



# IC-IMPACTS

Canada India Research Centre of Excellence



**Building Healthier Communities  
in Canada & India**

## ANNUAL REPORT **2014-2015**

A Canadian Network of Centres of Excellence



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“The Prime Ministers appreciated the ongoing bilateral cooperation in science, technology and innovation and its role in improving the lives of their citizens. They took particular note of the partnership between IC-IMPACTS and the National Mission for Clean Ganga to find innovative technological solutions to clean the river Ganga; the ‘Water for Health’ collaboration between India’s Department of Biotechnology and IC-IMPACTS; and the ‘Safe and Sustainable Infrastructure’ and ‘Integrated Water-Management’ initiatives with the Indian Department of Science and Technology.”

– Joint Statement by  
 Stephen Harper, *Prime Minister of Canada*  
 Narendra Modi, *Prime Minister of India*

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## MESSAGE FROM THE CHAIRMAN OF THE BOARD OF DIRECTORS

It is with pleasure that I report that IC-IMPACTS continues to build upon its promise to advance research and enable knowledge transfer both in Canada and in India, for the betterment of both nations' communities. This past year has seen an encouraging increase in IC-IMPACTS' engagement with Indian partners, both in the government and private sectors.

Over the past several months, major initiatives have been launched that have seen IC-IMPACTS partnering with India's National Mission for Clean Ganga, India's Department of Biotechnology (DBT) and India's Department of Science & Technology (DST). These latter two partnerships have launched a joint call for proposals which will jointly fund research in the three themes set forth in IC-IMPACTS' mandate. The response to these calls has been very promising, with a number of impressive projects identified, some integrating multiple themes in a cross-disciplinary approach to the challenges faced both in Indian and Canadian communities.

Progress has been made in forging a richer and deeper relationship with the Government of India. In April 2015, Indian Prime Minister Narendra Modi visited Canada; IC-IMPACTS was mentioned in the Joint Statement released by the two Prime Ministers with note of an ongoing commitment from both countries to further support collaboration in the areas of infrastructure, water and health.

In the Canadian context, IC-IMPACTS researchers began testing their research within Canadian First Nations communities. In the Lytton First Nations community an innovative water treatment technology was piloted with initial success. A second BC First Nations community will further test this water treatment technology to help determine the overall scalability of the research outcomes in 2015.

Canadian companies have become increasingly engaged in IC-IMPACTS' activities. For example, companies such as Pultrall Inc and Schock Canada are actively working with Ontario researchers in the area of fibre reinforced polymers; Stantec Inc. is working with Indian industry and Canadian and Indian researchers on an innovative pavements demonstration project near Bangalore, where their design expertise is helping define a new approach for highly durable and cost-effective road systems for the many unpaved roads in India. Moreover, IC-IMPACTS' partnership with Engage North has brought Canadian graduate and undergraduate

students into the remote communities of the Dene Tha' in northern Alberta and Pangnirtung in Nunavut to develop a new model of partnership between northern Canadian, First Nations, and the academic communities.

We are now at the halfway point of IC-IMPACTS' initial five year funding term. It is time for us to begin preparations for what we hope will be a renewal of the network's mandate. To that end, planning and discussions have begun, that we expect will frame those preparations. It will be important to hear from our stakeholders and partners as we seek consensus on the vision for the next five years. Accordingly we look forward with your support to strengthen IC-IMPACTS and its value offering to both nations and their citizens.

Sincerely,



The Honourable Roy Maclaren, PC  
Chairman of the Board of Directors  
IC-IMPACTS Centres of Excellence

## MESSAGE FROM THE CEO & SCIENTIFIC DIRECTOR

With the dedicated efforts of many, fiscal year 2014-2015 has been another banner year for IC-IMPACTS. We made great strides towards achieving our goals in all areas of our endeavor.

Students are the backbone of IC-IMPACTS and we continue to provide quality research training to students in both India and Canada. fifty-two Masters and Doctoral students are currently enrolled in research projects funded by IC-IMPACTS, and even better, there has been a ten-fold increase in the number of students attracted to our program. Entrepreneurial thinking is highly encouraged and we believe that our graduates will create spin-off companies that will see expansion in our bi-lateral trade. To help foster this skillset, IC-IMPACTS delivered a workshop to graduate students in March 2014, showcasing experts who have been leaders in transferring research from laboratory projects into a commercial success.

But it's not been all lab and class work for our students. IC-IMPACTS students got first-hand exposure to Canadian communities through the unique Community Engagement Fellowships Program (a partnership between IC-IMPACTS & Engage North at the University of Alberta) that placed them in the communities of the Dene Tha' First Nation, Alberta, and Hamlet of Pangnirtung, Nunavut.

IC-IMPACTS primary mandate is to perform cutting-edge research with India that has a global impact. With one hundred and fifty-eight top researchers in our extensive Network, thirteen funded projects, and thirty-one research-industry partnerships, IC-IMPACTS research is now commanding significant world-wide attention and citations to our work are growing rapidly in accredited databases. IC-IMPACTS represents a unique and highly effective model of international research collaboration, which is gaining significant interest. Many other countries including Mexico, China, Japan, Italy, the USA, and Bangladesh have expressed a strong interest in working with IC-IMPACTS and expanding the spheres of their activities to both Canada and India.

In India, interest in IC-IMPACTS and its programs and world-leading researchers continues to grow. An evidence of this is in the large number of partnerships IC-IMPACTS has established in India this year. On the government side, Indian funding agencies including the Department of Science and Technology and Department of Biotechnology have collectively invested over \$2.5 million in IC-IMPACTS program and this amount is expected to grow significantly

in the coming years. New and innovative initiatives with these granting agencies involving business incubators, test-bed commissioning, and demonstration projects are expected to be launched in 2015.

We remain proud of our activities in our partner communities. We believe that through projects in these communities, we not only learn about the limitations and applicability of our research findings but also provide training opportunities to members of the community and create skilled workforce and employment. A perfect example of this is the high performance super-thin, rural road project in Thondebavi, Karnataka currently being commissioned. These technologies require significantly less material, reduce greenhouse gas emissions and recover surface water for on-site treatment—ideal for the 2.4 million kilometers of paved rural roads that India needs.

The 2014-2015 period also saw an intensified engagement with industry. The number of patents filed in India remains low (only 17 per million habitants as opposed to 748 in Canada). With our continued emphasis on commercialization of IC-IMPACTS technologies, the industrial sector in India is beginning to see IC-IMPACTS as a preferred research partner. This engagement not only nurtures Canadian business interests in India, but also provides enormous opportunities for our students, communities and researchers.

It is rewarding and heartwarming to see how much we have collectively accomplished in a single year. I am further humbled to be chosen to serve IC-IMPACTS as its Chief Executive Officer and Scientific Director and thank our Board, students, researchers, and all the collaborators for their trust and dedication.

