URBAN UPDATE

Nadine Ibrahim | nadine.ibrahim@uwaterloo.ca | Twitter: @NadineIbrahim

Urban Projects

I've been selected as a technical advisor for an ENVE/GEO Fourth Year Design Project (Capstone), for a group looking to design a net-zero energy for a high-density residential building. Aida Mollaei's 2nd Committee Meeting took place, with a change in research direction to include transportation in addition to buildings to calculate the weight of cities.

Engineering Education

Applied to the Waterloo Engineering Endowment Fund (WEEF) and received $4,500 to purchase materials to support city building models for the Urban Design Days activity. My online course on Sustainable Cities is now live here: http://cms.cel.uwaterloo.ca/sustainablecities

Teaching

Accepted teaching Rebecca Saari's course, ENVE335, with CIVE332 in Winter 2020, both pertain to systems and decision-making for engineers.

Urban Engineering in Cities

Thanks to the creative efforts of Daniella Cross and co-op student Manreet Birdi, my Urban Engineering Cities website launched this month, and updates are now live. The website contains information to re-imagine cities through urban engineering initiatives. You can find links to all Urban Update newsletters on the website. And you can also find out more about the Douglas Wright Engineer-in-Residence program that will be starting in 2020. To stay abreast of urban engineering activities such as the Turkstra Talks, Urban Design Days, City Circle, and Urban Provocations, among others, you can read more https://uwaterloo.ca/urban-engineering-cities/ #UWUrbanEngineering #TurkstraChair #UrbanUpdate

Event Highlights

Turkstra Talks. Full house for Ryan Zizzo from Mantle314. Nov 19.

EcoSummit. Attended and served on a panel presentation. Nov 20.

EnvE/GeoE Capstone. Attended the 4th year capstone project presentations. Nov 29.

First Lego League. Served as a Project Judge for the FLL Waterloo Qualifier at St. David's Catholic School. Nov 30.

Keep an eye out next month for...

Here are events to look forward to in December 2019:

- MTE Pitch, Dec 4
- PEO 30x30, Dec 5
- New Faculty Orientation for Lecturers, Dec 9
- Workshop for a new part-time MEng, Dec 10
- Donghui Lu PhD Defense, Dec 11
- Dept Christmas Party, Dec 13
- CEEA abstracts due, Dec 16
- CBC Radio Interview, Dec 18

Water Environment Federation the water quality people

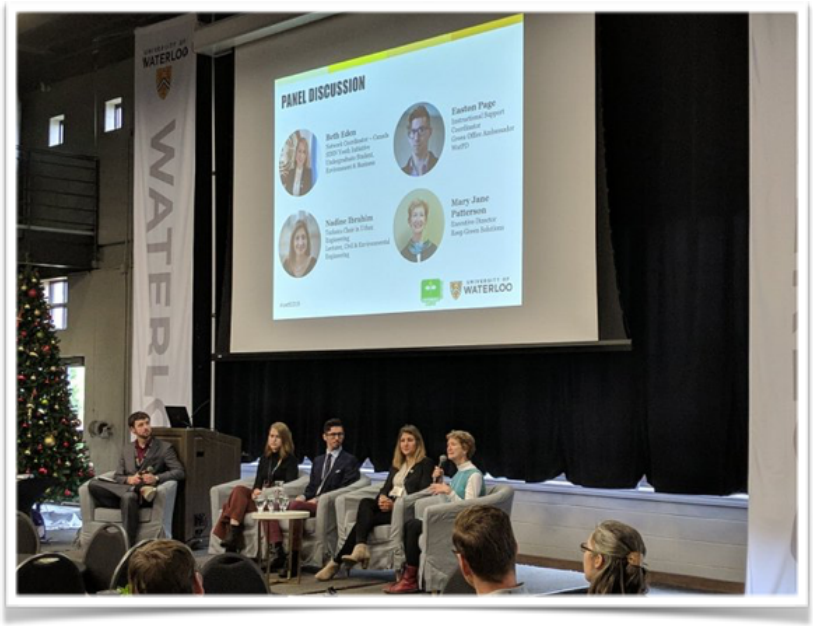
WATER ENVIRONMENT FEDERATION
MEMBER

CLF

CARBON LEADERSHIP FORUM
MEMBER

CARBON LEADERSHIP FORUM
EMBODIED CARBON NETWORK

EMBODIED CARBON NETWORK
MEMBER



EcoSummit: Building Hope, Nov 20 2019

Participated in Waterloo's 6th annual EcoSummit, which included the release of the 2019 Environmental Sustainability Report put together by the President's Advisory Committee on Environmental Sustainability (PACES) on which I serve. The theme this year was "Building Hope". I took part on a panel discussion moderated by Mat Thijssen, sustainability manager, and presented together with other panel members: Beth Eden, a student in Environment and Business; Easton Page, WatPD staff with Green Office gold certification; and Mary Jane Patterson, executive director Reep Green Solutions. Discussion topics included the UN's Sustainable Development Goals, making a difference locally and internationally and the rise of green cities.

