

News from ISSE Spring 2020

Director's Message

The 2019-2020 academic year has been significantly productive for ISSE research, education, and outreach. I would like to highlight a few of our accomplishments during this timeframe.

Research

During this past year, ISSE took leadership in developing several interdisciplinary proposals in graduate training, the food-energy-water nexus, USGS 104(g)/(b) proposals, wastewater issues related to fracking, and global crop sustainability. ISSE has strengthened its research collaborations with Tennessee Department of Environment and Conservation and Oak Ridge National Laboratory, especially in research concerning soil moisture, fire, and food waste. As ISSE seeks to put the products of its research into practice, our programs have yielded many peer-reviewed publications, presentations, and conferences, as well as media coverage.

Education

Besides its long-established training programs, ISSE was active in undergraduate research. In July 2019, students from Juniata College and the University of Guam came to the Methane Center to learn molecular biology and geochemistry methods and techniques as part of the center's NSF Hydraulic Fracturing Biocides Project. Kalina Scarbrough, an undergraduate in Industrial & Systems Engineering, is developing machine learning models to analyze sensor data for an ISSE Seed Project with Dr. Anahita Kojandi and Dr. Jon Hathaway. Ms. Scarbrough is a finalist in the Institute of Industrial & Systems Engineers Operations Research Undergraduate Competition.

Outreach

The ISSE outreach program is growing with new and expanded programs that support local economic and environmental sustainability. We are proud of Dr. Tim Ezzell's director role in the Appalachian Leadership Institute, a joint project with the Howard H. Baker Jr. Center for Public Policy and the Appalachian Regional Commission.



ISSE Director Dr. Mingzhou Jin

In the quest for a cleaner environment, ISSE has increased its statewide reach through the East Tennessee Clean Fuel Coalition and the Drive Electric Tennessee. A timely example of ISSE outreach stems from Dr. Terry Hazen's relationship with Juniata College: A clinic in Pennsylvania has implemented horse-and-buggy COVID-19 drive-through testing for Amish citizens.

Such work can only be realized through the vision and hard work of our staff and those with whom we collaborate, particularly the Tickle College of Engineering. We are beholden to you all.

ISSE Welcomes New Staff



Sherry Lynn Russell
Named New ISSE Business Manager

Sherry comes to Knoxville having recently relocated to the area from Rockford, Illinois, where she spent 22 years as a Business Manager at the University of Illinois. Her responsibilities include financial management of the department, contracts and grants management, and human resource functions. She loves spending time reading and hiking to waterfalls.

New Faces @ ET Clean Fuels



Virginia Salazar Buda, Drive Electric TN Coordinator

Virginia is the first line of communication for the Drive Electric TN (DET) program. Virginia coordinates and manages Tennessee statewide initiatives that advocate for the use and adoption of Electric Vehicles. DET is an initiative of East TN Clean Fuels and its partners. Virginia also advocates for the arts as a member of the Board of Directors of Tennesseans for the Arts.



Ainsley Kelso, DET Digital Media Coordinator

Ainsley is about to begin her senior year at UTK, majoring in Journalism and Electronic Media. From 2018-2020, Ainsley was writer and Editor-in-Chief at the Tennessee Journalist. She has considerable experience in digital media content creation, design, and management and is fluent in a wide variety of digital media platforms.

John Schwartz, Fulbright Fellow in Prague

Dr. John Schwartz, TNWRRC director, spent the 2019 Fall Semester in Prague as a Fulbright Fellow at the Czech Technical University (CTU). CTU's Faculty of Civil Engineering has more than 200 professors, researchers and lecturers and is similar in size to an American college of Engineering. The faculty is subdivided into individual departments in hydraulics, structures, transportation, etc.

Dr. Schwartz worked with CTU faculty and graduate students on three projects:

- An experimental project related to sediment trapping efficiency on grassland treatments.
- A project related to soil erosion on agricultural land using the mini-jet tester Schwartz brought from the US. The mini-jet tester is a unique piece



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CTU IN PRAGUE**

of equipment that measures streambank erosion. It was used to compare soil erosion estimates from CTU's rainfall simulator.

- The third project is a comparison study between stream revitalization practices and projects in the Czech Republic and stream restoration in the US.