Sincerely,



Dr. Nemkumar (Nemy) Banthia  
Chief Executive Officer  
& Scientific Director

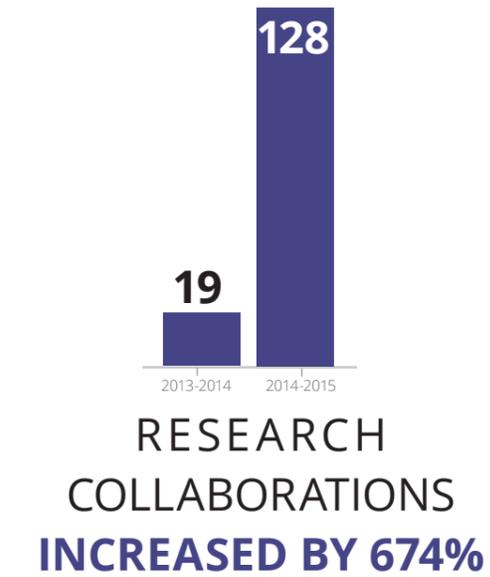
# HIGHLIGHTS OF SUCCESS



OVER  
**\$2.5 MILLION**  
COMMITTED FROM GOVERNMENT OF INDIA FOR RESEARCH PROGRAMS

**327**

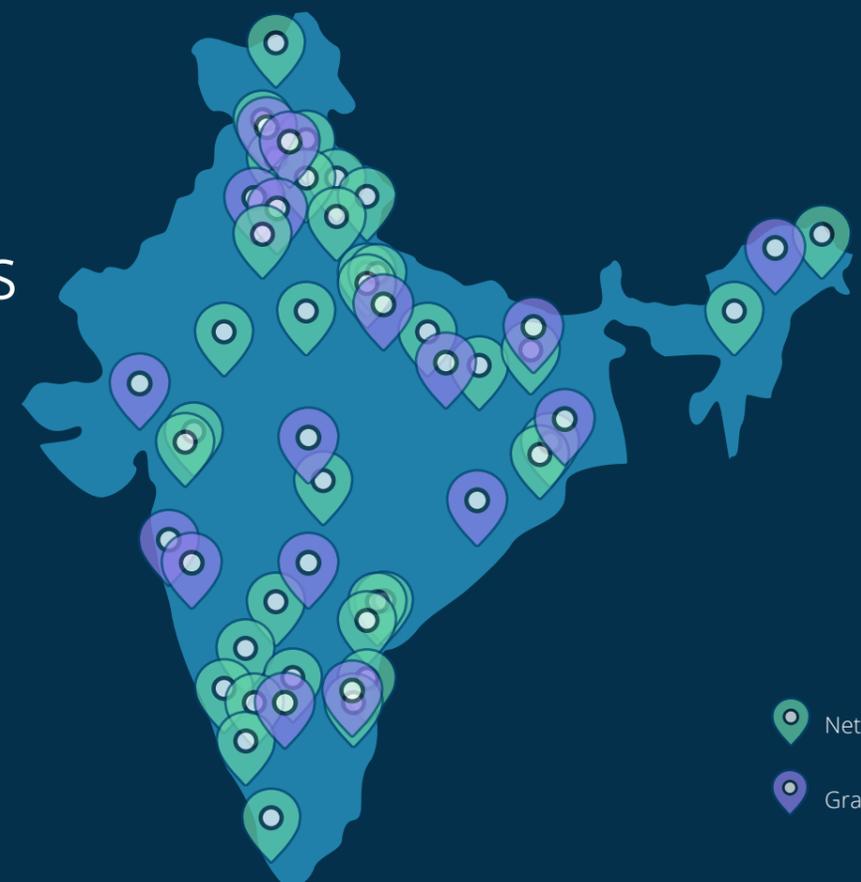
STUDENTS AND PROFESSIONALS TRAINED



**141**

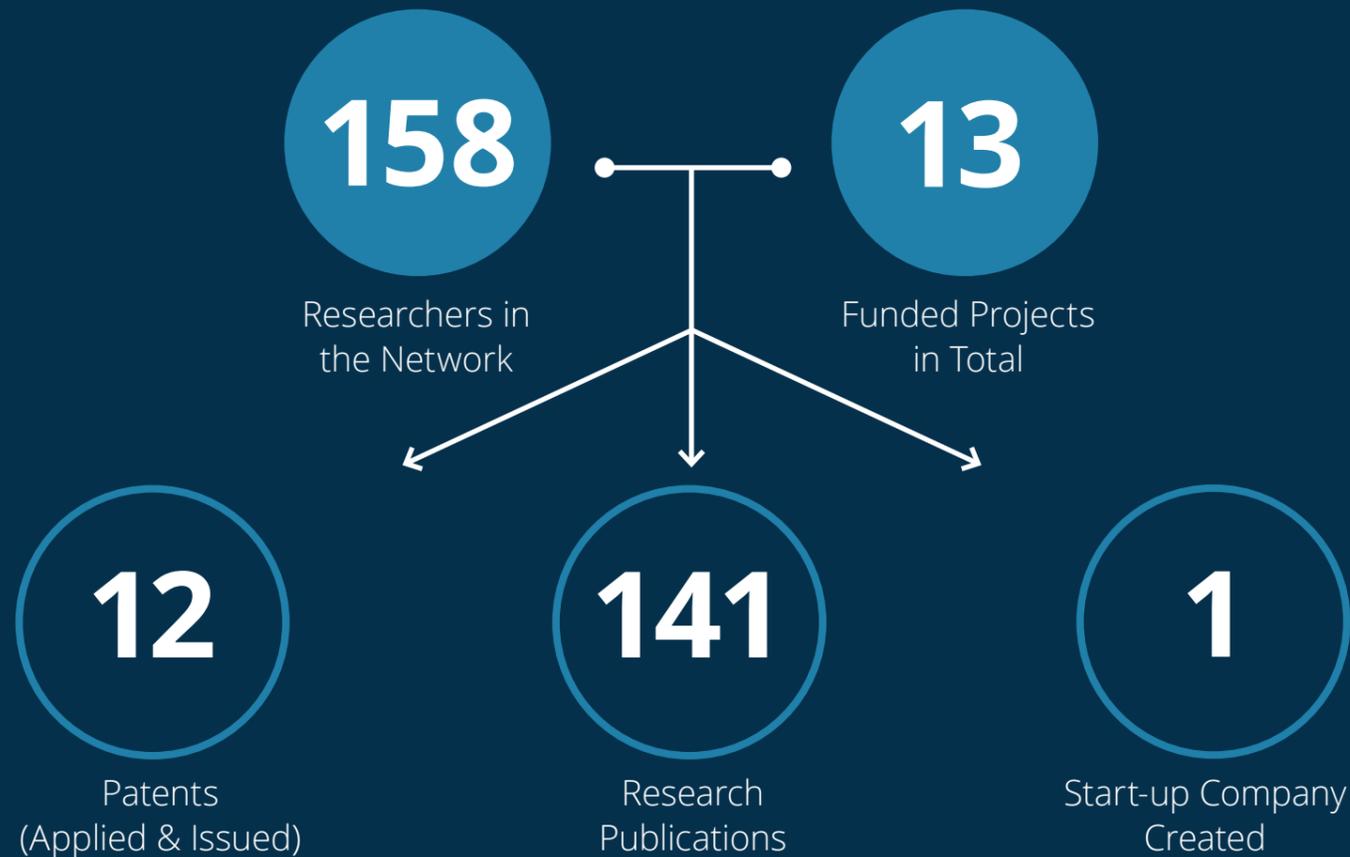
RESEARCH PAPERS PUBLISHED

## EXTENDED NETWORK OF RESEARCHERS & STUDENTS



Network Researchers  
Graduate Students

# SOLVING CHALLENGES & TRANSFORMING COMMUNITIES



Research projects funded by IC-IMPACTS are tackling urgent needs of Canada and India. As a result of these projects, civil infrastructure will not only be repaired and strengthened, but will also substantially reduce greenhouse gas emissions. Small communities will have new water treatment systems with more reliable power supplies and remote regions will be able to know when their water is unsafe to drink. New diagnostic technologies will be able to identify emerging viral diseases to enable faster and better treatment.

