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Message from the Director

Summer in Alaska is a miraculous time, when the sun refuses to set, the salmon run upriver, fireweed blooms everywhere, and people are energized by limitless daylight. It is also a very busy season for CESTiCC. CESTiCC researchers, students, and staff continue their active involvement in various research, outreach, and technology transfer activities, as you will see in this newsletter.

Particularly, I would like to invite you to check out our summer highlights – International Symposium on Systematic Approaches to Environmental Sustainability in Transportation and Summer Transportation Institute. CESTiCC appreciated the opportunities of these events to gather professionals to Alaska and discuss challenges and showcase recent development and advances to maximize
Imagine the best words to define the future of the transportation system. Environmental-friendly? Cost-effective? Sustainable? How about we link them all. Recently, many of the brightest minds in the transportation engineering field gathered in Fairbanks, Alaska during the first week of August to attend the International Symposium on Systematic Approaches to Environmental Sustainability in Transportation. Nearly 100 attendees hailed from industry, academia, and public agencies all over the United States and other countries including countries China, Japan, and Korea. The four-day symposium consisted of two pre-conference workshops, five keynote speeches, 45 lectern presentations, 11 poster presentations and three technical field tours. A total of 59 technical papers were published in the symposium proceedings as ASCE Special Publications. The full program of the symposium can be found on our website and all presentations from various sessions can be viewed under Publications on our website.

“Environmental sustainability in transportation is about making responsible decisions that will reduce negative impacts on the environment through the entire life cycle of transportation.” Dr. Jenny Liu, CESTiCC director and Chair of the Symposium Organizing Committee welcomed symposium-goers in her opening remarks and gave a brief introduction to various topics and dynamic sessions of the symposium. Dr. Liu also expressed her thanks to the symposium partners, Chinese Society of Civil Engineering, and Tongji University in China. Appreciation was also extended to the sponsors of the symposium, which were Platinum sponsors Shanghai Tongyan Civil Engineering Technology Co., Ltd., and Frontiers of Structural and Civil Engineering, Silver sponsors American Concrete Institute Alaska Chapter, and Tencate Geosynthetics, Bronze sponsor PDC Inc. Engineers, and co-sponsoring organizations Transportation Research Board and ASCE Construction Institute. To close her opening remarks, Dr. Liu gave a special thanks to the international advisory committee, technical committee, partners and friends of CESTiCC, reviewers of symposium special publications, and last but not least,
the local organizing committee and INE staff at UAF for their hard work and dedication.

Mr. Patrick Gamble, President of the University of Alaska, joined Dr. Liu in opening the symposium, followed by Dr. William Schnabel Interim Director of the Institute of Northern Engineering at UAF, Lydia Mercado and Denise Dunn Grant Managers with OST-R and Junming Wang the Science and Technology Counselor for the Consulate General of the People’s Republic of China in San Francisco.

On Sunday morning, Dr. Xianming Shi, Assistant Director of CESTiCC at Washington State University, moderated a workshop entitled Emerging Challenges, Best Practices, and Research Needs in Sustainable Winter Road Operations. Dr. Shi presented findings and results from his years’ experience in sustainable winter road maintenance operations, and discussed various topics such as life cycle sustainability of winter road operations, benefits and emerging challenges of such operations. Dr. Shi and attendees also discussed future approaches to winter road operations during the workshop.
Later that afternoon, Dr. Liv Haselbach, Associate Director of CESTiCC at Washington State University, hosted the second workshop that focused on Life Cycle Assessment (LCA). This workshop provided a snapshot of what is now internationally recognized as the LCA process for cradle to gate/grave/cradle assessment of environmental and resource impacts of a product, process or constructed element.