The stream restoration sites are on the outskirts of Prague at the urban-rural interface. The hydrological research station is a fully sensed site for rainfall, climate variables, streamflow, groundwater levels, interflow devices, and water quality samplers.

2019 Cleaner Production and Sustainability Conference in Hong Kong



With support from the National Science Foundation, Dr. Mingzhou Jin organized a panel discussion at the 2019 Cleaner Production and Sustainability Conference in Hong Kong on November 1, 2019. About thirty international researchers joined the discussion, including 10 US researchers from Purdue, University of Miami, University of Florida, Michigan Tech, Clemson, and University of Tennessee.

ISSE affiliates Dr. Baoshan Huang and Wenquan Dong also attended.

The panel discussed sustainable urban systems and circular economies through cleaner production and sustainability. They identified research gaps in integration and coordination between cities and surrounding rural areas.

Environmental and social sustainability can be achieved only through systems modeling on the interactions among many human and natural systems. A circular economy perspective can facilitate cleaner production beyond the production stage by incorporating the distribution, consumption, and recycling/reuse stages.

To make any technical and societal solutions work in the real world, researchers need to fully engage stakeholders who may have different interests and live far away from each other. The panelists stated that cultural and behavioral heterogeneity have not been fully modeled in global assessment models.

Research Activity Since July 1, 2019

Appalachian Tourism Study



The research team led by ISSE has completed the two-year study of Appalachian Tourism, conducted for the Appalachian Regional Commission. The final report is nearing release and should be out in the summer of 2020. The team's findings revealed several important points:

Tourism is a \$60 billion industry in the 13 state Appalachian Region, and it employs more than 577,000 people. This industry, however, is not distributed evenly across the area. About half of this economic activity takes place in just 26 of the region's 420 counties.

This uneven distribution does not mean that smaller counties do not benefit from tourism. Even areas with few visitors enjoy benefits from travel related activities. More importantly, these communities benefit from the indirect impacts of tourism. Modest numbers of visitors often

provide the tipping point for important services like lodging, dining, and specialty retail. These services, in turn, improve other economic development activities and enhance the quality of life for local families. Outdoor recreation and public lands are the foundation of the Region's tourism industry. As such, these areas and their resources should be protected.

Tourism and the traveling public are changing rapidly. New technologies, new business models, and new types of visitors are creating challenges for Appalachian communities. Appalachia needs to respond with improved broadband, 21st century transportation infrastructure, and a better understanding of a more diverse traveling public.

Soil Moisture Dataset

Working with Dr. Jiafu Mao, Dr. Yaoping Wang is creating a global monthly gridded soil moisture dataset for the years 1950-2016. They are performing detection and attribution analysis to separate the effects of external forces such as greenhouse gas, aerosols, and natural variability on its long-term trend. So far, Dr. Wang and Dr. Mao have created multiple versions of soil moisture products by applying simple averaging, optimal weighted averaging, and emergent constraint methods. They are still testing different setups of the detection and attribution, including at global and regional levels, to identify where the external forces have significant impacts.

Restoring Floodplain Wetlands Using Regenerative Stormwater Conveyances

Earlier this year, Dr. John Schwartz, director of the Tennessee Water Resources Research Center, and Dr. Jon Hathaway received a grant from the Environmental Protection Agency to study the loss of headwater wetlands that have resulted from the Southeast region's rapid and explosive urbanization. Efficient drainage systems route water quickly to local streams, bypassing floodplains and drying once vibrant wetlands. New techniques studied by the University of Tennessee show promise in restoring hydrologic connections allowing wetlands to be reestablished in these environments. The goals of this project are 1) to demonstrate the possibilities that Regenerative Stormwater Conveyances offer for recreating wetlands in urban environments and 2) to identify and document best practices for design of these systems.



Quantifying food lost and wasted along U.S food supply chain

US Department of Agriculture and US Environmental Protection Agency have set goals to reduce 50% of U.S food loss and waste (FLW) by the year 2030. This collaborative study by ISSE and the Oak Ridge National Lab quantifies the food lost and wasted along the U.S food supply chain to establish a baseline of food loss and waste (FLW). The research team is led by Dr. Sachin Nimbalkar, the group leader for Energy Efficiency at ORNL and a joint associate professor at UT. The team includes Wenquan Dong, an Industrial Engineering PhD student, Dr. Mingzhou Jin, ISSE director, and Ms. Kristina O. Armstrong, a post-masters research associate for energy efficiency at ORNL.

