IGERT Europe Summer 2015 Trip Report

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Overview and goals
In the summer of 2015, I traveled to Germany, as well as other countries in Europe, as a part of the National Science Foundation Integrated Graduate Education and Research Traineeship at the University of Texas at Austin.

I had many goals in taking the trip to Germany including:
1. To learn about European energy and water issues, particularly where those intersect and where they are different or similar to U.S. energy and water issues,
2. To hear interesting research on water and energy issues conducted in other parts of the world, including research advances and the state of the European energy industry,
3. To present my research to an international audience and gain useful feedback from a potentially different audience than I am used to,
4. To inform my research with the energy and water problems and solutions I observe in Europe,
5. To meet people I probably would not meet at UT or at another conference in the U.S., including other graduate students studying energy and water, as well as professors and researchers in my field, and
6. To learn more about German and European culture and improve my German speaking skills.

While these aspects might not directly affect my current research, they could help me relate to other researchers in my field and improve future collaboration.

I intended to achieve my goals by presenting at one conference and attending another one:
1. European Conference on Sustainability, Energy, and the Environment 2015 (ECSEE), Brighton, UK, and
2. Association of European Schools of Planning (AESOP) in Prague, Czech Republic.

I hoped the experience presenting at ECSEE would help me make connections with students and professors who research on similar topics and that attending the energy track at AESOP would help me engage with professionals who also interact with the engineering and policy aspects of the energy sector but with a different perspective. I also hoped the conferences would give me a broad perspective on energy issues in Europe as presentations include case studies of various cities across the continent.

I also visited universities in Europe to engage with faculty and students. The universities I visited include:
- Technische Universität München
- Cardiff University
- Oxford University, and
- The University of Birmingham.

Some of the professors and researchers I wanted to meet were on leave over the summer. I arranged skype calls with one professor from TUM and one from the University of London. I met one of the researchers from Imperial College in London while he was visiting Austin before my trip.

I spent some of the summer visiting other cities, improving my perspective on other cultures. Much of my trip was spent with another IGERT student, Christina Wirsching. The full schedule is included here:
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<th>Dates</th>
<th>Activity</th>
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<tr>
<td>10-Jun</td>
<td>Flight to London</td>
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<tr>
<td>11-Jun to 21-Jun</td>
<td>Personal travel in Italy and Germany</td>
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<tr>
<td>21-Jun to 3-Jul</td>
<td>Munich (Meetings and lab tours with TUM researchers)</td>
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<tr>
<td>24-Jun</td>
<td>Met with Dietmar, walked Garching, dinner with Thomas</td>
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<td>25-Jun</td>
<td>Worked at TUM main campus</td>
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<td>29-Jun</td>
<td>Lunch with Kordula, walking tour of hydroelectric plants in Munich</td>
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<td>30-Jun</td>
<td>Lab tour with Kordula</td>
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<tr>
<td>2-Jul</td>
<td>Visited the TUM Garching campus. While there we got lunch with Anja, an international coordinator who helped us coordinate a connection with Kordula.</td>
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<tr>
<td>3-Jul to 6-Jul</td>
<td>Personal travel in Ireland</td>
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<td>6-Jul to 12-Jul</td>
<td>England (Meetings with Researchers and ECSEE Conference)</td>
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<tr>
<td>6-Jul</td>
<td>Visited Professor Fogelman in Cardiff and landed in London</td>
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<tr>
<td>7-Jul</td>
<td>Visited Xiawei Liao, a PhD student at Oxford, and other researchers at the Environmental Change Institute</td>
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<tr>
<td>8-Jul</td>
<td>Visited Dan Murrant, a PhD student at the University of Birmingham</td>
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<td>9-Jul</td>
<td>Traveled to Brighton for IAFOR ECSEE Conference</td>
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<td>Personal travel in Austria and the Netherlands</td>
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<td>22-Jul</td>
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**Munich**

**Pre-trip Meeting with Dr. Konrad Koch and Laboratory Tour with Dietmar Strübing**

Before leaving Austin, I arranged a Skype meeting with a professor at TUM who would be on leave over the summer, Dr. Konrad Koch. We discussed differences in water and energy policy in the U.S. and Germany, the integration of policy into engineering research, and his research group’s work on energy recovery from farm waste and wastewater. From my experience speaking with Dr. Koch and with the other researchers in Germany, the water-energy-food nexus in Germany seems to focus more on energy constraints and generating energy from water or food than on the water use for the energy sector that is so prominent in the U.S.