## FUNDED RESEARCH PROJECTS

### INFRASTRUCTURE

#### Sustainable Infrastructure Using Smart FRPs

Canadian Lead: Dr. Shamin A. Sheikh, *University of Toronto*  
Indian Lead: Dr. Umesh Kumar Sharma, *IIT Roorkee*

#### Modelling and Assessment of Deficient and Repaired Structures

Canadian Lead: Dr. Frank Vecchio, *University of Toronto*  
Indian Lead: Dr. Pradeep Bhargava, *IIT Roorkee*

#### Conservation of Heritage Masonry Structures Within Cauvery Basin Waterworks

Canadian Lead: Dr. Vivek S. Bindiganavile, *University of Alberta*  
Indian Lead: Dr. Narayana Suresh, *National Institute of Engineering (Mysore)*

#### Characterization and Use of Industrial Fly Ash

Canadian Lead: Dr. Daman K. Panesar, *University of Toronto*  
Indian Lead: Dr. Bhupinder Singh, *IIT Roorkee*

### WATER

#### Development of an ICT Platform for Water Quality Monitoring

Canadian Lead: Dr. Clarence W. de Silva, *The University of British Columbia*  
Indian Lead: Dr. Arun Pande, *IT Innovation for Masses*

#### Quantum Dot Solar Panels for Water Treatment in Remote Settings

Canadian Lead: Dr. Edward Sargent, *University of Toronto*  
Indian Lead: Mr. Prashant Kamat, *Brick and Byte Innovative Products Pvt. Ltd.*

#### Handheld P-LAPS Pathogen Detector

Canadian Lead: Dr. Thomas Thundat, *University of Alberta*  
Indian Lead: Dr. Pradeep Nair, *IIT Bombay*

#### Compact High-rate Water Treatment Systems for Small Communities

Canadian Lead: Dr. Ramin Farnood, *University of Toronto*  
Indian Lead: Dr. Vivek Kumar, *IIT Roorkee*

#### High Quality Potable Water for Small/Remote Communities in Canada and India

Canadian Lead: Dr. Pierre Bérubé, *The University of British Columbia*  
Indian Lead: Dr. Pawan Labhassetwar, *NEERI*

#### A Nanotechnology Enabled Device for the Detection of Harmful Bacteria in Drinking Water

Canadian Lead: Dr. Michael J. Serpe, *University of Alberta*  
Indian Lead: Dr. Soumyo Mukherji, *IIT Bombay*

#### Microfabricated, Low-Cost, High-Sensitivity Chlorine and pH Sensor Systems for Water Quality Monitoring

Canadian Lead: Dr. M. Jamal Deen, *McMaster University*  
Indian Lead: Dr. Soumyo Mukherji, *IIT Bombay*

#### Direct Cryptosporidium Detection for Developed and Developing Nations

Canadian Lead: Dr. Mina Hoorfar, *The University of British Columbia*  
Indian Lead: Dr. Chanchal Mitra, *University of Hyderabad*

### HEALTH

#### Next Generation Molecular Diagnostics for Emerging Viral Diseases

Canadian Lead: Dr. Francois Jean, *The University of British Columbia*  
Indian Lead: Dr. Santanu Chattopadhyay, *Nationwide The Family Doctors*

# SAFE & SUSTAINABLE INFRASTRUCTURE

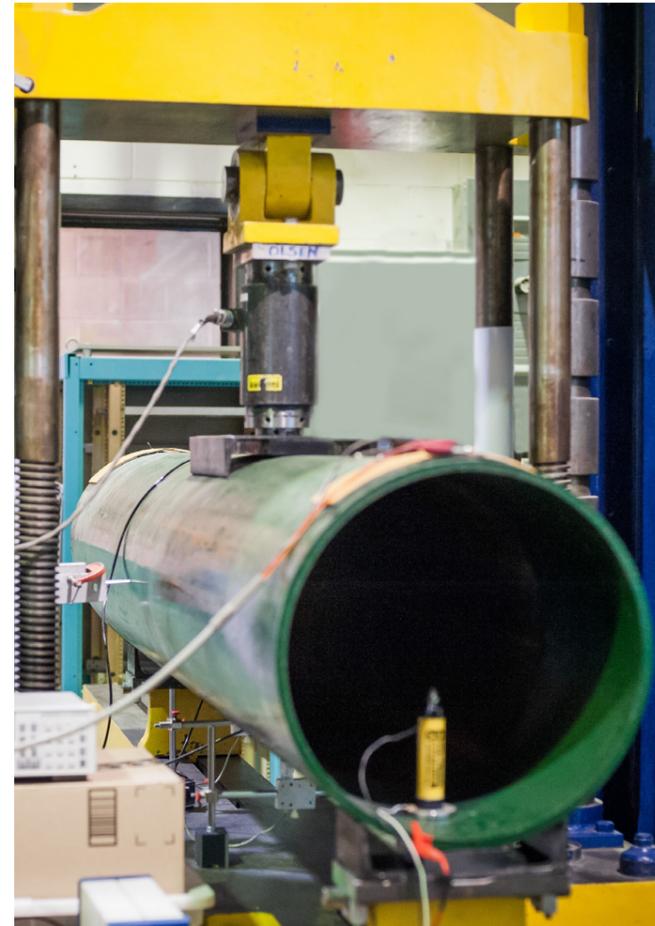
Developing and improving infrastructure is a major priority for both Canada and India. From 2014-2017, Canada plans to invest \$5.8 billion on developing and repairing infrastructure across the country. Similarly, India plans to invest \$1 trillion between 2012 and 2017, building new infrastructure and repairing and strengthening existing structures. IC-IMPACTS is working to solve infrastructure challenges by improving citizen safety and advancing building materials for built infrastructure through four funded collaborative research projects.

Currently, researchers are advancing reinforced structures by designing new reinforced bars that are 2-3 times stronger than the industry standard. IC-IMPACTS research projects are also recycling fly-ash and sugar cane ash by incorporating these waste products into new types of building materials. Additionally, researchers are working on creating an advanced software platform to accurately and more reliably assess structures around the world and across communities of all sizes.

These large, internationally scalable solutions are being accelerated through significant partnerships and meaningful collaborations with many organizations, including the Department of Science and Technology (Government of India), Stantec Inc., and Reliance Industries.

