

Northwestern University Global Engineering Trek Germany: Hamburg and Münster

September 2023



Introduction

With the generous support of the German Academic Exchange Service (DAAD), a group of 15 Northwestern undergraduate students traveled to Germany from September 9-17, 2023. The group was accompanied by Northwestern Electrical & Computer Engineering and Computer Science Professors Matthew Grayson and Seda Ogrenci, and staff lead Janka Pieper, Senior Director of Communications and Intercultural Learning in the Office of International Relations.

The group attended a variety of meetings and site visits, giving them insights into Germany's innovative advancements in sustainability and green energy, its political economy, policy advocacy, research, all combined with cultural immersion activities. Here is a summary of the highlights from each day.

Report by: Ryan Kessler Tanner Thomas Taymae Mimouni Kayla Shen Marcos Sanche Kiran Prakriya Rimen Jenhani Ava Dahnke Anika Gupta Sophia Jadziniak Lidia Orta Julia Davis Yanni Wilcox Alonzo Williams



Travel Days: September 9+10, 2023

Students met at O'Hare International Airport three hours before the 10:00 pm flight on Saturday, September 9th. The energy and enthusiasm about the upcoming experience was strong, even late into the evening!



We used the four-hour layover in Copenhagen for a discussion on sustainability and green energy in Germany and how it differs from the US, in terms of research, policy-making, public perception, and industry application. We arrived at our hostel in Hamburg on Sunday night at 8pm and called it a night.



September 11 - Morning

- by Ryan Kessler

In the morning of the first day in Germany, our group attended our first site visit in Hamburg by taking a walking architectural tour of some parts of the city. It focused on sustainable architecture and living, specifically in the river island part of the city known as Wilhelmsburg. We were shown several houses in the area that were notable and quite rare for how sustainability was incorporated into their architecture and construction. One building is currently the only kind of its own, in which it produces heat for the building using a photosynthetic process where carbon dioxide is pumped into these water tanks filled with algae. The light that isn't used by the algae is then converted to heat using exchangers.



Sustainable Architecture Tour of Wilhelmsburg, Hamburg.

Another building we were shown was on top of the water in a place where excess water reserves are stored. The water surrounding the bottom of the buildings are public despite the buildings themselves being privately owned. Following this, we saw some of the fastest constructed buildings in the area. Prefabricated timber parts made it possible to construct in short timeframes, even as short as ten days. Timber, as a material for the buildings, also helps a lot with emissions since no concrete is used as it is a material that actually will take in carbon dioxide instead, thus helping to reduce emissions.

September 11 - Afternoon

- by Tanner Thomas

In the afternoon, we visited the University of Hamburg to hear about the CEN, SICSS, and CLICCS programs. The CEN is the Center for Earth System Research and Sustainability, which was the overall program that we learned about in the first presentation. The program is highly interdisciplinary, and people from very different backgrounds are encouraged to enroll.

CLICCS stands for the Cluster of Excellence, Climate, Climatic Change, and Society, which focuses on identifying climate futures that are both possible and plausible. The main research areas include understanding climate variability and extreme scenarios, the climate-driven dynamics of social systems, and humanenvironment dynamics at the regional level. The cluster format was focused on bringing many people with different skills together to study a common issue. We also heard about the Hamburg Climate Futures Outlook study from a member of the research team, Dr Andrés López Rivera.

The final talk was on the School of Integrated Climate and Earth Science Systems (SICCS) by Dr Alexandra Franzke. This was an overview of the program, intended to give students a perspective on what they might study in Hamburg. Most master students at the university stay to pursue their PhD, and the administrators reminded us that a master's degree costs roughly \$350 per semester, compared to the tens of thousands of dollars in the US.



Touring the Universität Hamburg Campus

September 11 - Afternoon

- by Taymae Mimouni

The final site visit on our first day in Hamburg was the Max-Planck Institute for Meteorology. Dr. Felix Ament gave a short overview of the research goals and accomplishments of the institute. Dr. Ament took us on a tour of the roof of the institute where weather data is collected by various measurement tools used in climate research. We had the most fun with an older tool, one that burned a line onto a paper for the duration of sunshine, where students (and even Professor Grayson!) tested to see how hot it really was (it was very hot). Overall, we had a good time while also having a spectacular view of the city, learning a lot from Dr. Ament and seeing the work of the Institute and Hamburg University.