"People ignore design that ignores people."
Frank Chimero

Faculty Contribution

Bruce MacVicar is an Associate Professor in the Department of Civil & Environmental Engineering. He is a licensed engineer in water resources with a particular interest in the morphology and the hydraulics of rivers. Rivers in cities are often characterized by a set of physical, chemical, and ecological symptoms that together are referred to as the 'urban stream syndrome'. Amongst all the stressors on urban rivers, the changes in hydrology are perhaps the most obvious and pervasive. The combination of impervious land cover with efficient drainage means that the water balance of urban watersheds is flipped on its head, with much of the water falling as precipitation transferred quickly to streams and rivers rather than infiltrating into the ground. His research on urban rivers attempts to understand the impact of this water balance change on flooding and sediment transport. Working with partners in computer science and freshwater ecology, the hope is that this will help guide decision making around land development and lead to a more sustainable approach for water management and channel restoration in cities.

One current project focusses on characterizing the dynamics of coarse sediment on the bed of a river and the impacts of urbanization. People are used to thinking of rivers as channels that convey water, but they also move sediment. On scales of millions of years, erosion and landslides can drag entire mountains to the ocean. Part of the problem we have with managing urban rivers is that we speed up this process in particular spots, which results in physical changes such as rivers getting bigger, bridges failing due to scour, and buried sewers and pipelines getting exposed or breaking during floods. For example, in the images from before and after a flood (**), the channel bed after the flood is completely changed, with the sediment bed removed in one section to expose the smooth clay till underneath. A recent paper from graduate student Elli Papangelakis in Water Resources Research conceptualizes the change using 'virtual velocity', or the average speed at which sediment particles move downstream. In a typical rural stream the virtual velocity of the median grain size was found to be about 1.5 m per year, but in an equivalent urban stream similar sized particles moved more than 7.0 m per year. The frequency of movement was also different so that rather than moving once every two years on average, the urban sediment moved up to 5 times per year. From the perspective of creatures who live on and amongst these sediment particles (i.e. invertebrates and fish), these events are like tornadoes that rip up and reconfigure their habitat. Stormwater management techniques are designed to prevent these frequent floods, but long floods with lower peak discharges are shown to result in a new set of sediment transport changes that may lead to new ecological problems. Through this research we hope to provide new strategies for water and river management in sustainable cities.

Student Contribution

Sevda Payganeh started her PhD in Civil & Environmental Engineering with Dr. Haas and Dr. Knight in 2015, after completing her MASc from Systems Design Engineering under the supervision of Dr. Hipel. Her area of expertise is analyzing and proposing resolutions for conflicts among multiple stakeholders using systems dynamic and game theory approaches. Her Master's thesis focused on the Canadian energy sector. She developed a strategic decision-making platform for the industry's main parties to sustainably resolve their disagreements through a win-win perspective. Currently, she is designing a systematic framework to model disputes among water management parties such as municipalities, heavy water-consumers, NGOs and residential consumers. This leads to highly optimized asset management in the water resources management industry, and increases heavy water and residential customers' satisfaction, lessens municipalities' costs, and guarantees more engagement from the interested NGOs.

Local Canadian governments, in addition to many public and private companies, are heavy water consumers, which extract vast amounts of water from water sources such as the Great Lakes. Temperature changes, and storm water in the past few decades added to pollutants such as phosphorous pouring into the Great Lakes from various origins, place more pressure on these valuable, yet vulnerable water sources. The surrounding US states and Canadian provinces strive to protect the Great Lakes from water extractions and pollutants. The different priorities of the stakeholders have become sources of disputes that keep transitioning from one kind to the other. Traditional conflict resolution researchers tend to focus on investigating each of the conflicts independently from the other disputes existing among the stakeholders. However, a holistic view is required to understand the conflicts, acknowledging the previous disputes which have transpired in the past when analyzing each conflict. This broader perspective presents a better ability to study potential future conflicts since it enhances the predictability of the scenarios which might occur later during other disputes.

After identifying the relevant stakeholders associated with the Great Lakes, and their preferences and options, the various conflicts among them are analyzed using the Graph Model of Conflict Resolution (GMCR) tool (a mathematical approach within the game theory framework which studies strategic interactions among decision makers). However, the input for each conflict's GMCR model is highly influenced by the previous conflicts' outputs. This is accomplished through delicately assessing the results of the previous conflicts' GMCRs, and linking them to the gathered information on the conflict in interest. In the next step, major external variables that affect the current steady system are investigated. Political happenings, economic factors, social trends, technological advances, legal changes, and environmental crises, are some of the key variables that are investigated. Several scenarios based on this external analysis of the system are proposed and utilized for enhancing future decision-making. This understanding could help water for example, utility providers, who carry a huge responsibility towards millions of water users, predict and prevent potential water disputes with other stakeholders.