Paired with effective community engagement, strategic infrastructure partnerships have positioned IC-IMPACTS to deploy major research outcomes in India in 2015. Unique, Canadian-designed roads will create safer and more sustainable infrastructure for communities desperately in need of improved transportation routes, as well as test new advanced technologies specifically designed to improve longevity of roads and recapture water.

By recognizing the resource constraints of partner communities and the long-term potential of its research, IC-IMPACTS is transforming communities around the world and accelerating pathways between Canada and India.



## KEY OUTCOMES

- IC-IMPACTS broke ground on a rural infrastructure project, providing Indian communities with new, more durable pavements made with advanced fibers and thinner concrete.
- IC-IMPACTS leadership in infrastructure research accelerated a partnership with the Department of Science & Technology and leveraged funding for new projects.
- Collaborations with academic institutions and industrial partners have allowed IC-IMPACTS to build capacity in India's engineering sector, educating professional practitioners and future engineers in advanced infrastructure techniques.
- Innovative infrastructure research has led to a fully issued patent.

# PROJECT SPOTLIGHT



## Recycling Fly-Ash Waste in Concrete

**PROJECT:** Characterization and Use of Industrial Fly Ash

**CANADIAN LEAD:** Dr. Daman K. Panesar, *University of Toronto*

**INDIAN LEAD:** Dr. Bhupinder Singh, *IIT Roorkee*

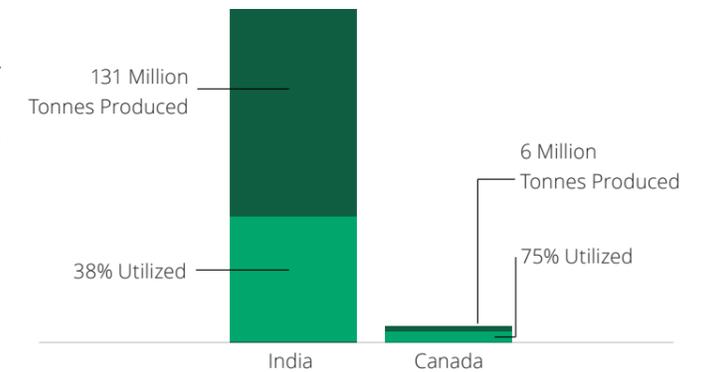
Concrete is one of the most widely used construction materials in the world. However, the current process for manufacturing cement, the main binder component of concrete, is extremely energy intensive and contributes to 5-7% of global man-made CO<sub>2</sub> emissions annually. Owing to increasing awareness of the impacts of CO<sub>2</sub> emissions on the global climate, the cement industry is seeking ways to reduce its CO<sub>2</sub> emissions, decrease raw material inputs, and lower the energy intensiveness of its processes.

Fly ash, a waste by-product produced from the combustion of coal in power plants, can be recycled and used in concrete to improve the strength and permeability of concrete while reducing energy use, emissions produced, and manufacturing cost.

India produces approximately 131 million tonnes of fly ash annually, with only 38% of this waste recycled. Much of it

*"We need to make responsible choices about the materials we use and be more thoughtful of our manufacturing processes and the entire life cycle of a product."*

– Dr. Daman Panesar  
*University of Toronto*



is swept up into the air adversely affecting the respiratory systems of nearby residents. As a consequence, the collaboration between Dr. Panesar and Dr. Singh will not only lead to improved infrastructure, but it will also have a strong multiplier affect to significantly improve the respiratory health of citizens. Canada produces approximately 6 million tonnes of fly ash annually, recycling up to 75% of the waste.

Dr. Daman Panesar and Dr. Bhupinder Singh are testing fly ash collected from 3 different thermal power stations in India (Nagpur, Bhanga, Roorkee) to assess how this waste product can be better utilized and recycled into new construction materials. Their goal is to utilize 100% of the fly ash produced. If successful, their work will have a profound impact on the air quality, infrastructure, and CO<sub>2</sub> emissions in India.

# INTEGRATED WATER MANAGEMENT

Nationwide, there are between 1380 and 1420 boil water advisories in Canada each year. Water quality is particularly challenging in some of Canada's First Nation communities. According to a 2011 national assessment, 50% of First Nations water systems in British Columbia are deemed "high risk" due to poor infrastructure, water contamination, inadequate record keeping, and untrained maintenance workers. In India, the World Health Organization reports that 21% of all communicable diseases are related to poor water quality.

IC-IMPACTS Integrated Water Management theme is currently funding eight water-based projects that will lead to the development of new water quality sensor technologies, innovative water treatment solutions, and new approaches in providing consistent and affordable power to water sensing and treatment equipment in areas of low availability of energy.

The Centre brings together people from industry, academia, government, and communities to create and accelerate, community-driven solutions. This unique approach has led to successful collaborations from leading institutions of both nations, where research teams from The University of British Columbia, University of Alberta, McMaster University, and University of Toronto are working with leading researchers from IIT Roorkee, IIT Bombay, and University of Hyderabad to advance research innovations.

To further innovate in the water-research field, IC-IMPACTS has partnered with the Department of Biotechnology, the Department of Science and Technology, and the National Mission for Clean Ganga. The Centre also engaged with leading water companies in Canada and India - Kerr Wood Leidal and CITS-EA Water to set the stage for new knowledge transfer in the next year.

IC-IMPACTS is working with its water-related partners to create strategies that strengthen Canada and India's

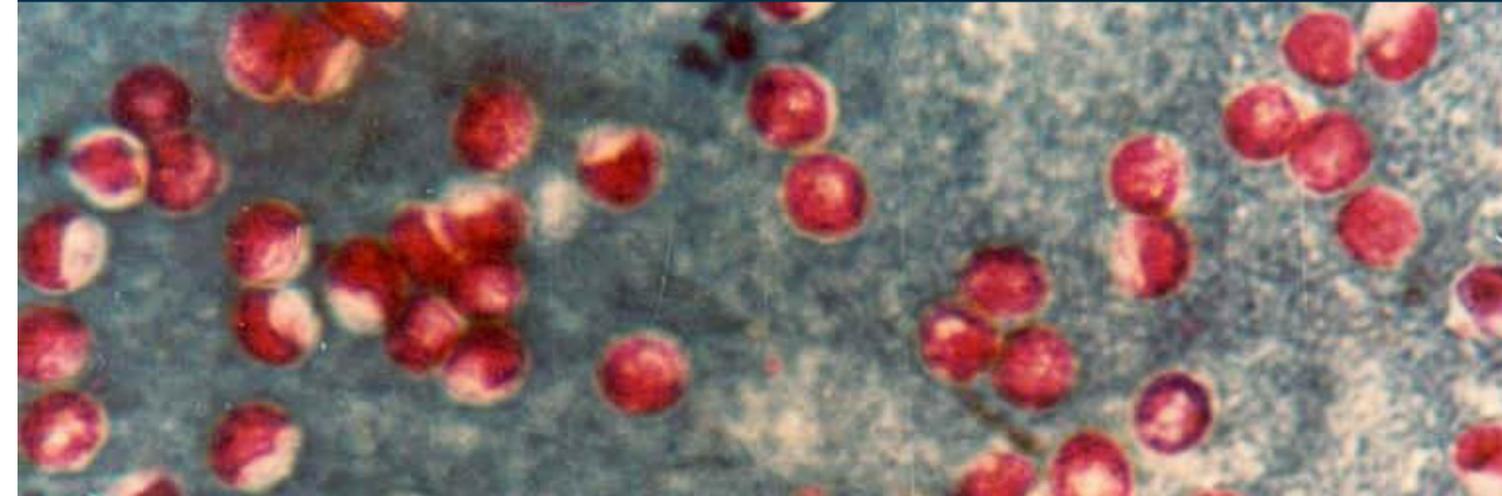
water monitoring and water treatment abilities. These partnerships will create unique opportunities for innovators to collaborate internationally, validate technologies, and gain greater market access.



