2018–19 / THE WATER INSTITUTE

IMPACT REPORT

UNIVERSITY OF WATERLOO | the water INSTITUTE

Water disregards boundaries. And so must we.

The University of Waterloo's Water Institute is **interdisciplinary**, **innovative** and **international**. In this report, we provide a glimpse of the impact that we have made in 2018-19.

INTERDISCIPLINARY

With the increasing scale and complexity of key water challenges, it has never been more important for water researchers, practitioners and students to understand the relevance of different perspectives and contributions from various water-related disciplines. The main strength of the Water Institute is its ability to catalyze and conduct interdisciplinary research.

INNOVATIVE

With over 150 researchers from 22 different departments and schools pushing the boundaries of water science, engineering, economics and governance, we develop and apply innovative disciplinary and interdisciplinary approaches and solutions to address key water challenges.

INTERNATIONAL

We promote sustainable water management through collaboration with leading water organizations around the world, and connect our researchers and students with science users such as governments, the private sector, and civil society.

Roy Brouwer
Executive Director
the Water Institute
University of Waterloo

The Water Institute

The University of Waterloo established the Water Institute in 2009 to provide an on-campus network of excellence in water research, education, and innovation, with a particular focus on promoting interdisciplinarity. Water Institute researchers represent a wide breadth of disciplinary expertise with a membership of over 150 faculty members and 300 graduate students, who collectively span all six Waterloo academic faculties. The Water Institute is ranked among the world's top water research organizations.

32nd BEST ACADEMIC INSTITUTION FOR WATER RESOURCES IN THE WORLD

Shanghai Ranking of Global Universities, Water Resources, 2018

OUR PEOPLE

150+ FACULTY MEMBERS

6 faculties

22 departments or schools

300+ GRADUATE STUDENTS

28 RESEARCH CHAIRS

RESEARCH FUNDING

$190+ MILLION

since 2009

SCHOLARLY OUTPUT

33,000+ PAPERS CITED since 2009

1,900+ PAPERS PUBLISHED since 2009

1,500+ PEOPLE ATTENDED the 2018-19 WaterTalks

SCHOLARLY TALKS

80 WATERTALKS since 2010

2,700+ PEOPLE VIEWED

WaterTalks on YouTube since 2010

Year at-a-glance

June 2018 /
WATER SECURITY CONFERENCE

Water Institute members co-chair and deliver three keynote speeches at Elsevier's first international Water Security conference in Toronto.

July 2018 /
SINGAPORE WATER WEEK

The Water Institute participates in the Singapore International Water Week.

UNITED NATIONS SDG MEETING

The Water Institute Executive Director gives a keynote presentation in New York City during the United Nations High-Level Political Forum on the implementation of the Sustainable Development Goals.

September 2018 /
BREAKING BOUNDARIES IN WATER RESEARCH CONFERENCE

The Water Institute hosts its bi-annual international research conference, attracting more than 200 participants, including two Stockholm Water Prize laureates.

EXTERNAL ADVISORY BOARD MEETING

The Water Institute's External Advisory Board, including representatives from leading water research organizations from around the world, meets to take stock of Institute progress.

October 2018 /
HIGH-LEVEL MALAYSIAN DELEGATION

The Water Institute hosts a delegation of 27, led by the Chief Minister, from the state of Sarawak in Malaysia.

November 2018 /
HYNES LECTURE

The Water Institute partners with the Canadian Rivers Institute to host the 2018 Hynes Lecture featuring Margaret Palmer, Distinguished University Professor at the University of Maryland and Director of SESYNC.

CRAES INTERNATIONAL SCIENTIFIC ADVISORY COMMITTEE MEETING

The Water Institute Executive Director participates in the inaugural meeting of the Chinese Research Academy of Environmental Science's International Scientific Advisory Committee in Beijing.

January 2019 /
NEW COLLABORATIVE WATER PROGRAM COHORT

Sixty-seven students begin classes in Waterloo's Collaborative Water graduate program, the largest cohort to date.

March 2019 /
WORLD WATER DAY CELEBRATIONS

The Water Institute organizes its annual World Water Day event exploring opportunities to provide marginalized communities with safe water.

RBC DISTINGUISHED LECTURE

The Water Institute hosts its annual RBC Distinguished Lecture featuring Ontario's former Premier, the Honourable Bob Rae, who addresses "What the challenge of clean water at home and around the world tells us about ourselves, our country, and our planet".