Examining weather measurement tools on the roof of the Max Planck Institute for Meterology

"The Global Engineering Trek deepened my interest in sustainability and renewable energy, while opening my eyes to the broad academic and professional opportunities in these fields. Directly because of the Trek, I decided to switch my fall quarter schedule to take a class called "contemporary issues in energy". Before attending the trip, I intended on pursing both an adjunct major in Environmental Policy and Culture and the ISEN certificate, but attending this program confirmed my interest in these areas. - Lidia Orta

September 12th - Morning

- by Kayla Shen

On Tuesday morning, we visited Harbor City, a community in Hamburg that is Europe's largest urban development project on a waterfront. It focuses on creating and constructing multi residential buildings for around 15,000 residents and more than 45,000 job opportunities. This was an urban planning project that focused on boosting ecological sustainability and increasing community and site resilience to the effects of climate change, such as flooding. The community has an 8-to-9 meter buffer from the waterfront and was designed to last for the long term. Boosting resilience boosts sustainability, and there were several mass timber buildings as well.



Hamburg Harbor City Tour

September 12th - Morning

- by Marcos Sanchez

Visiting the Renewable Energy Hamburg (REH) offices and exploring the organization's purpose was an eye-opening experience. Before the presentation started, our group walked into a large conference room with plates of goodies, bottles of water, and apple juice. I was appreciative of the organization's hospitality and respect for our interest. After acquainting ourselves with the room and refreshments, we listened to a presenter covering Germany's climate goals and how REH fits into the picture. REH provides a strong network of like-minded companies and educative measures to promote Germany as a sustainability leader. From there, our presenter gave a wide overview of the state of wind, solar, and hydrogen power in Hamburg and Germany as a whole.



Discussion on renewable energy at REH

Terminals operational by 2026 LOTHER ZVOS E-fuels terminal Open trading point and distribution for synthetic fuels supplied by the Chilean project Haru Oni as well as for hydrogen Hamburg Green Hydrogen Hub & its derivatives uture electrolysis at the site of a RI ILË HUE

REH slide on green terminals

Regional projects

"The Trek to Germany gave me hope that action is being taken against climate change and that I can be a part of it." Anika Gupta

September 12th - Afternoon

- by Kiran Prakriya

In the afternoon, we attended a talk with a project manager from Hamburg Wasser. He explained the structure of the company, the result of a merger of preexisting water management companies, and what services they provide, as well as how they provide the services. He mentioned that in the event of a leak, a team would be sent within twenty minutes to locate the exact location of the leak, turn off the water, perform repairs, and provide containers of water to the affected area so that their water usage would not be affected. This stuck out to us because it is quite different from how these issues would be treated in the United States.

Additionally, he spoke about their work in other countries, working with their existing water utility companies/infrastructure to help them improve their system and share their expertise. We found this part to be especially interesting as we heard about how the issue of water management was addressed in different countries with different resources and situations. We also noticed that the presenter stressed that those they worked with were colleagues. This experience was enriching as we got to see how water management was done in Germany along with a possible employment area for many of us as future engineers.





September 13th - Morning

- by Rimen Jenhani

On Wednesday morning, we met with representatives from SoliSolar, a non-profit organization based in Hamburg. The SoliSolar team helps Hamburg inhabitants buy and set up small solar power systems called balcony power plants. Each unit of these balcony power plants produces up to 250 kWh yearly, reducing a hundred kg of CO2 emissions and decreasing users' electricity bills by around ninety euros. In addition, SoliSolar promotes inclusion by ensuring that owning a balcony power plant is accessible to underrepresented communities. The SoliSolar team presents the final price to customers and allows them to pay more than the set amount. As a result, the extra funds are used to cover the offset of people who cannot cover the full cost. SoliSolar also facilitates the transportation of the equipment from their warehouse to the customer by coordinating with neighbors and other volunteers. Finally, after helping with the installation, they instruct customers on how to measure the electricity produced by the panel.



September 13th - Afternoon

- by Ava Dahnke

In the afternoon, we visited the Institute for Peace Research and Security Policy at the University of Hamburg to meet with Dr. Delf Rothe. Dr. Rothe's research focuses on the security implications of global climate change—specifically, the practices involved in producing and circulating information on potential environmental risks. At the beginning of the visit, Dr. Rothe asked each student why they were passionate about climate justice, which lead to diverse responses which included individual experiences or exposures to the concept of environmental equality. This was especially interesting, as it was the only visit in which every student talked about their own personal connections to the topic of discussion.