Dr. Koch set up a lab tour with his student, Dietmar Strübing. We walked through the various lab stations of the students and learned about a few of the projects that the group studies, including aquifer storage and recovery and improvements in energy recovery from wastewater treatment via anaerobic digestion.
Meeting and Laboratory Tour with Kordula Schwarzwälder

Kordula Schwarzwälder is a PhD student at TUM who also coordinates the water-energy-food nexus project with other universities from around the world. We met for lunch on June 29 and took a tour of the lab facilities at the Oskar von Miller Institut in Jachenau on June 30. Most of the lab spaces are devoted to concrete reconstructions of riverbeds used to simulate the flow from a weir that is coupled with a computer model.

Both photos show the same concrete reconstruction of a riverbed in Sweden. Right: A student syncs his lab setup with his computational model.
Left: The weir in this photo is specifically constructed to measure the flow through the flume. Right: The outdoor lab is home to two experiments. One is devoted to debris flow. Kordula’s work attempting to determine the cause of the decrease in mussel population despite improvements in water quality is the other experiment in this lab space.

Left: This weir was developed at the Oskar von Miller Institut. The intention is to reduce the impact a hydropower plant has on ecological life. Right: The inflow of this weir and each of the lab setups is from the Obernsee.
After our tour with Kordula, she took us to Wachansee to swim in an Alpine Lake. Then, one of the other researchers, Riccardo, took us back to Munich. He gave us an overview of his research on flooding on the Danube and took us on a short tour of Munich.

Left: The shops next to Wachansee all have rooftop solar. Right: I went for a swim. This lake is cold, about 15 °C in the summer.

Meeting with Anja Kölsch
We coordinated our visit to TUM with Anja Kölsch. She introduced me to Kordula and was also kind enough to get lunch with us and show us around the Garching campus, including a trip to the parabolic slides. Public buildings must have an art component, so the mathematics department decided they ought to also have a play component. The result: parabolic slides in the middle of a study area.

Left: The parabolic slides at TUM. Christina is exiting one of the slides in this photo. Right: Christina and I worked on research in the rooftop café at the TUM main campus.
Other Activities: Main Campus Visit, Dinner, and Impromptu Energy Tours

TUM Main Campus Visit
Christina and I visited the TUM main campus in the heart of Munich. We did not have anyone to meet on campus, so we worked on our research in the rooftop café.

IGERT Trainee Dinner
While in Garching, three IGERTs, Christina, Thomas, and I, met for dinner at a local biergarten. Before our dinner, Christina and I walked around Garching for a short time looking at the different solar installations on houses in the community. I was aware that home solar installations are more common in Germany. However, rooftop solar is more common in smaller towns than I realized. The experience of walking through this small farm community gave me a jumping off point for discussions on attitudes toward solar with researchers at TUM and the conferences I attended.

Hydropower Tour of Munich
Christina and I explored Munich via a hydropower tour of the city. There are many hydropower plants in Munich, some quite small and some up to 3 MW. The largest three facilities, Isarwerk 1, 2, and 3, and the city's largest power plant, Heizkraftwerk Süd, a natural gas plant, are on the Isar River within a few miles of each other. The Kraftwerk Bäckermühle, another small hydropower plant, on the site of the oldest recorded mill in Munich, is nearby.
Munich is a beautiful city. In addition to visiting the city power plants, Christina and I walked through much of other parts of Munich. Olympic Park is one of my favorite spots.

