M University*

4:30 pm **Adjourn**

Poster Titles

Analysis of Per- and Polyfluoroalkyl Substances in Houston Ship Channel Following the Intercontinental Terminals Company Fire Incident Using Ion Mobility Mass Spectrometry

Alan Valdiviezo, Interdisciplinary Faculty of Toxicology, Dept. of Veterinary Integrative Biosciences, Texas A&M University, College Station, Texas,

Noor Aly, Interdisciplinary Faculty of Toxicology, Dept. of Veterinary Integrative Biosciences, Texas A&M University, College Station, Texas,

Yu-Syuan Luo, Interdisciplinary Faculty of Toxicology, Dept. of Veterinary Integrative Biosciences, Texas A&M University, College Station, Texas,

Gaston Casillas, Interdisciplinary Faculty of Toxicology, Dept. of Environmental and Occupational Health, Texas A&M University, Center for Disease Control and Prevention, Atlanta, Georgia ,

Erin Baker, Dept. of Chemistry, NC State University, Raleigh, North Carolina,

Ivan Rusyn, Interdisciplinary Faculty of Toxicology, Dept. of Veterinary Integrative Biosciences,Texas A&M University, College Station Texas

Per- and polyfluoroalkyl substances (PFAS) are persistent organic pollutants of emerging concern. Following the fires at the Intercontinental Terminals Company (ITC) in Deer Park, TX, very large quantities of PFAS-containing firefighting foams were deployed. The release of these potentially hazardous substances into waterways in the Houston Ship Channel (HSC) prompted concerns over the extent and level of environmental contamination. A liquid chromatography tandem mass spectrometry (LC-MS/MS)- based study of temporal and spatial patterns of PFAS associated with the ITC fire incident indicated extensive contamination immediately after the incident. PFAS levels gradually decreased over a 6-month period. While highly informative, the LC-MS/MS "targeted" approaches are limited to a narrow range of analytes which do not account for the diversity of PFAS in firefighting foams. Therefore, we tested a hypothesis that an untargeted liquid chromatography, ion mobility and mass spectrometry (LC-IM-MS)-
based analysis of environmental samples with known presence of PFAS will provide a comprehensive profile of the contaminants and improve exposure assessment. We analyzed 31 samples from 9 sites in the HSC that were collected from April through August 2019. We used unique feature identification capabilities of LC-IM-MS to identify dozens of previously undetected PFAS in HSC. Our data showed that PFAS presence in HSC decreased gradually in concordance with LC-MS/MS analysis. The abundance of PFAS features detectable by LC-MS/MS were significantly correlated with those identified by LC-IM-MS; however, LC-IM-MS provided information on PFAS species not evaluated with traditional targeted analysis. In conclusion, these findings illustrated that LC-IM-MS enables a comprehensive and informative technique for rapid screening of environmental samples to facilitate exposure assessment during emergencies and provides guidance for subsequent focused targeted chemical analyses. This research was funded by grant from NIH (P42 ES027704).

Assembling Micro-Scale Data on Flash Flood Events

Rohan Singh Wilkho, *PhD student, Department of Civil & Environmental Engineering, Texas A&M University*

Nasir Gharaibeh, *Associate Professor, Department of Civil & Environmental Engineering, Texas A&M University*

Lei Zou, *Assistant Professor, Department of Geography, Texas A&M University,*

Shi Chang, *PhD student, Department of Civil & Environmental Engineering, Texas A&M University*

Understanding the causes and impacts of flash flooding at the micro scale (e.g., neighborhood) requires detailed fine-scale data. While currently available databases on flash flood events (e.g., NOAA's Storm Events database) are valuable, they are not sufficiently detailed for that purpose. This necessitates the harvesting of micro-data from other sources. This presentation describes the process of harvesting data about past flash flood events from the web. The harvesting process retrieves data on the event site (e.g., land cover and topography), storm characteristics (e.g., rainfall intensity), and community characteristics (e.g., socioeconomic and sociodemographic composition). The presentation outlines the steps of this process and provides sample results. The first step is to retrieve relevant webpages (i.e., webpages containing relevant information about past flash flood events). This step

involves the use of machine learning techniques to automate the retrieval process and make it sufficiently accurate. The second step is the extraction of locations of fatalities, injuries, and economic damages. This process involves the use of Data Mining, Natural Language Processing, and Geocoding techniques. Once the locations are extracted, other datasets (like the National Land Cover Database, the US Lithology, the US Census Bureau databases) are accessed to obtain the needed micro-data. The presentation concludes with examples of enhanced information obtained through the data harvesting process. This process and the resulting data could improve understanding and modeling of the causes and impacts of flash flooding at the micro scale.

