Interview with Faisal Hossain, Professor of Civil and Environmental Engineering

What kind of education did you need to get your position?
A Bachelor's degree in Engineering or another STEM field followed by a higher degree (PhD) based on advanced training and research on a specific field

What other skills or experiences do you have that help you to be successful in your career?
Education/Teaching; communication, film-making, volunteering for public service

What do you do in a typical day at your job?
I teach a class of students at undergraduate or graduate level who are interested understanding the challenges we face today and the possible solutions (on water/environmental issues). I carry out research with a group of very smart and dedicated graduate students and colleagues to find workable solutions for water challenges we face. I also engage a lot with stakeholders, trying to communication our work, understand their needs and context and I often make films and educational materials around them for public consumption. Nowadays I run a student film contest where STEM majors explore the arts to explore STEAM and how that helps in telling their stories on what they do with their work to make the world better.

What do you enjoy about your career?
Many things, but primarily the constant amazement by ideas that students and colleagues will share on ways to solve problems. As engineers, we solve problems. Students often surprise me with their outside the box and ambitious thinking for ideas they think are needed today. I also love the fact that there are unbridled opportunities to interact with stakeholders (public/communities/agencies/countries) from various sectors (such as food, water, energy) to learn about the problems they face and collaborate on ways to devise solutions. Often times, they present an eye-opening perspective outside the Ivory Tower that humbles you with the realization that all that advanced scientific knowledge that you learned inside the Ivory Tower will not work unless you recognize the on-the-ground challenges/hurdles (often times cultural, socio-economic) if you want lasting solutions. So, the stakeholder engagement keeps me real and humble and I'm constantly learning to appreciate the inherent wisdom people have accumulated in dealing with their challenges.

What are the challenges you face in your job?
The main challenge is that there aren't enough hours in a day to do all the things I would love to. But that's something that is not getting solved anytime soon. To be honest, I do not see much challenges in the academic environment I am in because there is no leash in creativity from above and you can unleash your ideas and will have all the space you need to try out radical ideas without the fear of failing. A minor challenge is the bureaucracy we often have to deal with, but that exists everywhere; and then there is this information overload (or I should say low signal to noise ratio) that can be distracting to doing meaningful work these days.

How do you see your job changing over the next decade?
With the rapid advancements in information technology, the main aspects of my job (teaching, research and service) have become both easier and also difficult at the same time. And it's how sensibly we adapt to it in the next decade that will define how we evolve in our profession of teaching and research. IT, easy availability of data, cloud computing etc. have made it massively easier for us to teach and do a lot more research with our collaborators than before. It has helped us take on bigger challenges as a team than before. But at the same time, if we are not careful, such easy availability of data, and IT luxuries can create walls of misunderstanding or our own bubble and remove us from the harsh realities on the ground that most people/stakeholders in need of new solutions face every day. Life is not a video game – that's the point I'm making. You've got to still do the good old fashion thing of making friends, establishing meaningful relationships from one human being to another, share stories, develop empathy, to get to the root of the problem (say on water or food) that we want to solve. There is no digital way of doing that. It is all analog and that's something we risk forgetting as move into the future in our profession.

How do you use NASA Earth observation data to help you make decisions? What kind of decisions are you making that use these data?
A lot! NASA is the world's best technological agency and only NASA, with its global observation capability (and extra-terrestrial exploring capability) can capture the human imagination and solve problems like no other. I use a plethora of NASA Earth observation data ranging from precipitation, water levels, land cover, soil moisture, land/water temperature etc. to take a pulse of the earth we live in and how it is changing. These data are used in many decision support systems to tell us what might be the future state, for example of a flooding or how much food we may expect to grow or even how much water we might have. Predicting the potential future helps us make decisions on how to prepare better whether that is for the next day, next week, next month/season or even next year. NASA provides this unique vantage of space of getting us the data globally anywhere and in near real-time which is publicly available (as long as you have access to internet) and immune to bureaucratic or political hurdles of data sharing on the ground. Using all these data, we can paint a much better story of what's happening to the world we live and how mother nature is behaving or how messed up or better we've made her (mother nature). It's impossible to paint this picture without space data.

For example, we use precipitation data and weather forecast data (which assimilates a lot of NASA data) to tell farmers when and how much to irrigate and even inform them if they can save water by not irrigating. This results in a lot of saving of water (which is precious) and also grow more food. We also use NASA data to monitor how warm or cold river waters are below a dam to understand if that dam is causing too much damage to the eco system. Once we know that information (for the numerous dams we have) we can make better dam operating decisions and inform the stakeholders on what to expect or how to mitigate negative impacts. We frequently use NASA precipitation data and river level data to forecast floods in rivers and relay that information right away to flood vulnerable inhabitants so that they have enough warning to take evasive action and protect their livelihood.