CESTiCC was honored to host five internationally well-known experts and professionals as the keynote speakers to discuss a variety of hot topics on advancing environmental sustainability in transportation. The keynote speech session was kicked off by Dr. Jon Zufelt, a Senior Hydraulic Engineer with HDR, USA. Dr. Zufelt has 30 years’ experience at the Cold Regions Research and Engineering Laboratory (CRREL). His presentation, *Waterborne Transportation in Cold Regions*, introduced the seasonal difficulties to navigation in cold regions of the world, and presented methods that proved successful in keeping navigation corridors open during winter. These methods were developed in the United States by the U.S. Army Corps of Engineers and other northern countries.
Dr. Feng Zhang, a distinguished professor of Nagoya Institute of Technology in Japan and a Concurrent Professor at Tongji University in China, presented his recent study on systematic investigation on Geological Repository of High-level Radioactive Waste (HLRW) in keynote speech entitled *Sustainable Development: Material, Design, and Performance*. As a senior pavement engineer and director of Engineering Materials Characterization Research Facility at the Louisiana Transportation Research Center, Dr. Louay Mohammad highlighted the motivations found in current transportation industry for exploring *new innovative techniques and methods for design, building, and preserving roads that ensure their sustainability*. The use of sustainable materials for paving applications were reviewed in this presentation, along with their design and performance. The fourth keynote speech was given by Dr. Anand Puppala, professor and associate dean in Research in College of Engineering at the University of Texas at Arlington in Texas. His presentation provided a comprehensive overview of the definitions and principles of *Sustainability, Case Studies and Lessons Learned in Transportation Geotechnics*. Last but not least, Dr. Chia-Pei Chou, distinguished professor at National Taiwan University, Taiwan, and director of the Science and Technology Division of the Taipei Economic and Cultural Representative Office in the USA, gave a talk on *Airport Pavement Behavior, Performance, and Management System*. Her speech covered a comparison of various existing runway roughness indices and introduced a new concept of roughness index which could be tailor-made for each runway based on its profile and aircraft combination.
A total of 45 technical presentations were given through nine lectern sessions. These sessions covered a variety of topics including: (1) bituminous materials and techniques for paving application; (2) geo-materials and soil stabilization; (3) management of stormwater runoff; (4) life cycle costing and assessment, energy consumption, and environmental assessment; (5) tunneling engineering and ground improvement; (6) advances and innovations in cementitious materials; (7) railway engineering and underground space; (8) constructions and operations in cold climates; and (9) resilient transportation engineering. CESTiCC researchers Xiong Zhang, Laura Fay, Liv Haselbach, Gang Chen, Nathan Belz, Robert Perkins, and Robert McHattie demonstrated their leadership in the field by co-chairing six technical sessions. CESTiCC researchers from our three consortium universities also used this great opportunity to share findings and results from their research with international audience through 17 technical presentations. CESTiCC researchers have been active in international collaboration and research dissemination.
Drs. Xianming Shi and Dae-Wook Park moderated the poster session held in the exhibition area of Wood Center at UAF. A total of 11 poster presentations were given in a variety of topics from tunnel engineering and soil mechanics, to properties of asphalt mixtures and winter roadway maintenance. CESTiCC researchers highlighted their work on sustainable winter roadway maintenance through posters, and enjoyed networking with symposium attendees.

Attendees visited the well-known Permafrost Tunnel Research Facility maintained and managed by researchers at the U.S. Army’s Cold Regions Research and Engineering Laboratory (CRREL) Alaska Research Office. The Permafrost Tunnel was excavated from 1963–1969 for the study of permafrost, geology, ice science, and the mining and construction techniques specific to permafrost environments. Attendees were amazed by this unique research platform for studies in a frozen environment.
The Geothermal Renewable Energy Tour brought symposium attendees to Chena Hot Springs, the lowest temperature geothermal resource to be used for commercial power production in the world. Attendees learned about various renewable energy projects such as Chena’s geothermal power plant, greenhouse gardens, and ice museum, using the geothermal resources underlying Chena Hot Springs.

A group of symposium attendees participated in a whole-day post-symposium Beaver Slide Field Site Trip, near mile 110.5 of the Dalton Highway. This field site is a good example of the degradation caused by frost heave during winter and thaw weakening during subsequent spring, which is experienced by many roads in Alaska. This trip took attendees to the field site of one research project using wicking fabric to mitigate frost heave and thaw weakening on the way up to the Arctic Circle.