Dr. Rothe presented on his joint project with the University of Groningen entitled, "Between fear and hope: Security imaginaries of climate change and emotions in the Fridays for Future and Extinction Rebellion campaigns." The project examines how these two movements use visual content to convey climate change as a threat to human, national, or global security. Fridays for Future is an international movement of school students who skip Friday classes to participate in demonstrations to demand action from political leaders to prevent climate change. On the other hand, Extinction Rebellion is global environmental movement that uses nonviolent civil disobedience to compel government action to avoid tipping points in the climate system.

Studierendengruppe aus den USA zu Besuch am IFSH Wissenschaftler Dr. Delf Rothe sprach mit Studierenden der Northwestern University über den Zusammenhang zwischen...

https://ifsh.de/news-detail/delegation-einer-summer-school-aus-den-usa-zu-besuch-am-ifsh

September 13th Afternoon

At the end of this busy day we got to visit the U.S. Consulate General in Hamburg at their new Alsterufer location, where we were welcome by Consul General Jason Chue and his team. We enjoyed a conversation with Consul Chue about the importance of international exchange, transatlantic relations, and the meaning of being a global citizen.







U.S. Consulate General Hamburg ... September 28 - 📀

Students from Northwestern University's Global Engineering Trek shared their passion for and vision of sustainability, climate and energy transition with us. Their meetings in Germany will spark transatlantic creativity and cooperation to guide these future leaders to solutions for a greener world.

#CulturalExchange #NorthwesternAbroad #NU



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September 14th

- by Anika Gupta

In the morning, we took the train from Hamburg to Münster, where we picked up rental bikes immediately after we arrived at the Hauptbahnhof. Our wonderful host Martina Hecht from the University of Münster took us on short bike tour to the main building, gave us an overview of the university, and explained the steps international students can take to apply for a graduate degree.

We then visited University of Münster's MEET, a battery research institute that focuses on researching new battery technologies and battery production methods. Batteries are crucial for energy storage and distribution. MEET mainly researches production methods for lithium-ion batteries, the type of battery that is currently in most of our everyday devices including our phones and electric cars. Lithium-ion batteries still have a way to go in terms of efficiency, charging speed, and ethical production. One major concern with current production methods of lithium-ion batteries is the use of cobalt. Cobalt is a limited resource extracted from mines with ethically questionable working conditions. Thus, it is neither a sustainable nor ethical way to produce batteries. MEET is looking to replace cobalt with nickel. If it seems viable, they will give their research to a corporation for mass production.



Getting ready for a research lab tour at MEET



Stopping at the university's main building

September 14th - Afternoon

- by Sophia Jedziniak

Our last visit of the day was to the Institute of Business Administration at the DEP of Chemistry at the University of Münster and PharmacyLinks. The site visit included a presentation and Q&A session with Professor Leker and several graduate students. The department focuses on the intersections between business, chemistry, and sustainability. It was interesting to learn about their battery research to not only make them more sustainable and efficient but also make them more economically feasible. The entire GET trip has stressed how interdisciplinary the entire climate science field is, so understanding the economic and financial side behind these sustainable motives was crucial.

It was also interesting to learn about the graduate students' research and how it pertains not just on a local and regional level but can extend to a national one when making strides in the environmental industry. The graduate students worked both at a local company while also at the university, so their perspective was unique in having a firsthand experience in the technical field. This was highly beneficial to furthering our understanding of how finances highly impact sustainable decisions. Unfortunately, making operations and systems more sustainable aren't typically motivated by a moral cause but instead economic benefits. Though this may be hard to digest, learning about this influence was important to have a more realistic approach when learning about the field. It provides a more holistic perspective and can be used in order to influence important leaders whether they be governmental or in the technical field to persuade them to use more sustainable practices.



September 15th - Morning

- by Lidia Orta

We got to visit the BASFs Coatings plant a bit outside of Münster. The presentation delivered by BASF outlined the company's sustainability goals and raised some important key theoretical concepts related to sustainability, particularly the importance of embracing a circular economy model. BASF discussed various steps that businesses in general can take to contribute to a more circular economy. These measures included producing higher-quality and more efficient products, encouraging refurbishment, and facilitating touch-ups rather than encouraging disposability. We then went on a tour of the plant which showcased BASF's commitment to both product performance and environmental efforts. They showed us how they test their products in real-life conditions to ensure they work well for customers and then led us to an on-site wastewater treatment indicating responsible water management.