The study identifies the sectors and stages that contribute most to FLW, how FLW is disposed of in each sector, and the most effective ways to reuse and recycle the FLW generated in the U.S. food supply chain. Five major stages of on-farm production, manufacturing and packaging, distribution, wholesale and retail, and consumer stages were considered using data from USDA and other sources for the year 2016.

In 2016, approximately 311 million metric tons (MMTs), more than half of food harvested for human consumption, were wasted or lost, including

- 21.4 MMTs of food materials were harvested but not acceptable for buyers due to improper on-farm production activities (e.g., harvesting and storage) and buyers' strict standards. It is also estimated that among on-farm FLW, 13.2 MMTs were sent to landfills, which is considered real waste, and 8.2 MMTs were used to feed animals.
- Food manufacturing and packaging is the largest contributor to FLW, with a total of approximately 207.2 MMTs after food donation. However, most of this amount, 137.2 MMTs, was actually recycled for use in other industrial sectors, such as pet food and fertilizer. Water evaporation during food processing (e.g., dried fruit and vegetables) caused a loss of 66.4 MMTs. As a result, only 1.2 MMTs of food were actually disposed of via landfill, representing a high level of circular economy in the U.S. Food manufacturing sector.

- Distribution generated the least FLW of 10.4 MMTs. The main cause was rejection due to food spoilage during shipment, which was low because of modern logistics technology and management (e.g., much more advanced cold chains than before).
- Wholesale and retail (e.g., warehousing and grocery stores) contributed 25.4 MMTs of FLW for various reasons such as consumer rejection and overstocking. In general, U.S. food logistic service providers, wholesalers, and retailers have started to donate or recycle a large percentage of their FLW, mainly through composting and digestion. However, greater efforts can be made since around 40% of FLW in this stage are still disposed of in landfills.
- Consumers (i.e., household and food services) are responsible for 48.5 MMTs of FLW. Consumers are the biggest contributors to landfills (46.3 MMTs). The consumer stage uses much less diversion, reuse, or recycling than other food supply chain stages. Therefore, more efforts should be made to prevent, recover, and recycle the FLW at the consumer stage.



Bargain-hunting for biodiversity: New tool pinpoints conservation targets

A new tool to help protect vulnerable species such as the *Eurycea sosorum* salamander, found near Austin, Texas, identifies some of the most cost-effective conservation bargains in the US.

The best bargains for conserving some of the world's most vulnerable salamanders and other vertebrate species can be found in Central Texas and the Appalachians, according to new conservation tools developed at the National Institute for Mathematical and Biological Synthesis (NIMBioS) at the University of Tennessee, Knoxville. The study involves a suite of computer algorithms that surfs across many different kinds of data to create maps of top priorities and projections of what species would benefit most from increases in conservation dollars.

An interdisciplinary team of computer programmers, biodiversity data scientists, conservation decision makers, economists, and others from around the globe convened at NIMBioS to develop the optimization tool, which was published in the journal *Ecological Applications*.

“The challenge for conservation practitioners is how to best combine many really disparate kinds of data and do so in a way that lets them compare possible options for protection—the goal being to find opportunities where conservation efforts offer the greatest bang for the buck,” said the study's lead author, UT Professor of Ecology and Evolutionary Biology Paul Armsworth.

The algorithm considers data including land acquisition costs, future development patterns, budget allocations for conservation, and the presence of threatened species. The new approach could prove valuable to conservation and natural resource managers looking to optimize conservation dollars.