## KEY OUTCOMES

- IC-IMPACTS water-related projects are positively affecting communities in British Columbia with 2 projects currently deploying technologies and providing people with cleaner water.
- IC-IMPACTS achievements in water-related research accelerated a partnership with the Department of Biotechnology and leveraged \$1.5 million in research funding.
- Significant engagements with NMCG is setting the stage for increased knowledge sharing between experts across Canada & India.
- IC-IMPACTS water-related research projects have led to two patents fully issued, eight patents currently in the application stage, and a start-up company in the solar energy business.

# PROJECT SPOTLIGHT



## Accelerating detection of water parasite *Cryptosporidium*

**PROJECT:** Direct Cryptosporidium Detection for Developed and Developing Nations

**CANADIAN LEAD:** Dr. Mina Hoorfar, *The University of British Columbia*

**INDIAN LEAD:** Dr. Chanchal Mitra, *University of Hyderabad*

Cryptosporidiosis is the second largest cause of diarrhoeal disease and death in infants. Cryptosporidium, the parasite that causes Cryptosporidiosis, has a unique physical form that makes it very difficult to detect and very expensive to remove from water. Dr. Mina Hoorfar and Dr. Chanchal Mitra are working on developing a biosensor that will replace the current method of detection.

The current system for Cryptosporidium includes an 7-step process that can take several days to deliver results. The 7 Steps - Sampling, Transport, Elution, Second Elution, Concentration, Enrichment, and Detection - contain many limitations that can delay results from being delivered and is very costly. By developing an innovative device, users will have a tool that can rapidly detect the waterborne disease with significantly reduced analysis time and increased test efficiency at a much lower cost.

The creation of this biosensor has become quite interdisciplinary, bringing together microbiologists, biochemists, and engineers from both India and Canada to share knowledge and focus on how this device would be used in the field. Its creation and success may save millions of lives across Canada, India and the rest of the world.



*"We wanted to have a real-time device, where a non-expert person can go and test the water in the lake or in the water source."*

– Dr. Mina Hoorfar  
*The University of British Columbia*

# PUBLIC HEALTH

With a refocusing of IC-IMPACTS Public Health theme in 2013, 2014-2105 was devoted to stimulating engagement by health researchers from across Canada and India. Through these efforts, 16 health research proposals were submitted for consideration by IC-IMPACTS, a thematically integrated Call for Proposals "Water for Health" was concluded between the Department of Biotechnology and IC-IMPACTS resulting in 34 projects at the water-health intersection, and the first IC-IMPACTS funded health project was launched.

In addition, IC-IMPACTS entered into a partnership with the Canada India Network Society to develop multi-sector partnerships in the areas of Public Health and Disease Prevention. As part of this collaboration, IC-IMPACTS brought a delegation of Indian Educational Institutes and

representatives from FICCI (Federation of Indian Chambers of Commerce) to participate in the 2014 "Health and Civil Society" Networking Conference in Surrey. This conference forged new relationships between Canada and India in the health sector and brought awareness to India of Canadian expertise in the health-technology-economy interface as well as Canadian leadership in health care management and practitioner development.

IC-IMPACTS is actively working to develop a new collaboration focused on emerging mobile health technologies, a key emphasis of which would be industry sector innovation and the opportunities for next step research between industry and academia in Canada and India.



## KEY OUTCOMES

- IC-IMPACTS launched its first collaborative research program in the Health sector.
- IC-IMPACTS is helping develop increased collaborations between health experts across Canada and India, attracting proposals for 50 different research programs.
- IC-IMPACTS is engaged in discussions with the Department of Biotechnology to develop new initiatives to support health technology development.
- Leading research in the Public Health realm has garnered IC-IMPACTS a patent currently in the application stage.

# PROJECT SPOTLIGHT



## Faster Detection of West Nile & Dengue Virus

**PROJECT:** Next Generation Molecular Diagnostics for Emerging Viral Diseases

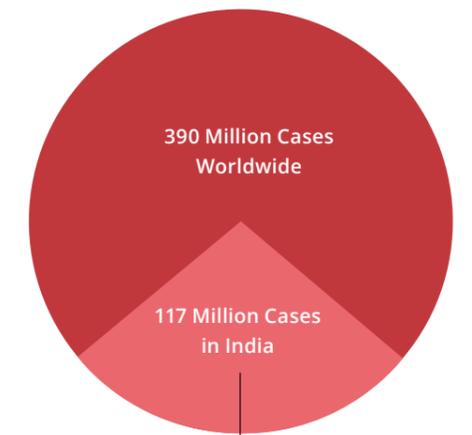
**CANADIAN LEAD:** Dr. Francois Jean, *The University of British Columbia*

**INDIAN LEAD:** Dr. Santanu Chattopadhyay, *Nationwide The Family Doctors*

An estimated 117 million cases of Dengue Hemorrhagic Fever are reported in India every year, whereas, West Nile cases reported in Canada make it the third highest country in the world for individuals infected with the virus. Dr. Francois Jean and Dr. Santanu Chattopadhyay are developing new tools and methods that will detect West Nile and Dengue virus significantly faster.

Viral infections are traditionally analyzed using a technique called Real-Time PCR (qPCR). qPCR analyses are generally time consuming and expensive, especially when compared to analyses performed using a Mass Spectrometer. Since mass-spec analyses are traditionally used for bacterial infections, Dr. Jean and Dr. Chattopadhyay are developing a novel Mass Spectrometry Biotyper System that can be used to analyze viral infections. Using this new system and accompanying methods, detection of West Nile Virus and Dengue Virus will be greatly improved and much faster.

The research team is currently adapting the Mass-Spec model for viral infections. Soon they will be optimizing their tool and demonstrating detection methods on known clinical samples. After validating their tests in Canada, the team will then demonstrate their technology in India and test in the field.



These viruses need to be handled and tested in a secure environment. West Nile Virus needs to be handled in a Level 3 containment lab and Dengue needs to be handled in a Level 2 lab. Having created one the largest Level 3 containment labs in the world, Dr. Jean aims to train technicians from India and build their capacity on Level 3 protocols and techniques at his FINDER lab in Vancouver, Canada.

# MOVING RESEARCH OUT OF LABS & INTO COMMUNITIES



## PROVIDING CLEAN DRINKING WATER IN BC

“95% of First Nations communities are remotely located and there is a big need to find water systems that will work,” says Dr. Madjid Mohseni, a professor at The University of British Columbia. By innovating and adapting traditional technologies to a community’s needs, clean drinking water and improved health can become a reality for many communities across Canada and India.