RESEARCH EXCELLENCE RECOGNITION

OCTOBER 2018 / Peter Huck's NSERC Industrial Research Chair in Water Treatment renewed for a record 6th five-year term.

OCTOBER 2018 / Carolyn Ren and Alexander Wong named members of the Royal Society of Canada's New Scholars, Artists and Scientists.

NOVEMBER 2018 / Mark Servos appointed Fellow of the Society of Environmental Toxicology and Chemistry.

DECEMBER 2018 / Susan Elliott named in 2018 Canadian Women in Global Health List.

APRIL 2019 / Janusz Pawliszyn and Mark Servos win 2018 best paper award from Environmental Science and Technology Letters.

APRIL 2019 / Keith Hipel receives 2019 Killam Prize from the Canada Council for the Arts.

A changing climate and water security are intricately linked. At the Water Institute we appreciate the complexity of this relationship, and understand it requires thoughtful and rigorous examination from different angles.

Interdisciplinary

"The Water Institute brings together a large group of water researchers, including both natural and social scientists, really catalyzing interdisciplinary approaches. Being part of the Institute makes it possible to do innovative and impactful water research."

Professor Nandita Basu
Earth and Environmental Sciences and
Civil and Environmental Engineering

UNDERSTANDING THE IMPACTS OF CLIMATE CHANGE AND POLAR ICE IN A WARMING WORLD

The Arctic is warming at a significantly greater rate than other regions of the world. Polar ice, including glaciers, ice sheets, ice streams and ice shelves, are at risk of disappearing. Professor **Christine Dow** (Geography and Environmental Management) uses large-scale ice sheet modelling, remote sensing and in situ data collection to understand subglacial hydrological controls on ice dynamics over multiple spatial and temporal scales. This understanding allows Dow to better predict the nature of ice mass changes and rates of sea level rise. Professor **Chris Fletcher** (Geography and Environmental Management) uses state-of-the-art computer models and simulations of the global climate system to understand the processes that drive regional variations in temperature and precipitation. Fletcher's application of scientific computing, which includes the use of artificial intelligence, helps to better predict temperature, precipitation, snow cover and sea ice on timescales from weeks to centuries.

DE-RISKING CANADA FROM THE IMPACTS OF CLIMATE CHANGE

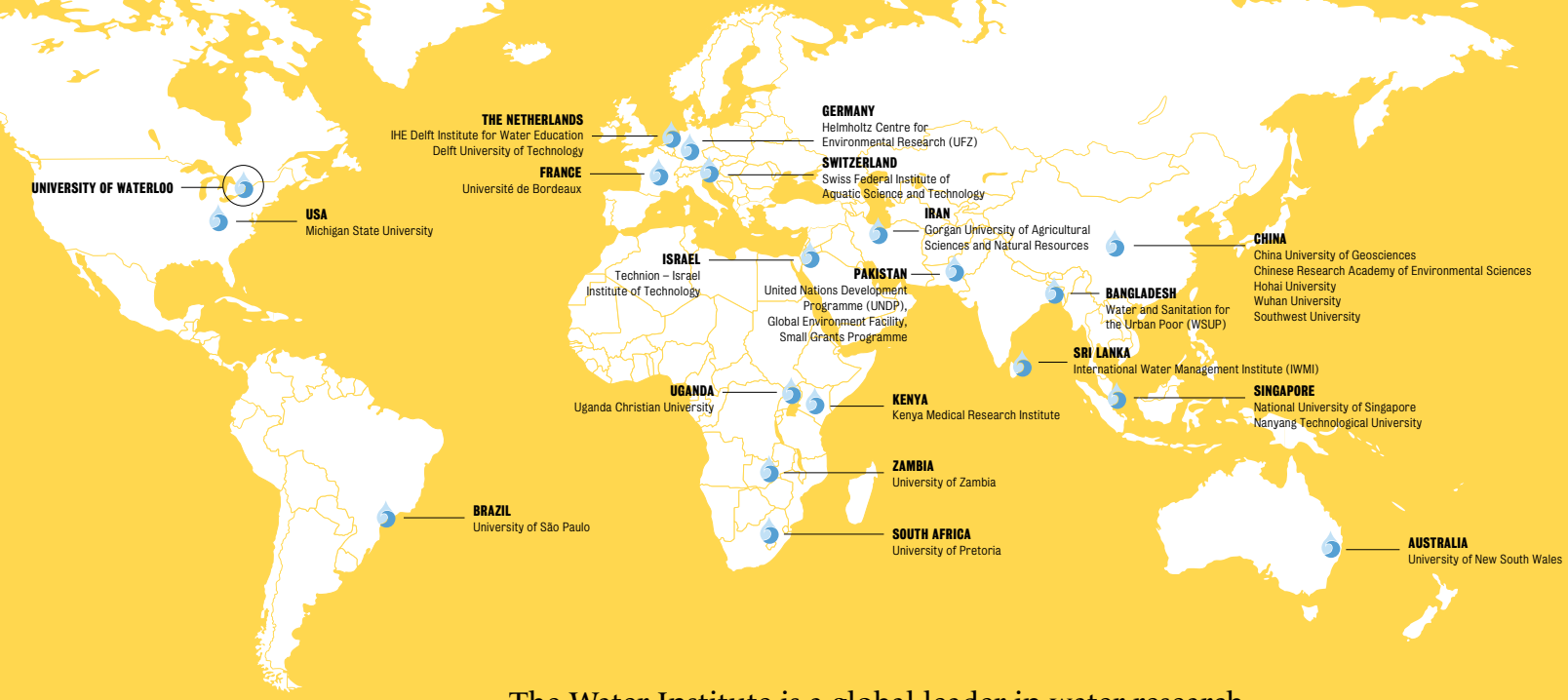
Over the past decade, more frequent and severe extreme weather events have resulted in a sharp increase in the costs associated with recovery across Canada. Professor **Blair Feltmate** is Head of the Intact Centre on Climate Adaptation (Faculty of Environment) which focuses on means to limit extreme weather risk in Canada for homeowners, communities, governments and businesses. Feltmate also works closely with the Federal Government, where he is Chair of the Government of Canada's Expert Panel on Climate Adaptation and Resilience. Professors **Jason Thistlethwaite** (Environment, Enterprise and Development) and **Daniel Henstra** (Political Science) study governance and risk management strategies designed to reduce the impacts of climate change and water-related impacts, such as municipal climate change plans, flood maps and stormwater management schemes.