left: *Eurycea sosorum* salamander.
photo: Nathan Bendik, City of Austin

Active Sponsored Projects

PI	Sponsor	Title	Start
Mingzhou Jin	US - NSF - National Science Foundation	2019 International Conference on Cleaner Production & Sustainability	9/4/19
Mingzhou Jin	US - NSF - National Science Foundation	Coupled FEWS-Sustain Global Crop US-China	7/1/19
Mingzhou Jin	DOE - ORNL - UT Battelle - Oak Ridge National Lab	Industrial Landfill Waste Management	7/30/19
Mingzhou Jin	DOE - ORNL - UT Battelle - Oak Ridge National Lab	Policy Study - Adoption of Alternative Fuel Vehicles	6/25/19
Mingzhou Jin	East Tennessee Clean Fuels Coalition	Administrative Support for East Tennessee Clean Fuels Mod 14	Continued
Timothy Ezzell	Appalachian Regional Commission	Appalachian Leadership Institute	1/1/19
Timothy Ezzell	Appalachian Regional Commission	Trends and Strategies for Tourism in Appalachia	Continued
Timothy Ezzell	East Tennessee State University	Increasing Economic and Entrepreneurial Opportunities by Promoting Outdoor Recreation Among Underrepresented Visitor Groups	8/15/19
Sheila Webster	National Partnership for Environmental Technology Education	National PETE DOE Worker Training	Continued
John Schwartz	Tennessee Dept of Environment and Conservation	TN Stream Quantification Tool Training	New
John Schwartz	National Park Service-Great Smoky Mountains	Improving the GRSM's understanding of its natural resources and processes thereby enhancing protection of the Park's resources	Continued
John Schwartz	National Park Service	Southern Appalachian Cooperative Ecosystems Studies Units, Characterizing Water and Soil Chemistry from the chimney tops to fire	Continued
John Schwartz Tim Gangaware	DOI - USGS - US Geological Survey	Tennessee Water Resources Research Center Program	Continued
Jon Hathaway	US - EPA - US Environmental Protection Agency	Restoring Floodplain Wetlands and Hydrologic Connectivity Using Regenerative Stormwater Conveyance	10/1/19
Jon Hathaway	Wood PLC	Assistance with Metro Nashville Stormwater Manual	5/6/19
Chris Wilson	West Virginia University	Appalachian Community Technical Assistance and Training Program	3/3/20
Yaoping Wang	DOE - ORNL - UT Battelle - Oak Ridge National Lab	Data Analytics Support for Integrated Earth Model	3/13/19

Education Activity Since July 1, 2019

Undergrad Student Recognized by IISE

Kalina Scarbrough, an undergraduate researcher working on an ISSE seed project with Drs. Anahita Kojandi and Jon Hathaway, has developed machine learning models to analyze sensor data. She was recently recognized as a finalist in the IISE Operations Research Division Undergraduate Student Research Dissemination Competition for this work. Her abstract for the competition states:



Green infrastructure (GI) inspection and maintenance is an increasingly common burden for stormwater managers and utilities nationwide. Harnessing the possibilities of the Internet of Things (IOT) and sensor data-driven decision making can help inform and optimize green infrastructure inspection and maintenance. It is, however, unclear how many sensors would be needed to accurately monitor GI performance. The objective of this study is to identify a minimal set of sensors placed in bio-retention areas that can accurately identify trends in soil moisture in real-time, which may be used as an indicator of poor performance.

This award recognizes scholarly undergraduate student work as well as the ability to communicate results effectively. The award encourages more participation from undergraduates in research and in division-level activities. Furthermore, since the award includes a presentation to decide the winner, students are encouraged to improve both their written and technical presentation skills. Ms. Scarbrough, pictured above, will present her work at the conference later this year, at which time IISE judges will determine the winners.

What Is Driving the Global Wildfire Trend?

Recent wildfires in California, Australia, and Tennessee cause the public to wonder whether wildfires are more prevalent than before, and if so, what the underlying reasons may be. ISSE research assistant, **Rongyun (Savannah) Tang**, a PhD student at Industrial & Systems Engineering, is working to answer those questions under the supervision of Dr. Jiafu Mao, an R&D staff member of the Climate Change Science Institute at ORNL, and Dr. Mingzhou Jin at UTK.