Catalyzing Proactive Climate Adaptation with Green Jobs at the Nexus of Water, Food, and Energy Terminal Company Fire

Hope Hui Rising, *Assistant Professor, TAMU Department of Landscape Architecture and Urban Planning*

Ryun Jung Lee, *Lecturer, TAMU Department of Landscape Architecture and Urban Planning*

Abimbola Olorode, *MLA Candidate, TAMU Department of Landscape Architecture and Urban Planning*

Hrishikesh Ballal, *Founder, Geodesignhub, Doug Wunnerburger, Instructional Professor, TAMU Department of Landscape Architecture and Urban Planning*

Doug Wunnerburger, *Instructional Professor, TAMU Department of Landscape Architecture and Urban Planning*

This poster contains links to three ten-minute online mobile geo-surveys that enable participants to delineate suitable sites for climate-adaptive responses, which include water-based interventions (that facilitate adaptation in-situ), land-based strategies (that incentivize proactive relocation), and air-based tactics (that enable emergency evacuation). To maximize synergies and minimize conflicts among these three modes of adaptive responses to climate extreme events, we will host a geodesign game from 1:30 to 4 p.m. on March 5. We invite your networks and you to complete all three mobile geo-surveys before February 10, 2021 and to participate in the geodesign game.
During the geodesign game, participants will prioritize the identified suitable sites and adaptive responses for instantaneous and incremental impacts of climate change. Please email hope.rising@tamu.edu to register for the geodesign game. We will email you a link to a pre-game survey intended to help optimize the geodesign game outcomes through specific teaming strategies. The email will also contain a link to a post-game survey to help identify ways to improve the geodesign game and teaming strategies while measuring the geodesign game outcomes. These sites and strategies will be proposed within the contributing watersheds of the Galveston Bay as a test bed while considering their implications at the level of the Texas Gulf water resources region, and the contributing watersheds for the Gulf of Mexico. The following description summarizes the diverse set of parameters we intend to address using strength-weakness-opportunity-threat (SWOT) analyses to evaluate the effectiveness of each geodesign game move, which locates an adaptive response to a suitable site.

This geodesign game intends to explore the pros and cons of locating a science and technology cooperative zone midway between the Bryan-College Station area and the Houston-Galveston region versus integrating the zone within the Bryan-College Station area as an extension of Texas A&M University. The science and technology cooperative zone will host facilities for space tourism and research, makers of electrical cars, autonomous vehicles, fuel cells, solar panels, biofuel, and other green-, clean-, and high-tech companies displaced from areas impacted by fire and flooding as well as in-state companies interested in collaborating with Texas A&M University as a research and development and job training partner. The high-speed train for transporting passengers between Dallas and Houston in 90 minutes received approval by the Federal Railroad Administration in September 2020. The proposed Texas bullet train route will make it possible to commute between the Brazos Valley station to Houston within 30 minutes to make the in-between area an extension of the Houston-Galveston region.

The geodesign game will explore climate adaptive development topologies to integrate canal-oriented terrestrial, amphibious, and floating developments with room-for-the-river projects along the Trinity River. These projects have the potential to serve as living classrooms to demonstrate flood-adaptive design strategies that support self-sufficiency in water, food, and energy as locally as possible. The potential locations for these climate-adaptive water industrial parks will be selected to avoid areas vulnerable to the impacts of sea level rise, the Flash Flood Alley, and the areas with an increase in precipitation intensity. Participants will have the opportunities to prioritize these locations.

These room-for-the-river projects as water-based research parks intend to capture runoff as close to its source as possible to minimize the downstream peak runoff volumes for the Brazos River and the Trinity River. Meanwhile, these projects aim to maximize the transport of sediment to the Gulf Coast to help provide ongoing sediment supply to the Coastal Spine project to better protect the coastal communities from storm surge flooding. During Hurricane Harvey, the flood level reached up to 69 feet

where the Trinity River enters the Galveston Bay. Reducing the impacts of riverine flooding on the water level of Galveston Bay is essential to making the Coastal Spine project viable.