ENSURING FISH ARE SAFE TO EAT IN THE CANADIAN NORTH

In the Canadian north, country food sources are an integral part of Indigenous communities' diet, but their quantity and quality is impacted by various factors, including climate change. Balancing the benefits and risks of eating subsistence fishes is a complex problem as some northerners have become wary of eating traditional foods due to perceived risks of contamination. Professors **Heidi Swanson** (Biology), **Brian Laird** (Public Health and Health Systems) and **Kelly Skinner** (Public Health and Health Systems) use a community-centred approach to quantify the risks (e.g., contaminants) and benefits (e.g., nutrition, food security) of eating local fish. Using environmental and human health data, their research reinforces the message that the benefits of country food consumption generally outweigh the risks of contamination.

IDENTIFYING SUSTAINABLE AGRICULTURAL FUTURES FOR CANADA

A changing climate can have positive and negative impacts on Canadian agriculture. Professor **Merrin Macrae** (Geography and Environmental Management) is studying how climate change is expected to modify water availability and water quality in agricultural regions of Canada. Macrae's research identifies how changes in current practices might help farmers best adapt to future scenarios. Professor **Roy Brouwer** (Economics) is examining farmer behaviour and decision-making in adopting agricultural best management practices when faced with climate-related risks, and what economic and policy instruments are appropriate to support the sustainable management of water resources in the agricultural sector.



The Water Institute is a global leader in water research and education. We collaborate with leading water organizations around the world to make a difference.

International

"My time as a Visiting Fellow at the Swiss Federal Institute of Aquatic Science and Technology (Eawag) in 2018-19, facilitated by the Water Institute, was not only a tremendous personal and professional experience, but re-affirmed the importance of connecting to the world's leading water research organizations."

Professor Mark Servos
Department of Biology

BREAKING BOUNDARIES IN WATER RESEARCH INTERNATIONAL CONFERENCE

On September 24, 2018, 200 water researchers, practitioners and students gathered at the University of Waterloo for the Water Institute's "Breaking Boundaries in Water Research" international conference. The event showcased cutting-edge research taking place at Waterloo, and at partner institutions worldwide, in five priority areas: human health and well-being, urban water systems, watershed management, blue economy and global water cycle. 2016 Stockholm Water Prize winner Professor Joan Rose of Michigan State University delivered the opening keynote lecture, while students of Waterloo's Collaborative Water Program presented outcomes of their interdisciplinary, experiential course work. The event concluded with the annual Water Institute RBC Distinguished Lecture featuring 2018 Stockholm Water Prize winner Professor Mark van Loosdrecht from the Delft University of Technology.