Dr. Pierre Bérubé and Dr. Madjid Mohseni have been researching solutions to poor-quality drinking water in small communities for several years. Under their IC-IMPACTS project, both scientists are taking a radical look at conventional water treatment technologies - with Dr. Bérubé focusing on membrane-based technologies and Dr. Mohseni researching ultraviolet technologies.

Dr. Bérubé and Dr. Mohseni focus on three factors when designing these technologies: 1) the technology needs to be cost effective, 2) it has to be socially sustainable and well received by members of the community, and 3) it must be easy to operate.

With these factors in mind, Dr. Mohseni developed a new type

of UV radiation that can rid water of both unfriendly bacteria and chemicals. By using extremely short wavelengths of UV radiation, highly reactive components of water react with bacteria and chemicals to clean and purify the water.

This exciting research has led to demonstrating this technology in BC communities. Working with BI Pure Water, GE Water and members of the Lytton First Nation, the water treatment equipment was installed inside a truck, enabling the technology to be mobile and used in multiple communities. The truck visited Lytton First Nation in the Fall of 2014 where the water treatment capabilities were demonstrated to the community and the technology was evaluated for field testing.

This IC-IMPACTS project is a great example of how communities can be transformed through collaborative research, keen industry partners, and engaged community members. The mobile unit is preparing to further demonstrate its water treatment capabilities at a second BC First Nation community and will also be piloted in the Faridkot Region of Punjab, India, both in 2015.



## BUILDING SUSTAINABLE ROADS IN INDIA

The IC-IMPACTS Advanced Pavements project officially began on March 30, 2015, just outside of Bangalore, India at a coconut-breaking ceremony in the community of Thondebavi.

The new super thin pavement technologies use innovative fibers to increase strength and durability, potentially increasing road lifespan by 15 years. Overall these new roads will use significantly less material, reduce greenhouse gas emissions and recover surface water. With over 46% of roads in India unpaved, there is immense potential for this technological deployment.

IC-IMPACTS developed these innovative road designs through multi-faceted partnerships between Canadian and Indian industry and academic partners: Stantec Inc, ACC Cement, Reliance Industries, FOSROC, National Institute of Engineering (NIE), the National Institute of Engineering, The University of British Columbia, and the University of Alberta.

The project has garnered significant interest and resulted in a new partnership with the Karnataka Government State Highways Improvement Project, which will undertake the construction of a second road with pavement designs supplied by IC-IMPACTS.

Final revisions for the road designs are currently taking place, with major construction expected to begin in June 2015. If successful, these unique pavement technologies may be widely adopted into thousands of other pavement projects in India and will be tested for transferability to Canadian communities.

*Overall these new roads will use significantly less material, reduce greenhouse gas emissions and recover surface water*



# DEVELOPING LEADERS & BUILDING CAPACITY

95

Current HQP on  
Research Projects

13

Workshops &  
Events Held

100

Professional  
Practitioners Engaged

IC-IMPACTS is training the next generation of researchers to become “innovation leaders.” By building capacity across Canada and India, the Centre is helping create the backbone of Canada and India’s economic future.

## CREATING COMMUNITY-DRIVEN PROJECTS FOR APPLIED RESEARCH



*“I felt so inspired by the people of Nunavut. The youth are passionate about their communities and their culture while being aware of ‘mainstream’ news and politics. I am humbled to have been a part of their lives.”*

– Jason Wang  
Engineering Student at University of Alberta

IC-IMPACTS successfully partnered with the University of Alberta’s Engage North program in 2014 to create a unique Community Engagement Fellowship program that works with northern Canadian and First Nation communities to create community-driven projects for undergraduate and graduate students across Canada.

The outcomes of these fellowships are multifaceted: host communities share their deep cultural knowledge and traditions and in exchange the fellows share their technical skills and knowledge to address community-identified applied projects.

In the inaugural year of the program, IC-IMPACTS funded 3 students to develop projects and learn from these unique Canadian communities. Masters student Rachel Harris of the University of Toronto participated in the graduate fellowship in Dene Tha’ First Nation, Alberta, where she worked with the community to better understand community health concerns and the barriers to access affecting some residents. Malaya Bishop and Jason Wang both completed their undergraduate fellowships in the Hamlet of Pangnirtung, Nunavut where they helped develop computing skills of Pangnirtung youth and established an archive of cultural resources.

Working together with remote First Nations and Inuit communities in northern Canada, IC-IMPACTS is helping provide real-world experiences for undergraduate and graduate students where they build skills in community engagement and applied research, while simultaneously helping the research community better understand the culture, needs and opportunities to co-develop new forms of partnerships for the future.

# DEVELOPING LEADERS & BUILDING CAPACITY

## INSPIRING YOUNG INNOVATORS TO RESTORE THE GANGA RIVER



In partnership with the Asia Pacific Foundation of Canada, IC-IMPACTS launched an essay competition in January 2015 to inspire young BC high school students to think globally and propose solutions on how to restore the Ganga River in India. BC Students in Grades 10, 11, and 12 were invited to submit an essay that would examine the current issues of the Ganga River and propose a solution that would positively affect the communities depending on it.

The top four finalists presented their solutions in a poster format during the IC-IMPACTS 2015 Research Conference on March 12, 2015 in front of leading researchers, industry experts, government representatives, and community members.

David Nguyen of University Hill Secondary and Haley Bonner of White Rock Christian Academy tied for 1st place. Melanie Sawatzky of Rick Hansen Secondary School placed 3rd and Grace Fraser of Ballenas Secondary School was a finalist.

This successful competition inspired young innovators to solve global challenges while building their presentation and public speaking skills. The competition also helped build strong ties with a Canadian organization focusing on creating Canadian and Indian partnerships.

## BUILDING ENTREPRENEURSHIP SKILLS FOR CANADIAN GRADUATE STUDENTS



On March 11, 2015, IC-IMPACTS held a seminar for graduate students working on IC-IMPACTS projects to build skills in entrepreneurship and innovation. The students heard from 3 key speakers who have helped commercialize and transform research into products.

Dr. Carlos Ventura, Director of the Earthquake Engineering Research Facility at The University of British Columbia spoke to the students about needing proven peer-reviewed research before technology can be commercialized. Dr. Ash Parameswaran, Director of the Institute of Micromachine and Microfabrication Research at Simon Fraser University shared experiences of commercializing his novel colour changing E. coli detection method. He urged students to tailor their research to specific community needs and to work with partner organizations to ensure their research can be safely used by community members. Mr. Angus Livingstone, Innovation Catalyst at The University of British Columbia shared successful case studies and provided great insight into how researchers go about forming companies around new technologies.

The session was very well received with a request by students to develop more skill building seminars in the future. By building skills in commercialization and entrepreneurship, IC-IMPACTS is helping graduate students become future leaders of innovation.