This adaptive water urbanism initiative intends to use the creation of job centers for green, blue, and space economies and the increased mobility from the high-speed train as catalysts for proactive relocation from areas vulnerable to impacts of climate change and sea level rise. Participants will have the opportunities to contribute to the programming and design of these climate-adaptive water-based research parks. They will also be invited to brainstorm possible strategies to instigate community-based proactive relocation to minimize the loss of lives and properties in part of the Houston-Galveston region within increasing vulnerability to the impacts of climate change.

Climate Adaptive Design Game Workshop for Regenerating the United States-Mexico Borderlands

Hope Rising

Mexico is a top foreign tourism destination for U.S. travelers and country of residence for U.S. expatriates. More than 20 percent of U.S. jobs are linked to trade along the border with 1 in 24 workers relying on U.S.-Mexico trade. Mexico is the main export destination for three of four U.S. border states (Arizona, California, and Texas). However, the United States-Mexico Borderlands are extremely vulnerable to the impacts of climate change.

This design game workshop strives to identify priority intervention zones and strategies for adapting the Mexico-U.S. borderland to the impacts of climate change through a market-based mechanism in a post pandemic context. The climate adaptive planning and design strategies will double as a proactive financing mechanism for making the borderlands more resilient, livable, and prosperous. One possible way to achieve this goal is to upscale the carrying capacity of the borderlands to host clean-, green-, and high-tech companies and migrants relocated from areas impacted by wildfire and flooding. By creating within science and technology cooperative zones along the border, many essential products for climate mitigation and adaptation, such as electrical cars, solar panels, and biofuel, can become more competitively priced for global export.

Water will be used as a driver for generating and evaluating DEEP (design-environmental-economic planning) climate adaptation actions. These actions intend to catalyze self-sufficiency as locally as possible through harnessing free abundance at the nexus of water, food, and energy to transform wastes into resources. These DEEP actions intend to better adapt borderland communities to the impacts of climate change, including more intensive flash flooding, more sustained drought, and more severe heat stress. Meanwhile, they aim to address the existing social and environmental challenges to provide multidimensional securities to support mutually beneficial exchanges of flows among human and non-human agents of the borderland as a coupled natural and human system.

The workshop will use the results of the Phase I workshop for *Advancing Sustainability of U.S.-Mexico Transboundary Drylands* organized by the National Academies of Sciences, Engineering, and Medicine as a point of departure to inform DEEP climate adaptation actions that seek to: 1) mitigate the impacts of flash flooding on sediment loss from mountainous regions into the Rio Grande and the Rio Bravo reservoir storage area; 2) harnessing the precipitation increase in downwind areas due to the Heat Island Effect of upwind population centers; 3) Minimizing evapotranspiration of runoff from mountainous snow pack areas; 4) maximize groundwater recharge through water reuse, surface water storage, flow engineering, and green infrastructure; 5) reduce water consumption associated with energy production; 6) increase the use of green and renewable energy in wastewater treatment; and 7) minimize water demand from agricultural, industrial, commercial, and residential users.

Comparing Regional Drivers of Toxics Transferal Risk: Applying the Toxics Mobility Vulnerability Index in San Diego County, CA; Harris County, TX; and the State of Rhode Island

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The convergence of natural disasters and environmental contamination from anthropogenic sources heightens the potential for toxicant mobility and transfer and increases the potential for subsequent negative health impacts. We developed and applied a Toxics Mobility Vulnerability Index (TMVI) to understand the contribution of various components of vulnerability to toxic materials transfer in three areas of the U.S.: San Diego County, California; Harris County, Texas; and the State of Rhode Island. Vulnerably components considered include % industrial land, % vacant land, % of land designated as floodplain, % of land designated as impervious surface, social vulnerability, and the prevalence of 13 health conditions. Findings indicate "hot spots" of vulnerability to hazard-induced toxics transfer in each study area, but the main drivers of increased risk differ across the three study areas. However, the most vulnerable U.S. Census tracts in all three study areas have overlapping exposure to a combination of vacant land, industrial land use, impervious surfaces, floodplains, and social vulnerabilities. Recommendations related to ways to expand the scope of the TMVI to the entire U.S. and house, maintain, and expand the dataset to ensure access by researchers, decision-makers, and the public will be provided. Applying tools such as the TMVI to highly vulnerable urban and coastal locations will help to identify changes needed to preparedness and mitigation planning and highlight areas where limited resources for investment- and policy-related remediation should be focused, both before and after disasters. This research was funded by grant from NIH (P42 ES027704).