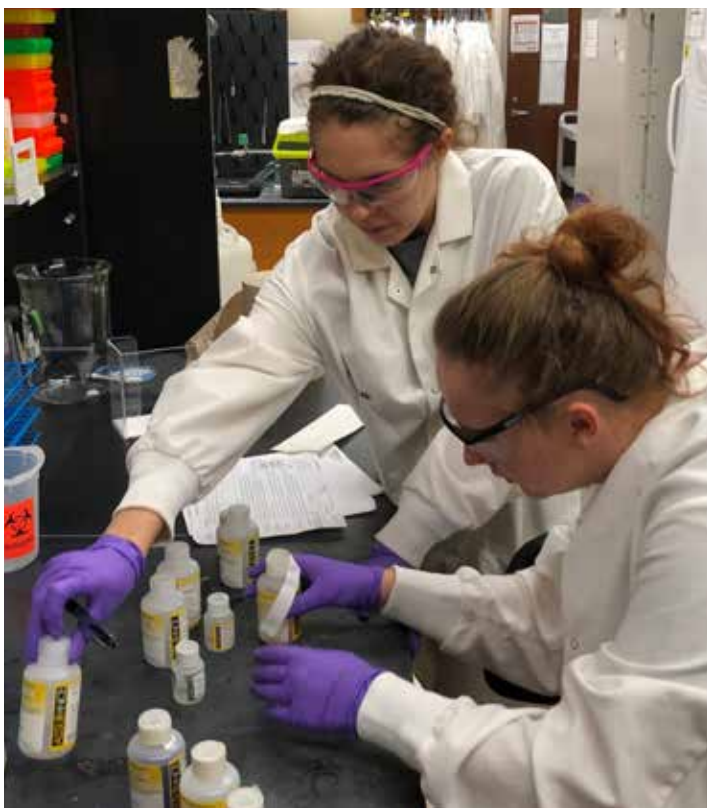
Preliminary results show that the satellite-derived burned areas for the past 20 years have declined, and this decreasing trend is consistent with what is simulated by the latest land component of DOE's Energy Exascale Earth System Model (ELM of E3SM). ELM factorial experiments further indicate that the changed fire activities at the global scale is mainly determined by the changing climate and land use and land cover change. Relevant regional analysis focusing on spatiotemporal dynamics of ecosystem fires in China over the past two decades has been accepted by Geography and Sustainability.

Savannah is continuing the inter-comparisons among different sources of fire data and developing recommendations for potential mitigation of wildfire-induced damages. This research is supported by the ORNL Terrestrial Ecosystem Science Scientific Focus Area (TES SFA) project, funded by the US Department of Energy.

Methane Center: NSF Hydrolic Fracturing Biocides Project

In July 2019, undergraduate Students from Juniata College, an undergraduate-only institution, and University of Guam, a minority serving institution, came to the Methane Center to learn microscopy, IP-OES, molecular biology, and geochemistry methods and techniques as part of the center's NSF award, Impacts of Biocides Associated with Hydraulic Fracturing on Aquatic Microbial Communities.

This award is to study the environmental implications of biocides used in hydraulic fracturing, particularly antimicrobial resistance. The students collected water and sediment samples from 21 streams in Pennsylvania and completed the first summer field sampling. These samples have now been processed for cell counts, ions, organic acids, and trace metals and will be processed for biocides and microbial community composition and function as well as for cultivation of biocide resistant strains.



DOE Worker Training Program

Dr. Shelia Webster, ISSE research director, and training staff members were registered for the Emory University conference, Facilitating Workforce Protection for Biosafety and Biopreparedness when it was cancelled because of the Covid-19 Pandemic. Consequently, they participated in several days of virtual classroom presentations that included National Institute of Environmental Health and Sciences (NIEHS) Essential Worker Training for Train the Trainer.

Dr. Webster and her staff also attended a virtual grantee meeting with the Partnership for Environmental Technology Education (PETE). That webinar covered different plans to address Covid-19/ Hazardous Waste Operations and Emergency Response (HAZWOPER) training. Other virtual meetings included Virtual Covid-19 Respiratory and Personal Protective Equipment Training and a Revised Covid-19 Biosafety and Infectious Disease Response Initiative.

Rex Short, Program Manager for HAZWOPER ONLINE, facilitates the collaboration between UCOR and UT. Currently, the HAZWOPER 24-hour and the 8-hour online refreshers have increased during the Covid-19 shutdown at UT and DOE facilities.

To bridge the field-to-lab studies of fundamental biological interactions, Dr. Dominique Joyner, certified trainer from Great EST Training and UT Microbial Ecology and Lab Manager, will integrate ENIGMA (Ecosystems and Networks Integrated with Genes and Molecular Assemblies) research information into the HAZWOPER training. ENIGMA is a DOE funded project at ORNL, where field researchers are required to have 40-hour HAZWOPER and RAD Worker II level training.