*Stay tuned, a complete symposium photo gallery will be on the website very soon.*
Summer Transportation Institute

CESTiCC, the Alaska Tribal Technical Assistance Program Center, and the Alaska Local Technical Assistance Program Center hosted a Summer Transportation Institute on June 8-12, 2015, at the University of Alaska Fairbanks. This five-day training workshop attracted more than 30 participants from various communities, representing federal highway administration (FHWA), state transportation agencies, local village councils, tribal councils, and universities. Lectures, lab tours and field trips with various topics on transportation infrastructure in a rural and cold environment were provided free of charge to participants.

On behalf of CESTiCC, Dr. Jenny Liu gave a brief opening remark on June 8th. It was a great opportunity to promote transportation issues for environmental sustainability to tribes and rural communities.

On June 8th, attendees were exposed to tribal transportation through several lectures. Mr. Kyle Kitchel from FHWA introduced the history of modern road building on tribal
lands. Professor Byron Bluehorse, director of Alaska Tribal Technical Assistance Program Center, spoke on federal government departmental structure of tribal transportation programs. Lastly, Professor Kevin Illingworth from UAF discussed tribal sovereignty in Alaska.

CESTiCC researchers lectured on other rural transportation topics throughout the week. Dr. Xiong Zhang's lecture on Soil Basics covered a wide range of themes including soil mechanics, soil classification and dehydration of road embankments. Participants also showed great interests in Dr. Zhang's presentations on innovative materials and design to mitigate permafrost heave.

Dr. Jenny Liu and Mr. Robert McHattie shared their experience and findings from several completed projects on pavement Preservation treatments in Alaska and other cold regions on Wednesday. Other lectures including Gravel Road Design by Mr. McHattie and Dust Control Practice by Dr. David Barnes addressed very typical transportation issues in rural areas of Alaska such as Alaskan transportation systems that contain long-distance unpaved roads.

Participants were provided with opportunities to join the permafrost tunnel tour and off site field visit to various road spots around Fairbanks. Attendees also had opportunities to visit asphalt, concrete and soil labs guided by CESTiCC faculty and students.

CESTiCC faculty and students gave a tour of civil engineering labs at UAF. Attendees were able to visit asphalt, concrete, soil, structural, geotechnical and environmental labs. We appreciate Dr. Jenny Liu, Dr. Sheng Zhao, Dr. David Barnes, Mr. Billy Connor, Dr. Lin Li and graduate students Chuang Lin and Beaux Kempf ro introducing testing
equipment and procedures, conducting experiment demonstrations, and sharing their experience to simulate real field situations through lab practices.

Research

CESTiCC Project Progress Update Meetings

For two weeks in June CESTiCC held project progress update meetings for all ongoing projects. This gave the PI a chance to update everyone on the status of his/her project. Each PI created a powerpoint presentation showing work completed (progress so far with some results/products), on-going work/work to be completed, and any concerns/issues. CESTiCC Directors, the Advisory Board, match funding agencies, and the technical advisory committee of the project. To make this information widely available to the public we uploaded each powerpoint presentation to our website along with the recorded audio from the meetings. We encourage you to take a look at our website and see the innovative work our PIs are doing.

New LCA Modules Released

The Life Cycle Assessment(LCA) process is now internationally recognized for cradle to gate/grave/cradle assessment of environmental and resource impacts of a product, process or constructed element. CESTiCC Associate Director Liv Haselbach and PhD student Quinn Langfitt have been developing modules in the LCA Learning Module Series that are available on the CESTiCC website. They are intended to be used for
personal education, short background workshops or as components for more detailed classes. The modules are in PowerPoint format with narration and will automatically play the audio and advance slides when put in presentation mode. Each module is approximately 20 minutes long. Currently there are 12 modules in four groups available for use.

Overview modules contain a self-assessment quiz at the end of the presentation that you can optionally take at your own pace by forwarding the slides. Correct answers are provided. Detailed modules provide a few suggestions for homework or further study at the end of the slideshow. For more information, suggestions or comments please contact Liv Haselbach at haselbach@wsu.edu or Quinn Langfitt at quinn.langfitt@email.wsu.edu.