Dual Plagues of the 21st Century: Complicating COVID-19 Response with Innovative Approaches to Desert Locust Swarms

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Desert Locust (Schistocerca gregaria) has caused tremendous agricultural and economicdestruction across more than sixty countries spanning the Sahel, East Africa, and South Asia,resulting in prolonged shortages of crops and widespread famine that exacerbates alreadypronounced food insecurity. At the same time, climate change poses an existential threat to existinglocust management strategies, as severe storms associated with rising temperatures become morecommon. Cyclones primarily affect Desert Locust prevalence when they transform traditionally aridregions into wetter environments; not only does moist soil provide breeding grounds for locusts, butincreased rainfall can also cause temporary lakes to form, which foster the growth of vegetation intraditionally barren areas. This novel vegetation serves as a food source for growing locust hordes,and swarms quickly multiply. After two cyclones hit the Arabian Peninsula in 2018, the locustpopulation in that area increased 8,000-fold.
This interdisciplinary, solutions-driven project spans the diverse disciplines of anthropology,environmental science, and public health to explore locust mitigation strategies across geographic,cultural, and linguistic boundaries. We investigate the various interventions currently beingimplemented by local and intergovernmental organizations and the varying efficiencies of theircollaborations to combat the intrinsically cross-boundary problems of climate change and DesertLocust outbreaks. These national organizations mediate communication between stakeholders andnational associations, seeking to build trust and cooperation. Through the analysis of theserelationships, our work seeks to ameliorate vulnerabilities that may exist in such boundary-spanningcommunication. Ultimately, this analysis will determine effective and culturally-competentlocust-mitigation strategies.

Environmental impacts of Hurricane Florence flooding in Eastern North Carolina: Temporal analysis of contaminant distribution and potential human health risks

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Hurricane Florence made landfall in Wilmington, North Carolina, on September 13, 2018 and torrential rains continued in the area for 5 days causing extensive flooding. There are a number of potential sources of hazardous substances and Superfund sites in Eastern North Carolina, many of these sustained water damage and contaminants may have been released into the environment. The objective of this study was to conduct temporal analysis of contaminant distribution and potential human health risks from Hurricane Florence-associated flooding. Soil samples were collected from 12 sites across four counties in Eastern North Carolina

in September 2018, immediately after Hurricane Florence, as well as at two 4-month intervals thereafter (January and May 2019). Chemical analyses were performed for polycyclic aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls and other industrial chemicals by gas chromatography-mass spectrometry. Metals were analyzed using inductively coupled plasma mass spectrometry. We calculated hazard index and cancer risk at each site using EPA Regional Screening Level Soil Screening Levels (SSL) for residential soil. Elevated levels of PAH and metals, indicative of presence of a pyrogenic source of contamination (e.g., coal ash), were detected in the locations downstream from the coal ash storage pond that is known to have leaked due to Hurricane Florence-associated flooding. Importantly, levels of PAHs at these sites are of human health concern because cancer risk values exceeded 1×10-6 threshold. Levels of other contaminants measured across other sites, or corresponding hazard index or cancer risk, did not exhibit spatial or temporal differences. This work shows the importance of rapid exposure assessment following natural disasters that may cause re-distribution of hazardous substances. It also establishes baseline levels of contaminants for future comparisons. This research was funded by grant from NIH (P42 ES027704).

Evaluating Vulnerability to Flood-Induced Chemical Contaminant Releases through Integration of Geospatial Data and Hydrodynamic Simulations

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Houston has experienced three '500-year' floods 3 years in a row (Memorial Day Flood in 2015, Tax Day Flood in 2016, and Hurricane Harvey in 2017), and chemical contamination after flooding events remains a major concern. This collaborative work from Texas AM University and One Concern combines flood modeling simulations with GIS data to evaluate the potential risk of chemical releases and contamination due to flooding, and to integrate data into holistic metrics for assessing population vulnerability/resilience. Harvey, Memorial Day Flood and Tax Day Flood scenarios were run to represent three representative "samples" of storm-related vulnerability, the potential risk of flooding was evaluated at 722 chemical facilities in the Houston-Galveston-Brazoria area. Additional baseline metrics of chemical release vulnerabilities were added based on data from U.S. EPA's Toxic Releases Inventory as well as incidents reported in facility Risk Management plans. Baseline vulnerability and flooding vulnerability data were integrated using ToxPi visualization. Simulation results indicated that while most chemical facilities were not affected in the simulation, the affected facilities had predicted water depths and velocities up to 6.90 m and 2.42 m/s in Harvey, 10 m and 2.1m/s in Memorial Day, and 4.09 m and 2.57 m/s in Tax Day Flood event, respectively. Flood prone facilities tended to concentrate near to Houston Ship Channel area. Low correlation (0.43) was found among baseline and flooding risks, suggesting they are measuring independent vulnerabilities when aggregated and prioritized using ToxPi. These results demonstrate the feasibility of identifying facilities with simultaneously high potential risks from flooding and high risks of chemical releases, and can be used to identify facilities what would benefit from improve resiliency planning. This research was funded by grant from NIH (P42 ES027704).