- by Julia Davis

We then headed to Evonik Oxeno, a chemical manufacturer that uses C4chemicals, byproducts of petroleum refining, to make a variety of plastic and synthetic rubber products used in several industries. During the site visit, we began with a presentation that outlined some background about the business. The next presentation went into detail about how they source these C4 chemicals and some of the basic chemical processes to turn them into useful products. Finally, there was a presentation about their sustainability practices and products. Evonik sources their raw materials mostly from refined petroleum, which obviously is not sustainable as the refined products are being burned into CO2 in various ways. To conclude our visit, we took a bus tour of their gigantic manufacturing facilities, which stretched for several kilometers and was almost unfathomable in scale and complexity.



September 15th - Afternoon

- by Yanni Wilcox

"PARK(ing) Day," an international day of action where streets get closed off for cars and are being repurposed for urban activities, was truly an eye opening and enlightening experience! The event provided a unique opportunity to witness proclimate activism, community engagement, and a stark contrast in civic participation between Germany and the United States. Walking through the car free streets adorned with pro-climate posters and citizens enjoying the space through yoga, chalk drawing, dancing, and making music made me envy the collective action that was displayed. Neighbors and friends had come together to reclaim their streets from cars, showcasing the innovative uses of their urban streets. What stood out the most to me was the passion and dedication the people of Münster were demonstrating. It was heartening to see how deeply connected they were to their cause.



September 16th: Bike Tour

- by Alonzo Williams

On our last day in Münster, Germany, we had the opportunity to explore this charming and environmentally conscious city in depth. One highlight of the tour was at the very beginning where we learned about Münster's rainwater management system, which utilized a large, shallow lake called Aasee, to prevent excess rainwater from flooding the city streets. While not directly related to energy usage, sustainability also relies on solutions that can consistently work and the solution of a rainwater collection basin, while having some flaws in its implementation in Münster, is one that has proven to be an effective solution that could be implemented in newer construction here.

The second part of the tour saw us visiting a zoo that had recently built an area for animals from warmer climates. One of the more relevant features for our trip was the intelligent design of the new room for the enclosures, aimed at maximizing solar heat gain while minimizing heat loss—creating a comfortable environment for the animals.



September 16th: Bike Tour Continued

The second half of the tour included a stop at a grocery store which encouraged the use of less-than-perfect produce, as well as reusable containers helping to reduce the waste commonly produced from the normal operation of grocery stores. Following that we visited two stores that exclusively used environmentally friendly sourced materials, which demonstrated a commitment to sustainability and offered eco-conscious products. These shops were all part of a larger street which focused on new sustainable ways to live.



Our bike tour concluded on a high note with a visit to the vibrant farmers market. Locals showcased their fresh produce and other amazing food. The market's lively atmosphere and the variety of offerings made it a memorable ending to the tour. I also had a fairly engaging talk with a local, who told me about his hometown and how he had moved to Münster recently.

"This trip showed me that studying abroad or pursuing a job abroad is accessible to anyone with enough foresight and drive. Although I may not be able to pursue a master's degree in Germany next year because of the language barrier, I won't rule out Germany from my radar because it's too far away or inaccessible." Marcos Sanchez

Departure Day - Sept 19

We rose very early in the middle of the night to catch a train from Munster to Düsseldorf airport. After a short flight, we used another 4-hr layover to debrief on the whole trip and listen to students' impressions and reflections. It was truly an unforgettable learning experience, with just the right mixture of culture and academics. Thank you, DAAD, for supporting us in our endeavors!

- GET Germany 2023 Trekkers



Ryan Kessler, Mechanical Engineering `25 Tanner Thomas, Chemical Engineering `24 Taymae Mimouni, Earth & Planetary Sciences `24 Kayla Shen, Environmental Engineering `24 Marcos Sanchez, Environmental Engineering `24 Kiran Prakriya, Electrical Engineering `26 Rimen Jenhani, Computer Engineering `26 Ava Dahnke, Chemical Engineering `24 Anika Gupta, Biomedical Engineering `24 Sophia Jadziniak, Environmental Engineering '26 Lidia Orta, Economics `25 Julia Davis, Civil Engineering '26 Yanni Wilcox, Computer Engineering `25 Alonzo Williams, Civil Engineering `24