*“What a great program! It was inspirational to see so many accomplished personnel working for a socio-economic cause.”*

– Muhammed Farooq  
Graduate Student at UBC

## BUILDING CAPACITY IN INDIA'S ENGINEERING SECTOR



On January 14 & 15, 2015, IC-IMPACTS and IIT Hyderabad jointly held a Winter School in Hyderabad, India. The two day program brought together professors and students from various TEQIP (Technical Education Quality Improvement Programme) institutions for training on advancements in structural engineering and materials.

The IC-IMPACTS Winter School provided an overview of advanced procedures to assess conditions of these buildings, and an overview on leading methods of evaluating building strengths and design schemes.

TEQIP institutions help train more than 300,000 engineers annually. By providing seminars in advanced structural health monitoring, condition inspection, and strengthening techniques, IC-IMPACTS, and IIT Hyderabad are ensuring future building professionals in India are equipped with advanced skills and the latest procedures in the working environment.

*“This Winter School is an illustration of how the synergy of two countries can work together in the area of research and development for the benefit of mankind.”*

– Dr. Prasad Koorella, CBIT, Hyderabad, India

## EDUCATING PRACTITIONERS ON ADVANCED MATERIALS

On January 5, 2015, IC-IMPACTS was invited to the Stewols Knowledge Forum, an interactive session on advances in Resilient Concrete Infrastructure. Organized by Stewols India and held in Nagpur, the event was attended by over 60 engineers, architects, professors, and executives.

Many structures in India that are designed to last 50 to 100 years only last 22 years on average. Most of these structures use older materials that are less durable than newer technologies.

The structural strength of buildings could vastly be improved through the use of high performing materials like Steel Fibre Reinforced Concrete (SFRC). Additionally, sensors that help monitor the building's integrity and strength can also be used to help extend the life of these structures. As practitioners are



still hesitant in using these new technologies at full capacity, the workshop helped increase the knowledge base on such advances. By sharing Canadian expertise it is hoped that some of the approaches being used in Canada will be adapted in India.

# MOBILIZING INDUSTRY

95

Multisector Partnerships

3

New MOUs with Industry

4

Industry Focused Events

IC-IMPACTS is strengthening and accelerating pathways between Canada and India in the infrastructure, water, and health-related sectors. The Centre is helping Canadian and Indian industry better connect with each other to collaborate internationally, validate technologies, and gain greater market access. By bridging industry with academia, government, and community groups, IC-IMPACTS is helping create significant partnerships and unique opportunities.

## IC-IMPACTS SIGNS 3 NEW MOUs WITH INDUSTRY



IC-IMPACTS helps connect academic researchers, industry innovators, community leaders, and government agencies across Canada and India to work hand-in-hand to find solutions to the key challenges that affect the quality of life of millions of people in Indian and Canadian communities.

This year, IC-IMPACTS signed 3 new MOUs with innovative industry partners that will help expand the Centre's network around the world. The Centre partnered with forward-thinking companies Kerr Wood Leidal, GMR Highways, and Reliance Industries. These partnerships have been developed to facilitate Canadian technologies and raise awareness in India, and to connect Canadian Infrastructure leader Stantec Inc. with Indian infrastructure companies.

The Centre is looking forward to working closely with its new partners and is excited to work with new companies, organizations, and institutions in the coming year.

## SHOWCASING GREEN COMPANIES WITH BC GOVERNMENT

In partnership with the British Columbia (BC) Government, IC-IMPACTS coordinated and delivered an engaging workshop in Delhi, India, focusing on "Green Technologies For Smart and Sustainable Cities", a key priority of the Modi Government.

The workshop brought together over 60 leaders of industry, academia and policy makers to discuss India's rapid urbanization challenges and provide opportunities for existing solutions to be showcased or new collaborative initiatives to be formulated.

During the workshop, participants explored opportunities for collaboration in areas of smart water infrastructure and pipelines that sense damage and leakage, water recapture and reuse technologies for industrial wastewater, monitored infrastructure to improve community safety, and smart building technologies that self-monitor and regulate energy consumption. Clean transportation strategies were also discussed.



## CREATING PATHWAYS TO INDIA FOR WATER SECTOR



In October 2014, the EA Water Accelerator, Canada International Trade Services, and IC-IMPACTS hosted a day-long workshop with industry representatives and Ontario water researchers to learn about the market in India for existing Canadian water technologies and to identify leading projects that could be taken to the next step of development by pilot testing technologies in the Indian context.

As a result of this workshop, IC-IMPACTS and the EA-Water Accelerator are working to develop a strategy to better support water technology transfer to India.

# MOBILIZING INDUSTRY

## COLLABORATING WITH STANTEC INC.

Stantec Inc. has more than 15,000 employees working in over 250 locations around the world. They collaborate across disciplines and industries to bring buildings, energy and resources, and infrastructure projects to life. Since 1954, their local strength, knowledge, and relationships, coupled with world-class expertise, have allowed them to go anywhere to meet their clients' needs in creative and personalized ways.

Beginning in 2013, IC-IMPACTS collaborated with Stantec Inc. on infrastructure design to help build new roads in rural, India. By visiting Thondebavi and learning its needs, Stantec's team members were able to adapt concepts and help create designs for roads that suit India's climate and the community's local environment. Their expertise helped create new superthin pavements that require less material and recover surface water, enabling community members to become better connected through reliable transportation routes.

Stantec Inc. invests approximately \$1 million per year in supporting R&D across their core business lines in buildings, energy and resources, and infrastructure. Their R&D programs keep Stantec at the leading edge of new technology and emerging services while building relationships with academic and industrial partners as well as attracting promising future recruits. These activities increase Stantec's technical capabilities and add value for clients.

By partnering with IC-IMPACTS, Stantec expanded their partnerships in India and were able to develop new business opportunities. Because

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***"The Stantec team has been privileged to be able to work with the many excellent researchers and professionals that are part of the IC-IMPACTS team. I am impressed with the excellent partnerships that have formed."***

– Dr. Reed Ellis  
Vice President, Stantec Inc.

IC-IMPACTS collaborates with industry innovators, community leaders, and government agencies across India and Canada, the Centre was the ideal conduit to help extend Stantec's business into India.

Stantec's work begins at the intersection of community, creativity, and client relationships. Over the past few years, their focus on R&D has allowed them to support 170 research grants to internal teams and in partnerships with government agencies and private firms.

For more information please visit [www.stantec.com](http://www.stantec.com).



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***"The benefit in partnering with IC-IMPACTS has been the opportunity to showcase Stantec's specialized engineering capabilities and to gain contacts with Indian researchers, consulting firms, and government agencies."***

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## WORKING WITH RELIANCE INDUSTRIES

Reliance Industries Limited is an Indian-based private enterprise with business in the energy and materials sector. Incorporated in 1973 and based in Mumbai, India, Reliance partnered with IC-IMPACTS to help address growing infrastructure concerns across both Canada and India.

As the largest producer of polyester in the world, Reliance's expertise in the design and production of fibers made them an excellent partner in helping develop novel fibers to strengthen concrete. IC-IMPACTS and Reliance have worked together to design and optimize the extrusion, coating, and geometric processes involved in the production of fibers to help create a novel fiber-reinforced concrete.