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**Educational Outreach**

**ANSWER Camp**

On June 19th, 45 7th graders visited CESTiCC to learn about transportation engineering. The students came from nearly 25 different villages around Alaska and were apart of ANSWER CAMP, which stands for Alaska Native Student Wisdom Enrichment Retreat.

Students were exposed to transportation engineering through an innovative video that explored the potential careers in the field. This was followed by a group discussion led by Dr. Jenny Liu on the unique transportation challenges Alaskans are facing. Finally, the students were able to see a real asphalt lab with Dr. Sheng Zhao and continue their discussion on Alaska transportation issues.
Community Outreach at Tanana Valley State Fair

Founded in 1924, the Tanana Valley State Fair is the oldest fair in the state of Alaska. Each year the community gathers to experience the competitions, rides, rodeo, fair food, fireworks and special events. CESTiCC was happy to participate for the first time in the fair’s UAF Day. Different units from the university brought hands-on demonstrations, and interactive activities to showcase their work. CESTiCC’s table included a hot wheels exhibit to demonstrate the fundamentals of geometric and road design transportation engineering. Additionally, participants were able to see the ingredients that make up a road and asphalt concrete specimens brought from the lab. Participants particularly liked touching the asphalt sampler. People from all ages stopped by the table and it was great to share the current and future work of CESTiCC with the Fairbanks community.
**Technology Transfer**

**2015 Summer CUTC Meeting**

The Council of University Transportation Centers (CUTC) held its annual summer meeting at Rutgers University during the first week of June. University Transportation Center (UTC) directors and staff from all over the nation gathered to interact collectively with fellow CUTC members, government and industry. CESTiCC’s Director Jenny Liu, Grant Manager Kathy Peterson and Program Coordinator Melissa Sparks were all present at the 2015 CUTC Summer Meeting.

CESTiCC was given the opportunity to showcase its research during the Highlighting Successful UTC Grantee Activities session. Dr. Jenny Liu briefly talked about two research projects titled: *Transportation Life Cycle Assessment Synthesis* and *Bio-based Renewable Additives for Anti-icing Applications*. CESTiCC was also able to actively participate in the Western Region Workforce Development Breakout session where attendees explored current issues and concerns within the western region.

**ASCE E-Books Books Released**

The International Symposium on Systematic Approaches to Environmental Sustainable Transportation has received a total of 106 abstracts for presentation with a wide variety of topics in innovative sustainable materials, design, construction, operations, preservation, and management of transportation infrastructure, and environmental impact and assessment. A total of 64 technical papers were received for publication in the symposium proceedings, in which 59 were accepted and to be included in the proceedings based on a rigorous peer review process. The proceedings were published in two ASCE Special Publications (EI indexed) in E-book format: Environmental Sustainability for Transportation Infrastructure, and Innovative Materials and Design for Sustainable Transportation Infrastructure, edited by CESTiCC researchers Drs. Jenny Liu, Xiong Zhang and Sheng Zhao and guest editor Dr. Peng Li.
CESTiCC Researchers Visit China

Dr. Xiong Zhang was invited to visit several institutions in China including Wuhan Polytechnic University; Institute of Rock and Soil Mechanics, Chinese Academy of Sciences; Beijing Jiaotong University; Chinese Academy of Railway Sciences; Beihang University; and National Center for Materials Service Safety. Dr. Zhang shared his extensive research experience on advanced testing techniques for soils, constitute modeling of unsaturated soils, numerical simulation of climate soil structure interaction, and mitigation of frost heave and thaw weakening with Chinese peers through presentations and discussions. Some of the presentation topics were Use of Wicking Fabric to Dehydrate Road Embankment under Unsaturated Conditions, Modeling Residential Buildings on Expansive Soils in Response to Climatic Conditions, and Limitations of Suction Controlled Triaxial Tests in the Characterization of Unsaturated Soils. Dr. Zhang also toured research facilities at these institutes. Researchers all showed great interest in broad collaborations in research, education, and dissemination in the future.
Dr. Xianming Shi was invited to visit several institutions in China including Wuhan Polytechnic University, Wuhan and Chinese Academy of Transportation Sciences (CATS), Beijing. Dr. Shi shared his extensive research experience on sustainable concrete materials, nanotechnology and electrochemistry for geotechnical engineering, and sustainable winter highway operations with Chinese peers through discussions and presentations.