Exposure to Lead-Contaminated Drinking Water in Bryan and College Station Public Parks

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Safe drinking water is celebrated as a public health achievement and is a top priority for the Environmental Protection Agency. Yet today, lead (Pb) contaminated drinking water has the potential to be a public health crisis in the United States. Despite efforts to provide safe drinking water, update water infrastructure, and ensure strict drinking water regulations, there are incidents of unsafe lead levels and reports of associated adverse health effects. While there has been increased attention paid to the quality of drinking water within individuals' homes, little research has examined the presence and concentration of lead in water from drinking fountain sources located in public parks. This study sampled drinking water from every accessible public park in the Bryan–College Station (BCS) metropolitan area (N=25). With a lower detection level of 2.0 ug/l this study discovered a mean lead concentration of 1.28 ug/l across all sites and a maximum of 8 ug/l. Further, neighborhoods below the median income for BCS were twice as likely to have detectable lead levels in their water and had 1.5 times the mean concentration. This research supports previous studies identifying a disparate burden to lead exposure among low socioeconomic populations within the United States.

By examining the water quality in publicly accessible parks and drinking fountains, our study provides public health professionals with important information about how to improve the built environment to safeguard safe potable water. This research was funded by a grant from NIEHS (P42 ES027704).

Geospatial and Semantic Mapping Platform for Massive Disaster Related Scientific Publication Search

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Thousands of scientific publications relating to disaster preparedness, mitigation, response, and recovery have emerged, raising significant challenges for scholars to organize the literature, or even synthesize the knowledge in a timely or comprehensive manner. The freely available open academic movement provided lots of open accessible scientific publications to the global research community to apply recent advances in natural language processing and other AI techniques to generate new insights in support of the ongoing disaster research. There is a growing urgency for these approaches because of the rapid acceleration in new disaster related literature, making it difficult for the research community to keep up.

To facilitate disaster research, we have developed a Geospatial and Semantic Mapping platform to search and organize these large and unmapped digital collections. The semantic map visualizes research topics based on customized natural language processing algorithms, which helps users to identify their content of specific interest beyond keyword searches in web search engines. The resultant geospatial map extracts all the location names mentioned in the publications, illustrating where disaster studies have been conducted and where neglected study areas might exist. The system can be deployed as a web service for easy access.

Geospatial VR: A Web-based Virtual Reality Framework for Collaborative Disaster Simulations

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Immersive visualizations and 3D modelling show a great potential to constitute the next-generation of map-based information systems where real-world locations can be recreated with in-situ spatiotemporal data displays and simulated event dynamics. This research introduces GeospatialVR, an open-source collaborative virtual reality framework to dynamically create 3D real-world environments that can be served on any web platform and accessed via desktop and mobile devices as well as virtual and augmented reality headsets. The framework is capable of generating realistic simulations of desired locations entailing the terrain, elevation model, structures (e.g. buildings, roads, bridges), dynamic visualizations (e.g. water and fire simulation), and information layers (e.g. disaster damages and extent, sensor readings, surveillance data, occupancy, traffic, weather). These layers serve the purpose of effective and in-situ visualization of useful data to aid public, scientists, officials, and decision-makers in acquiring a bird's eye view of the current, historical, or forecasted condition of a community. The framework incorporates multiuser support to allow different stakeholders to remotely work on the same VR environment and observe other user's actions and 3D positions via avatars in real-time, and thus, presenting the potential to be utilized as a virtual incident command center or a meeting room. The purpose of GeospatialVR is to augment existing web based cyberinfrastructures that have geospatial components to constitute the next-generation of information systems and decision support systems powered by immersive technologies. To demonstrate the framework's usage and benefits, case studies have been developed for flooding, wildfire, and transport accidents.