To strengthen the partnership between UT, ORNL, and other trainers on DOE sites, ISSE staff send e-communications with personnel responsible for training to ascertain employee and employer ongoing needs and Covid-19 impact.

left: Dr. Maria Fernanda Campa works with a Juniata College undergraduate student.

Tennessee Water Resources Research Center Training



Since July 1, 2019, TNWRRC has offered seven different courses: Levels 1 and 2 of Tennessee Erosion Prevention and Sediment Control (TNEPSC) Training Program for Construction Sites plus a TNEPSC Recertification course; Levels 1 and 2 of Tennessee Hydrologic Determination Training and its corresponding Recertification course; and the Storm Water Control Measure Inspection and Maintenance Workshop. TNWRRC has offered a total of 32 course sessions and trained 2,200 professionals in these workshops.

TNEPSC offers three training workshops for developers, contractors, engineers, and other professionals, inspection personnel, and enforcement officials responsible for all aspects of preparation and implementation of Storm Water Pollution Prevention Plans for preventing erosion and controlling sediment at construction sites one acre or more in size.

Tennessee Hydrologic Determination Training is a course for conducting hydrologic determinations. Successful completion of the training course is one of the requirements for certification as a Qualified Hydrologic Professional.



Storm Water Control Measure Inspection and Maintenance Workshops are available to design engineers and architects as well as plan reviewers and other local municipal program personnel. They provide insights on avoidance and minimization approaches to site layout, design guidance on specific permanent stormwater control measures, and experience using tools developed to assist designers and plan reviewers with implementation of runoff reduction and pollutant removal requirements.





Outreach Activity Since July 1, 2019

Appalachian Leadership Institute

Last year, a team from ISSE and the Howard H. Baker Jr Center for Public Policy was selected to develop and implement the curriculum for the Appalachian Leadership Institute, a new program created by the Appalachian Regional Commission. The UT team is assisted in this effort by Tuskegee University and Collective Impact, a consulting firm located in Huntington, West Virginia.

In October 2019, the UT-led team and our ARC partners launched the Institute in Moorehead, Kentucky. The inaugural class includes forty rising leaders representing communities across the thirteen states in the ARC region. Over the next year, these leadership fellows will participate in seven sessions located across the region. Session themes include economic opportunities, critical infrastructure, natural and cultural assets, workforce development, and capacity building.

During the sessions, leadership fellows interact with national and regional leaders and topical experts. To date, these have included the U.S. Postmaster General, two former governors, and a member of the White House Council of Economic Advisers. Fellows also visit important regional sites, such as Dalton, Georgia's Q-Cells plant, the nation's largest manufacturer of solar panels. Other session activities include small-group leadership discussions and team challenges, active learning exercises designed to promote cooperative decision-making and planning skills.

The response to the curriculum has been enthusiastic and positive, and the team has been asked to continue for next year's institute.



The Leadership Class touring Mount Sterling, Kentucky



ISSE graduate student Alex Moore with Megan Brennan, United States Postmaster General

DriveElectricTN's goal: get 200,000 EVs on Tennessee's roads by 2028.

Throughout 2018, a team of stakeholders developed a vision for electric transportation in Tennessee. They set goals and guiding principles for increased electric vehicle adoption over the next five-to-ten years. These stakeholders—TDEC and TDOT, electric utilities, electric vehicle manufacturers, businesses, and advocacy groups—comprise Drive Electric Tennessee (DET).

DET Hosts Ride & Drive at 2020 Knox News Auto Show

In February 2020, DriveElectricTN staffers and volunteers held an electric vehicles (EV) Ride & Drive at the Knox News Auto Show. This included 35 student volunteers from UTK. Attendees could test drive five different EV models over the three-day event held at the Knoxville Convention Center. The DriveElectricTN EV Experience™ at this year's show was principally organized by Virginia Salazar Buda, Coordinator of the East Tennessee Clean Fuels Coalition's DriveElectricTN program.