Their trips enhanced the visibility of CESTiCC in China and led to potential collaboration in various fronts with Chinese institutions in terms of student recruitment and joint research projects.

**CESTiCC Hosts International Guests**

On a rainy day in late June, CESTiCC was honored to host visiting guests Dr. Xiaoduan Sun an endowed Professor from University of Louisiana at Lafayette and Mr. Shuangjie Wang and Mr. Zuo Wang from First Highway Consultants Co. associated with China Communications Construction Company (CCCC) LTD. Visitors showed great interest in CESTiCC research as they have similar challenges of building and maintaining transportation infrastructure in cold climates. Dr. Doug Goering, Dean of College of Engineering and Mines at UAF, brought the visitors to the rock layers along the sides of Thompson Drive and introduced them to his extensive research on air convection embankment and thermosyphons to preserve permafrost. The visitors were able to visit the air convection embankment field site as seen below. Visitors also had the opportunity to tour lab facilities and discuss further collaborations with CESTiCC.

![Image of visiting guests at Thompson Drive](image1)

**Dr. Serena Chung Presents at NW-AIRQUEST**

CESTiCC Researcher Dr. Serena Chung from Washington State University presented her research on *Cold Start Emissions from Vehicles* this June at the Northwest International Air Quality Environmental Science and Technology Consortium (NW-AIRQUEST). NW-AIRQUEST focuses on air quality management decision-making in the Pacific Western North America region, which includes the following states and provinces: Washington, Oregon, Idaho, Montana, Alaska, British Columbia and Alberta. The consortium seeks to provide sound scientific advice to air quality management decision makers, improve air quality forecast systems to create a sophisticated database of
atmospheric data, develop tools to address air quality issues, educate the community on current air quality issues and collaborate with other organizations outside of the region with shared goals.

**CESTiCC Presents at TRB Committee ADC60 Summer Workshop**

CESTiCC Associate Director Laura Fay and CESTiCC researcher Dr. Mehdi were invited speakers at the TRB ADC60 Committee on Waste Management and Resource Efficiency in Transportation Summer Workshop: Sustainability in a Time of Resources Scarcity during the second week of June. The workshop engaged attendees from across the country to learn how to operate and live sustainably in a time of resource scarcity. Laura Fay presented *Best Practices for Winter Road Maintenance* and Dr. Mehdi presented *Managing the Corrosion and Toxicological Effects of Roadway Deicers*.

![CESTiCC Workshop Attendees](image)

**Upcoming Events**

- **International Conference on Ecology & Transportation (ICOET):** September 20-24, 2015. The conference is co-hosted by the North Carolina Department of Transportation, with support from the US DOT Federal Highway Administration. ICOET addresses an array of ecological issues related to transportation systems. Experts from the field will gather to collaborate on the most current research information, quality applications, and best practices to enhance development and the ecological sustainability of transportation systems. CESTiCC is proud to sponsor ICOET and MSU Ecology Program. CESTiCC Assistant Director Rob Ament will be representing CESTiCC at the conference through multiple presentations and posters.

- **CESTiCC Webinar Series to resume in September:** September - December 2015. We will be exploring the following topics: sustainable construction in remote
cold regions: methods and knowledge transfer, impact of cold climates on cold start emissions, pervious concrete performance, and evaluation of the effectiveness and cost-benefits of woolen roadside reclamation projects. To view the webinar schedule please visit the CESTiCC website.

- **ASCE Fairbanks Branch October Meeting**: October 21, 2015. CESTiCC Director Dr. Jenny Liu is invited to give a presentation to ASCE Fairbanks Branch at the October meeting. The presentation will provide an overview of CESTiCC and its role in enhancing outreach, technology transfer, and workforce development for professional societies.