Historical Spatial and Temporal Distribution of Legacy Contaminants in Galveston Bay and the Houston Ship Channel (GB/HSC) – a systematic evidence map

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To our knowledge, there have been no other systematic maps interested in characterizing the historical spatial and temporal distribution of legacy contaminants in Galveston Bay (GB) and the Houston Ship Channel (HSC) sediments. We apply a systematic evidence map to evaluate whether a baseline dataset exists for chemical concentrations with consideration given to identifying relevant exposure risks for Houston residents. Objective: The objective of this systematic evidence map is to determine whether there is a baseline reference dataset for GB/HSC that can characterize the historical spatial and temporal distribution of legacy contaminants in the region. Methods: Our inclusion/exclusion criteria utilize a Condition, Context, Population (CoCoPop)

statement that addresses five areas: chemicals of interest (condition), geographic region and environment descriptor (context), sediments (population), and study design. In total, our search identified 487 studies with 24 studies analyzed after full text data extraction. Results: Most of the available studies reported on dioxins/furans or mercury; data for other organics and heavy metals was sparse and limited to certain geographic regions of GB/HSC. For example, most metal data were more frequently reported in Upper and Lower Galveston Bay, while the organic data were reported in the Houston Ship Channel. Conclusions: The resulting data sparsity within certain regions of GB/HSC make it difficult to determine baseline levels. Future efforts will need to broaden the spatial, temporal, and contaminant coverage as well as improve key word indexing and data reporting so as to facilitate study identification by future systematic evidence maps and reviews. This research was funded by grant from NIH (P42 ES027704).

Integrating Prediction Models and Urban Analytics into Scenario-based Resilient Design

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Urban expansion can worsen climate change conditions and enlarge hazard zones. The use of land change prediction modelling to inform scenario-based planning can help increase capabilities when dealing with uncertainties in urbanization such as urban growth and flood risk. This research uses the Land Transformation Model (LTM) to predict three different urban growth scenarios for a highly contaminated site in Tampa, FL. The LTM is used to predict potential future urban growth according to the following scenarios: 1) Business as usual –growth based on current growth patterns; 2) Growth as planned –growth based on the current land use plan; and 3) Resilient growth –growth based on all future development occurring outside of the floodplain. The site comprises a coastal neighborhood which is both socially and physically vulnerable. It is heavily affected by flooding and characterized by industrial land uses, brown fields, and sites listed by the US Environmental Protection Agency's Toxic Release Inventory. The research asks, how effective is the current comprehensive plan in adapting urban growth to decreasing flood risk and pollutant load? To achieve this, we develop master plans according to each predicted urban growth scenario then assesses their probable impacts of each using the Long-Term Hydrologic Impact Analysis Low Impact Development Spreadsheet as a performance model. Findings show that the current future land use plan for Tampa, while it appears to be better than current patterns of development, has higher flood exposure, storm water runoff, and pollutant discharge than current conditions, but much higher conditions than resilient growth. All 14 pollutants examined decrease significantly in the resilient growth scenario, compared to other scenarios, and nearly 30 % lower than the current conditions. This research was funded by grant from NIH (P42 ES027704).

Intercalibration Comparison Study: Targeted GC/MS Compared to Untargeted Ion Mobility/MS

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A study was designed with the objective of comparing the detection (presence/absence) and absolute quantification of environmental contaminants (especially PCB and PAH) between traditional targeted gas chromatography / mass spectrometry (GC/MS) and untargeted ion mobility – mass spectrometry (IM MS). The study procedures included of the use NIST Standard Reference Material (SRM) 1944 which is a mixture of marine sediment collected near urban areas in New York and New Jersey. SRM 1944 has been used in evaluating analytical methods for the determination of selected polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCB) congeners, chlorinated pesticides, and trace elements in marine sediment and similar matrices. Reference values are also provided for selected polybrominated diphenyl ether (PBDE) congeners, selected dibenzo-p-dioxin and dibenzofuran congeners, total organic carbon, total extractable material, and particle size characteristics. All the constituents for which certified, reference, and information values are provided for SRM 1944 were naturally present in the sediment before processing. SRM 1944 and procedural blanks (with and without surrogates) were extracted using traditional methods with an Automated Solvent Extractor using dichloromethane, treated with copper to remove sulfur and further cleaned up using silica/alumina chromatography. The extract from each step were quantitatively split. All the extracts were then analyzed by IM-MS and the extract process through the entire clean up by GC/MS. The GC/MS analyses confirmed the certified concentrations for targeted PAH and PCB analytes that were present and will be compared to the results of untargeted IM-MS

result. This research was funded by a grant from NIEHS (P42 ES027704).