QUEEN ELIZABETH SCHOLARS – ADVANCED SCHOLARS PROGRAM

The Queen Elizabeth Scholars – Advanced Scholars (QES-AS) program is a Canadian initiative that supports doctoral researchers, postdoctoral fellows and early career researchers from Canada and Low-and-Middle Income Countries (LMICs) to develop solutions to complex national and global challenges.

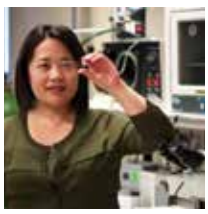
During 2018-19, the Water Institute, with McMaster University, hosted 14 international scholars in executing the QES-AS "Water Security as a Foundation for Healthy Communities and Sustainable Livelihoods" project in partnership with the Kenya Medical Research Institute, Uganda Christian University, University of Zambia, UNDP Global Environment Small Grants Program in Pakistan, China University of Geosciences and Gorgan University of Agricultural Sciences and Natural Resources in Iran. The project is building the institutional capacity of LMIC partner institutions in climate-smart agriculture for food security, climate-proof public health services under increasingly severe drought and flood conditions and safe water supply and sanitation facilities to improve the health status of mothers and infants.

Innovation

The University of Waterloo has been recognized as Canada's most innovative university for 27 years running. Innovation in water education and research comes naturally at the Water Institute.

"I joined the Collaborative Water Program to learn more about the wicked water problems we're currently facing, and to learn from students outside of my home department. This interdisciplinary setting provided an atmosphere that most students have never experienced. It really helped me think outside of the box – and outside of my engineering silo – allowing me to see how I can contribute to the bigger picture."

Navid Bizmark
Postdoctoral Research Associate,
Princeton University,
PhD, Chemical Engineering (Water)
University of Waterloo, 2017



CANADA'S MOST INNOVATIVE GRADUATE WATER PROGRAM

Jointly delivered by 11 academic units, and co-ordinated by the Water Institute, the Collaborative Water Program is the **most interdisciplinary water graduate program in Canada**. The program's unique and innovative design encourages students to push the boundaries of their research and discover what other disciplines can contribute by having students complete specialist training in their home unit, while working with students from a variety of other units and disciplines in two additional interdisciplinary, experiential water courses. Rob de Loë, CWP Director, notes *"We need people with deep disciplinary expertise to tackle our water problems, but we also need people who can work with specialists from other fields, and who can see the ways in which water problems cut across those disciplines. That's what the Collaborative Water Program offers Waterloo students – a truly interdisciplinary experience."*

RESEARCH AND INNOVATION

Water Institute researchers and students develop new ideas, products and technologies to address water problems and make an impact. Here are some examples.

Monica Emelko (Civil and Environmental Engineering) and **Alexander Wong** (Systems Design Engineering) have developed artificial intelligence software capable of identifying and quantifying different kinds of cyanobacteria, offering agencies and others the potential to save significant time and resources in water quality monitoring.

Juewen Liu (Chemistry) has developed highly sensitive fluorescent biosensors with catalytic DNA for heavy metal detection in water, offering users cost-effective, on-site, real-time detection capabilities.

Sriram Narasimhan (Civil and Environmental Engineering) has developed an approach to detect leaks in water infrastructure using hydroacoustics and artificial intelligence which supports the implementation of autonomous hydraulic monitoring systems for water distribution systems.

Carolyn Ren (Mechanical and Mechatronics Engineering) has developed the first real-time, portable, intelligent lab-on-chip device allowing for the rapid detection of pathogens and contaminants in water and reducing the costs of environmental protection.

Norman Zhou (Mechanical and Mechatronics Engineering) has developed environmental sensors powered by a moisture-driven electrical generator that uses the flow of water in titanium dioxide nanowire networks to generate battery-free power when exposed to moist environments, offering a potential alternative to electronic sensors that require regular maintenance.

CWP

67 STUDENTS PARTICIPATED in 2018-19

OVER 60% of students identified as female since 2013

76 RBC SCHOLARSHIPS WORTH **$465,000** since 2013

255 STUDENTS PARTICIPATED since 2013

80+ FACULTY MEMBERS SUPERVISED CWP STUDENTS since 2013

11 RBC VISITING FELLOWS since 2013

Learn more about

OUR IMPACT

uwaterloo.ca/water-institute-impact

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the water INSTITUTE