The EV Experience™ is one of over 20 EV-related projects that DriveElectricTN is spearheading; it connects event attendees with local EV owners and auto dealers who offer new and used EVs in their stock. Participants can question EV owners, learn about charging options, explore the different types and models available, discover how much money they can save on fuel and maintenance costs, and then test drive one or more EVs to experience the fun of driving electric.

“Our Knox News Auto Show event was our most successful event to date,” says Daniel Siksay, EV owner and Co-Coordinator for ETCleanFuels. Over 8,000



people attend the three-day event. “I engaged with hundreds of people and offered dozens of test drives to folks. It felt great to share my passion with them and show Knoxville that EVs are viable options for them and their families.”

Another essential aspect of the EV Experience™ is asking participants to complete Pre- and Post-Drive surveys about their perspectives on electric vehicles. The data collected shows just how effective direct experiences with EVs are. On the question, “What is your perception of EVs?” the ‘very positive’ option went from 51.2% in pre-drive surveys to 90.4% in post-drive surveys. The survey showed that 40% of respondents moved from any of the lower four options (somewhat positive, neutral, somewhat negative, and





Chattanooga, East Tennessee Clean Fuels and Middle West Tennessee Clean Fuels, and the Tickle College of Engineering's Institute for a Secure & Sustainable Environment at the University of Tennessee, Knoxville.



very negative) to the 'very positive' choice. In response to the question "How likely are you to consider an EV as your next vehicle?" 'very positive' answers doubled, climbing from 30.4% to 59.0%.

Through this and other projects, DriveElectricTN hopes to spur Tennessee to reach 200,000 EV registrations by 2028 and establish Tennessee as an electric transportation leader in the Southeastern US. Without the leadership and dedication of these partners, DET could not accomplish these goals:

Tennessee Valley Authority, Tennessee Department of Environment and Conservation, Office of Energy Programs, Seven States Power Corporation, EPB in

DriveElectricTN Year 1 Accomplishments

- Creating a multi-year Roadmap Strategy;
- Establishing Executive and Co-Chair Committees to guide the Roadmap's initiatives and projects;
- Developing branded marketing materials and communication plans;
- Hosting over 20 Ride and Drive statewide events;
- Partnering with several organizations including TDOT to develop a plan for filling Direct Current Fast Charging locations along I-40 in three neighboring states; and
- Researching and developing fiscal sustainability goals and objectives through grant, foundation, and DET membership channels.



Publications, Presentations, and Media Coverage Since July 1, 2019

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In the Media

Dr. Terry Hazen:

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Dr. Joshua Fu:

UT Study Shows Effects of Wildfires on Health (<https://news.utk.edu/2020/03/05/effects-wildfires-health/>)

Fu Appointed to Scientific Leadership Team for WMO (<https://cee.utk.edu/fu-appointed-to-scientific-leadership-team-for-wmo/>)

Switch to E-Vehicles Will Benefit Taiwan's Air Even with Coal-Based Power (<https://cee.utk.edu/fu-switch-to-e-vehicles-will-benefit-taiwans-air/>)

Drive Electric TN:

Electric Vehicle Widescale Analysis for Tomorrow's Transportation Solutions: Driving Electrification Through the Power of Data (<http://www.energetics.com/evwatts>)



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Honors & Awards



Joshua S. Fu is the John D. Tickle Professor in the Department of Civil and Environmental Engineering. This year he was named a Board Certified Environmental Engineering Member, American Academy of Environmental Engineers & Scientists; Vice Chair of the Scientific Leadership Team and Steering Committee, Measurement-Model Fusion for Global Total Atmospheric Deposition Initiative, World Meteorological Organization, Geneva, Switzerland; Advisor to the Advanced R&D Advisory Committee for the President's Office, Industrial Technology Research Institute, Taiwan; and Member, Distinguished Lecturer Committee, Association of Environmental Engineering and Science Professors.



ISSE Director Dr. Mingzhou Jin, Industrial & Systems Engineering, received the 2020 Chancellor's Research and Creative Achievement Award, which recognizes tenured faculty members who have received national and international recognition in their field, to stimulate research and creative achievement, and to emphasize that faculty research and creative achievement are integral to the mission of the University of Tennessee. This past March, Dr. Jin was awarded the 2020 Tickle College of Engineering Research Achievement Award.

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