Nearby Nature and Post-Traumatic Stress Disorder: Evidence from Hurricane Affected Communities

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Exposure to a severe natural disaster such as a hurricane or flood can lead to mental health issues such as increased risks of stress, anxiety disorders, and post-traumatic stress disorder (PTSD). Exposure to nearby nature has consistently been demonstrated to help vulnerable or disadvantaged populations cope with stress. However, the effects of nearby nature on mitigating post-traumatic distress has not been discussed much. This study aims to understand the associations between nearby nature and levels of PTSD in Houston communities that were affected by Hurricane Harvey using a cross-sectional survey. We sampled 30 Houston neighborhoods that endured severe loss during Hurricane Harvey, and then employed an address-based sampling of households within the block groups in 2019. We had a total of 272 participants, among whom 62.3% were females, and 28.5% were Hispanic. Self-reported neighborhood green space was measured using an adapted NOS scale. PTSD was measured using the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) as a dichotomous outcome, and hurricane-related distress was measured using the subscales of the Impact of Event Scale (IES-R). Generalized linear mixed models were used to test the relationships. In the models, neighborhood- and individual-level confounding variables were controlled. Results showed significant associations between nearby nature and lower levels of PTSD, as well as the avoidance domain of hurricane-related distress. As the first study that links salutogenic environmental factors to post-hurricane mental disorders, this study contributes to the literature by identifying the mental health effects of green space in the aftermath of the most severe hurricane in recent years. The findings from this study can provide policy implications in establishing a holistic disaster planning that incorporates mental health promotion. This research was funded by grant from NIH (P42 ES027704).

Post-Harvey: Status of Sediment Contaminants along the upper Houston Ship Channel, Texas

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The Houston Petrochemical complex is located along the upper Houston Ship Channel (HSC), within the lower Buffalo Bayou and the San Jacinto Estuary. The petrochemical complex became established and experienced rapid expansion beginning in the early 1930's. As a direct consequence, by the late 1960's, these water bodies were among the top ten most polluted water bodies in U.S. Historically, HSC area contains elevated concentrations of polychlorinated biphenyls (PCBs) when compared with similar size industrial areas worldwide. The results from post Hurricane Ike study (2010-2012) found PCBs and PCDDs/PCDFs concentrations above Texas DSHS guidelines (for human consumption) in blue crabs and fish from the HSC while organochlorine pesticides have a declining trend. Hurricane Harvey (2017) produced an estimated input of 14 × 109 m3 of freshwater and deposited 9.9 × 107 metric tons of sediments to Galveston Bay. Flood from Hurricane Harvey inundated a large number of refineries, chemical plants and legacy waste sites and released 0.57 × 106 tons of raw sewage and about 22,000 barrels of oil, refined fuels and chemicals to the Galveston Bay estuary. Nonetheless, it is obvious that Hurricane Harvey has caused a significant loading of pollutants and redistribution in the region of upper the HSC area. This in turn has provided an opportunity to investigate the present status of sediment contaminants along the HSC area. Surface sediments were collected in 2019 from 20 outfall stations along the upper HSC. High concentrations of total PCBs (highest 2414 ng/g), total PBDEs (60 ng/g), total PAHs (74 μg/g) and mercury (3.6 μg/g) were found in some these outfall stations. This research was funded by grant from NIH (P42 ES027704).

Resilience through Regeneration: An Engagement and Performance-based Approach to Repurposing Vacant Community Lots with Green Infrastructure

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Many urban areas affected by flood disasters are also becoming increasingly ecologically and socially fragmented due to the accumulation of vacant properties. While redevelopment is often viewed as the primary objective in regenerating vacant properties, they can also potentially provide ecological and hydrological land uses. Rather than chasing development-based incentives for regenerating vacant lots in high flood-risk and high-contamination exposure communities, a balance should be sought between new developmental land uses and green infrastructure to help counteract stormwater runoff, flood, and hazardous exposure effects, or "Resilience through Regeneration." This research uses built environment performance models to evaluate the economic and hydrologic performance of green infrastructure regeneration projects for three marginalized neighborhoods in Houston, Texas, USA. Each project site is characterized by excessive vacant lots, flood issues, and contamination effects due to proximity to industrial land uses. Purposeful efforts were made to 1) utilize the same definition and inventory method for vacant properties, 2) utilize similar design processes and equivalent engagement procedures, and 3) utilize the same performance assessment methodology to increase the generalizability of conclusions. The master plan for each project was created following a participatory design approach which utilized feedback loops between university personnel. Local organizations, and community members to assist in design decision making. Results suggest that, when using green infrastructure to regenerate vacant properties, 1) flood risk continually decreases, 2) upfront economic costs increase in the short term (when compared to conventional development), and 3) the long-term economic return on investment is much higher. This research was funded by grant from NIH (P42 ES027704).