Meeting with Prof. Valerie Fogleman at Cardiff University
Christina connected with Prof. Valerie Fogleman, a law professor at Cardiff University. We discussed the differences between policy and attitudes toward environmental issues in the United States and the European Union. For example, the parliament in the England is very pro-hydraulic fracturing, much like the Texas state government. However, landowners in England do not own their mineral rights. The Crown owns them. Thus, English landowners are not incented to push for oil and gas drilling on their property unlike Texas landowners who do own the mineral rights. In addition, local planning commissions have the authority to stop hydraulic fracturing processes. In Texas, the state recently asserted its authority in regulating oil and gas drilling, overturning a city ban of hydraulic fracturing in Denton, TX. Prof. Fogleman met us for a short time at her office on campus. Then we went for coffee in the middle of the city. She later sent us even more information via email.
Meeting with researchers at the Environmental Change Institute at Oxford

I met with researchers who look at the water-energy nexus at Oxford’s Environmental Change Institute. Edward Byers, a postdoc at ECI, was my main contact and introduced me to Dan Murrant at the University of Birmingham and Xiawei Liao, a doctoral researcher at ECI. Ed was on leave and unable to meet. Xiawei took me on a tour of Oxford as we talked about our research. His work is focused on water use at power plants in China, where water supplies and energy demands could constrain power supplies. Iliana Cardenes Trujillo, another doctoral researcher, looks at the energy use for municipal water supply. Mike Simpson, a postdoc at ECI, is looking at the water-energy nexus in the United Kingdom from a systems level. In addition to talking about our research, we coordinated on conferences that feature water-energy research and hope to meet up again at one of these events.
Meeting with Dan Murrant at The University of Birmingham
I met with Dan Murrant in Birmingham to discuss our research on water use for power plants and some of the differences in perception of the water-energy nexus between the different countries. We discussed our work over coffee then took a tour of the Birmingham campus.

![The clock tower is one of the iconic buildings at the University of Birmingham](image)

Meetings with Researchers and Evenings in London
I visited London with the hopes of meeting researchers in London, in addition to other cities in England and Wales. However, most researchers I spoke to who work in London do not live in London and often are not in the city over the summer. Instead, I met one of the researchers in Austin in May and skyped with another researcher after my trip. Dr. Kaveh Madani was unable to meet in London this summer, but happened to be in Austin for the Environmental and Water Resources Engineering Congress in May. He and I both presented our work at the conference in separate sessions and discussed market management of water resources after a panel he moderated. After my trip, I met with one of the professors, Dr. Laurence Smith, via skype about his research on catchment management, including economic and policy incentives.

Despite missing researchers in London, the experience of staying in London was still quite wonderful. I walked the city in the evenings and got very lost attempting to navigate the bus system during a tube strike on our last night. The buses did not keep their normal routes and many of them stopped running, making the experience of navigating the city much more challenging. We took a cab home from the Tower of London and learned about “The Knowledge,” the extensive amount of information one must know to become a Black Cab driver in London. There are multiple oral tests where the candidate must give the fastest route from point A to point B. Most drivers spend years traversing the city on mopeds to learn the streets. My respect for Black Cab drivers is immense. While acting the tourist, I still gravitate towards water. The photos below show a few of the water views I found in London.
Left: Paddington Basin has a bit of algae in it. Right: The tower of London is gorgeous at night.

This is my favorite picture from London: Big Ben, the London Eye, and a double decker bus.

**ECSEE Conference in Brighton**

Christina and I visited Brighton, UK to attend the European Conference on Sustainability, Energy, and the Environment 2015 (ECSEE). I presented my research on water use and policy for hydraulic fracturing in Texas in the first technical session on the first day of the conference. There were many questions about hydraulic fracturing and the various solutions we have implemented in Texas. The next presenter did not show up for the conference, so the moderator had each member of the audience talk about their perspective on energy in their country. I found this to be the most educational part of the conference.
Left: Brighton is a gorgeous, cold, pebble-filled beach town. Right: I presented some of my research at the ECSEE Conference (photo credit: Christina Wirsching).

