CACHE Progress in 2017-18

The Center for Applied Collaboration on Human Environments (CACHE) was established in early 2016 by seed funding from iSEE, the Department of Civil and Environmental Engineering (CEE), and the College of Engineering. In its second full year, the Center supported ongoing research to identify and mitigate environmental consequences caused by and found within households, communities, and cities. Under the Directorship of CEE Professor Tami Bond, the Center has made some strides this year:

- **Paper Published on Seasonal Fuel Use in Nepal.** In December 2017, CACHE postdoc Nick Lam and Bond published the paper "Seasonal Fuel consumption, Stoves, and End-uses in Rural Households of the Far-western Development Region of Nepal." Working with collaborators at the Centre for Rural Technology in Nepal (CRT-N) and the Berkeley Air Monitoring Group, Lam delved into the total energy needs of rural families in Western Nepal and the social interplay between those needs and the technologies and fuel sources required to meet them. Read more on the CACHE website >>>

- **CACHE to Embark on Pre-Ignition Emission Study.** In December 2017, the National Science Foundation (NSF) awarded the CACHE $599,951 to explore the complex chemistry that happens in wood in the moments just before it bursts into flames. In a study titled "Pre-Ignition Biomass Emissions: Causes and Characterization", the CACHE research team will develop an ignition chamber in which to light fires and measure the rate and amount of gases and particles generated from fuels during ignition. From these data, researchers will build a virtual model to replicate real-scale ignition — a whole log, for example — for further exploration of the circumstances that result in either high or low emissions. More on the CACHE website >>>

- **Lessons Learned from emPOWER Collective Pilot Project.** Last year, CACHE-affiliated researchers in the U.S. partnered with implementers from CRT-N to work with the nearly 100 residents of a village in the Kavre District of Nepal to explore how personal agency affects aspirations for basic community services and to evaluate how these aspirations affect the long-term sustainability of development interventions.

  After a preliminary visit to engage local leadership and benchmark household energy behaviors, emPOWER partners at CRT-N conducted a two-day personal agency training workshop for 30 village residents. During daily activities, participants reflected on their self-worth, developed a personal narrative, identified their core beliefs and personal strengths and weaknesses, and practiced active-listening and teamwork skills. In September, the team revisited the to gauge how residents' perspectives may have changed since the empowerment training. During this visit, researchers learned about an unanticipated delivery of new cookstoves to each house in village. This unexpected event led to focus groups discussing energy needs, as residents reacted to the cookstoves that they had not chosen.

Phase One of the emPOWER project will close out with 12 monthly visits to mentor residents on their personal action plans and observe the effect of agency-based training.

Based on the findings of the pilot project, the team is eager to keep pursuing transformational engagement around indoors air quality, energy use, and health. In April 2018, the group submitted a $1.4 million funding proposal titled "Enhancing Energy Security and Climate Resilience by Coupling Personal Agency Training with a Flexible Basket of Technological Solutions" to the International Development Research Centre.

- **SPHERE Seeks Planning Grant.** Bond, along with CEE Professor Helen Nguyen, Paul Francisco of the University of Illinois Applied Research Institute, Daniel Giammar of Washington University in St. Louis, and John Volckens of Colorado State University applied in June 2018 for a $120,000 Planning Grant from the U of I to prepare an NSF Engineering Research Center (ERC) grant proposal for Sustainable Performance of Healthy and Efficient Residential Environments (SPHERE, one of the CACHE research thrusts).

  The team wants to plan for an ERC whose mission is to improve quality of life at home through the interacting air, water, and human systems in residences — with an emphasis on low-income settings. Impacts from this work will include a more sustainable built environment that promotes human health and wellbeing, improved comfort and productivity of residents, resilience to natural disasters, and ability to reduce greenhouse gas emissions and improve energy efficiency.

- **Other Grant Proposals.** CACHE was part of two other proposals in the past year that were not awarded:
  - A $265,348 proposal (Cornell was the lead institution) to the U.S. Department of Energy titled "Constraining Aerosol Deposition to the Ocean Estimates Using GEOTRACES Data and Models"; and
  - A $82,800 proposal (Minergy Nepal was the lead institution) to Wuppertal Institute for Climate, Environment and Energy titled "Building Energy-Resilient Communities through Personal Agency, Whole-Community Energy, and Inclusion"

- **CACHE Director on the Road.** CACHE is working hard to share its perspective on emissions measurement and technical intervention strategy with the atmospheric sciences community. For that purpose, Bond has spent a several weeks of her summer speaking and meeting at international air quality conferences around the world. Here are a few of the venues at which she delivered keynote addresses, session talks, and facilitated discussions:
  - Warsaw Summit on Black Carbon and Other Emissions from Coal Heating Stoves and Combined Cooking + Heating Stoves, May 29-30.
  - Guest seminar at Lanzhou Joint Key Lab of Cryosphere and Environment, China, June 10.
  - Association of Environmental Engineering and Science Professors annual Conference, June 20-22.
  - Seminar at International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal, July 13.