Spatial and Temporal Distribution of Surface Water Quality Contaminants after The Intercontinental Terminal Company Fire

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After the fires at Intercontinental Terminal Company (ITC) in Houston, Texas in March 2019, Texas Commission on Environmental Quality (TCEQ) and Environmental Protection Agency (EPA) had collected water samples from 38 locations in Houston Ship Channel and Galveston Bay for up to two months, which were chemically analyzed for 433 hazardous substances. Although these data were displayed on the ITC response website, no further analyses have been reported. In this study, we used these data to evaluate the time- and location-dependent patterns of chemical concentrations, as well as to compare with EPA water quality criteria. After web-scraping 77,841 rows of data, we selected for evaluation seven analytes of common concern for human health risk – benzene, ethylbenzene, toluene, xylene, oil and grease, total suspended solids, and total petroleum hydrocarbons – substances for which temporal and spatial analysis could be performed. Temporal analysis indicated that concentrations of hazardous substances dissipated rapidly, with most analytes declining to steady-state or below detectable levels after 1-2 weeks. Spatial analysis demonstrated that substances were most concentrated near the ITC site, with substantial dilution at distances of 1 km or more. At locations near the site, levels of benzene initially exceeded water quality criteria by up to 50,000-times; while most locations quickly returned to acceptable levels, a few locations remained elevated even after 4 weeks. Overall, contamination analyzed by TCEQ and EPA showed high concentrations near the ITC site during the first week, after which they largely declined to levels below EPA water quality concern. However, these conclusions are limited to the small number of substances analyzed for which there was sufficient data to examine their spatial distribution and time-dependence. This research was funded by grant from NIH (P42 ES027704).

Transport and Deposition of Contaminated Sediment in the Upper Houston Ship Channel by Coastal Hazards

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The Port of Houston, the sixteenth busiest port in the world, is served by the Houston Ship Channel, a federally-maintained waterway which is regularly dredged and widened to accommodate increasing traffic. The Houston Ship Channel traverses Galveston Bay, the largest estuary in Texas. The Bay is also the site of significant pollution (dioxins, PAHs, pesticides, PCBs, and metals), much of which is bound up in the fine bottom sediment. While dredging and other anthropogenic means of mobilization are generally quite controlled and governed by environmental regulations, there is a significant potential for mobilization of these sediments by natural hazards (primarily surge due to hurricanes). This can lead to deposition of contaminated sediment by surge in the industrial and residential neighborhoods surrounding the Channel, as well as re-deposition of this sediment within the Channel and away from monitoring locations. The redeposition potential of these sediments within the Channel is studied using a hydrodynamic model for tides, surge, waves, and sediment transport in Galveston Bay and the Houston Ship Channel. Historical hurricanes (notably Hurricane Ike) are used to force the model and determine the surge and resulting sediment redeposition. In addition, synthetic scenarios redolent of possible global warming trends and natural climatological variability are also used to simulate surge and sediment transport. Despite high surge potential in this region, it is anticipated that significant on-land deposition of sediment along the western branch of the Channel may not be a significant threat. However, mobilization of contaminated sediment away from present monitored locations to other (unmonitored) locations in the Channel and Bay is much more likely. This research was funded by grant from NIH (P42 ES027704).

Thank you to our partners!

Howdy!

On behalf of the *Organizing Committee*, the *Steering Committee*, and the *Programing Committee*, we would like to express our deepest appreciation to each of you and your respective organizations, for your support, active involvement, and valuable contribution as our *Conference Partners* to **Disaster PRIMR 2021 – Preparedness, Response, Innovation, Mitigation, and Recovery.**

We could not have organized the conference without your participation, so we are grateful for your support, involvement, and contribution.

Thank you, and Gig'Em!

Jorge Vanegas, Cory Arcak, Valentini Pappa

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