Prague: AESOP Conference
Christina and I attended the Association of European Schools of Planning (AESOP) annual conference in Prague, Czech Republic. I attended the energy track, learning about different issues faced by various European cities. Many researchers mentioned having to work around NIMBYism to provide renewable energy. One common theme mentioned throughout the session was the need to think across disciplines and scales to solve problems.

Left: I took a walk around the city and found the magnificent view at the Prague Castle. Right: The AESOP conference was hosted in the Architecture School at the Czech Technical University in Prague.
Sightseeing
I visited a few other places in Europe outside of my IGERT-specific experiences in Munich, the United Kingdom, and the Czech Republic.

Italy: Venice, Florence, and Rome
My mother and I traveled Venice, Florence, and Rome. Here, I also found that my favorite spots were water-, energy-, or engineering-related. We visited the canals in Venice and the Ponte Vecchio over the Arno in Florence. We saw architecture by the Romans and the artists of the Renaissance.

Left: My mom and I took a gondola ride through Venice. Right: The Roman Forum is full of ruins with interesting stories.

Left: The Duomo in Florence is an architectural marvel because of its amazing dome. It is the largest brick dome ever constructed. Right: The church on Weishaarstrasse in Korb, Germany.
Germany: Berlin, Wittenberg, and Korb
Before arriving in Munich, my mother and I visited Berlin and Wittenberg, Germany. In Berlin, we took advantage of the many museums and learned more about the horrors of World War II and the reunification of Germany. In Wittenberg, my mother and I were able to learn more about Reformation and our Lutheran heritage.
Christina and I took a day trip to the area around the Black Forest on a Saturday, while we were in Munich. My great-great-grandparents are from a town called Korb which we were able to visit. There is a street of my mother’s surname, Weishaar (Weishaarstrasse).

Ireland: Dublin and the Cliffs of Moher
Christina and I visited Ireland over the weekend before we went to the United Kingdom. My favorite location in Ireland is the Cliffs of Moher. We also visited the Guinness Storehouse, where one section devoted to water relayed the length to which Arthur Guinness would go to protect his water supply and the devotion the brewery has to clean water.
Left: The canal near our home in Dublin was quite soapy. Right: Christina and I visited the Guinness Storehouse and were excited to see the feature on water and the amazing view from the top.

Left: Christina and I visited the amazing Cliffs of Moher. Right: We stopped at the Burren where I took a picture with a very small man on my head (a rock climber in the distance).

**Austria: Vienna and the Raxalpe**
The weekend after the conference in Prague, we visited the Austria. Christina found us a gorgeous hotel in the Raxalpes for one night. We visited Vienna the next day.
Left: Christina and I took a trolley up to the top of the Austrian Alps to stay in a mountain hotel for the weekend. Right: We hiked around the top of the mountains that night and the next morning.

Street art is prominent on the Danube canal. These are seven of the panels I found interesting.
The Netherlands: Amsterdam, Rotterdam, and Kinderdijk
Before leaving Europe, I stopped in the Netherlands. The Dutch people are amazing water engineers and proud of their history with water. The canals in Amsterdam and the windmills outside Rotterdam in Kinderdijk are prime examples of this mastery of water. Kinderdijk is famous for having the most windmills in one place. The museum tells the story of sinking farmland and windmills built in the 1400s and 1700s to pump water to prevent flooding. Now electric pump stations do most of the work but millers who rent the windmills from the water board sometimes still operate their windmills in the evenings.

Left: Amsterdam is known for many things, among them the canals and the volume of cyclists. The photo shows a bicycle parked next to the Amstel River and the Prisengracht Canal. Right: Kinderdijk is home to 19 windmills used to pump water from the low-lying area.

Conclusions
In summary, I am very thankful for having been granted this opportunity to connect with other researchers at conferences and universities in Europe. Everyone whom I met was very kind and knowledgeable. The laboratory tours in Germany, research meetings in Wales and England, presentations at ECSEE and AESOP, and tours of water and energy sites around Europe have all enhanced my knowledge of water and energy issues and helped me gain insight into European views on water and energy. I hope I have also extended the reputation of the University of Texas among the energy community abroad.