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***"By collaborating with innovative partners, IC-IMPACTS has been able to accelerate partnerships and create a pathway between Canada and India for industry in both nations."***

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By collaborating with innovative partners, IC-IMPACTS has been able to accelerate partnerships and create a pathway between Canada and India for industry in both nations.

Beginning as a small textile company, Reliance Industries Limited has become a Fortune Global 500 company in less than three decades. With world-class manufacturing facilities across India and around the world, Reliance Industries is the largest private sector company in India and among the top five to ten producers in the world in major petrochemical products.

For more information please visit [www.ril.com](http://www.ril.com).

This partnership has been mutually beneficial - IC-IMPACTS has been able to successfully plan and coordinate the use of these innovative fibers in the designs for the new superthin pavements being built in India, while Reliance has been able to attain new business opportunities and directly work in Canada.

Over 800 public schools are currently in need of seismic upgrades in British Columbia alone. IC-IMPACTS and Reliance have created an approach where these schools can be upgraded to meet safety standards in a very sustainable and cost-effective manner. Reinforcing fibers designed collaboratively by Reliance and IC-IMPACTS are incorporated in a ductile form of concrete which is then sprayed over the masonry walls of schools. The innovative reinforcing coating produces a strong and ductile membrane over the walls that dramatically reduces damage during a severe earthquake.



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***"Reliance Industries Limited appreciates the opportunity to work with IC-IMPACTS Scientific Director, Dr. Nemy Banthia, in the area of advanced infrastructure solutions. Dr. Banthia has introduced us to numerous innovative ideas that have allowed our business to tap into new international markets. We are confident that this relationship will help our business new opportunities of partnering with infrastructure companies in Canada."***

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– Mr. Gunjan Sharma  
Senior Vice President, Reliance Industries Limited

# ACCELERATING PARTNERSHIPS & RAISING VISIBILITY

>2.5M

Over \$2.5 Million new investment for Research Projects

10

New MOUs signed this fiscal year

IC-IMPACTS Programs Putting Partnerships in Motion

72

Industrial Companies

524

Academic Researchers

27

Government Agencies

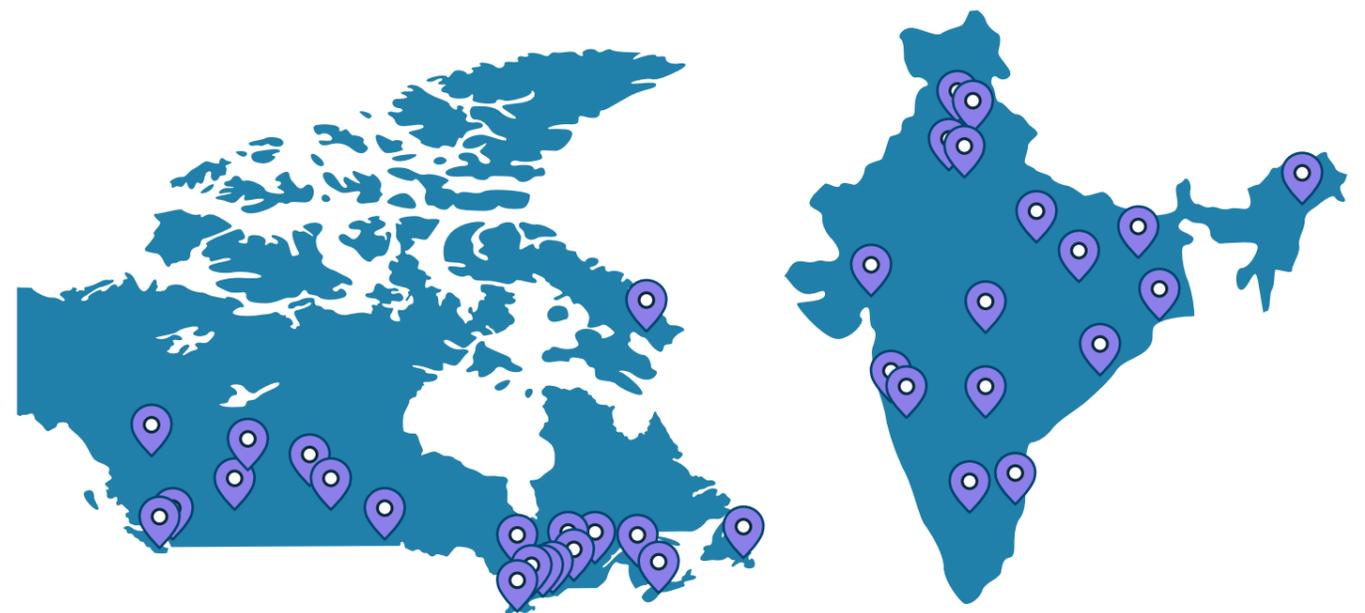
IC-IMPACTS unique partnership model has captured the imagination of many countries. Through partnership with the Indian federal government and local communities alike, the research communities of our two nations are being drawn together and are engaging industry who see IC-IMPACTS requirement for deployment of research outcomes and partner community strategy as a unique pathway for long term commercial benefits.

## A NETWORK OF RESEARCHERS & STUDENTS ACROSS CANADA & INDIA



 Network Researchers

 Graduate Students



# ACCELERATING PARTNERSHIPS & RAISING VISIBILITY

## DBT CONTRIBUTES \$1.5 MILLION TO RESEARCH INITIATIVE



The Department of Biotechnology (DBT), Government of India partnered with IC-IMPACTS on May 1, 2014 to create a joint “Water for Health” research initiative, supporting collaborative research projects focused on developing and evaluating new technologies in the research areas of water and health.

DBT and IC-IMPACTS each committed \$1.5 million (Canadian dollars / equivalent Indian Rupees) to help strengthen innovative collaborations between researchers working in India and Canada, and to help stimulate practical research outcomes applied in communities of both nations.

The Water for Health initiative is focused on improving water sources to better the overall health of a community. Over 30 applications for collaborative research were received in the areas of Water Purification Biotechnologies, Waterborne / Water Related Diseases, Wastewater Treatment, Heavy Metals Identification, and Sustainable Waste-Water Infrastructure.

This represents one of the most significant responses to a bilateral Call for Proposals experienced by the Department of Biotechnology.

## IC-IMPACTS PARTNERSHIP MODEL GENERATING INTERNATIONAL INTEREST

The foresight of the Canadian Federal Government in establishing the Canada India Research Centre of Excellence is attracting attention worldwide. With the Indian Government adding its leadership and support behind the Canadian initiative, the innovation and leadership of Canada and India are reinforcing their reputation for science and technology innovation. As IC-IMPACTS unfolds its unique impact-focused strategy, signature partner community focus, and its model of multi-sector engagement (bringing government, industry, academia and communities together), other countries are seeking to explore whether this bilateral model could be replicated or expanded into a multinational initiative.

In the past year, IC-IMPACTS’ CEO & Scientific Director, Dr. Nemy Banthia, has been requested to present the “IC-IMPACTS model” to Italy, China, Mexico, Bangladesh, and the United States.

## CREATING INFRASTRUCTURE & WATER SOLUTIONS WITH DST

On October 15, 2014, IC-IMPACTS announced a formal partnership with the Department of Science and Technology (DST), Government of India, to fund innovative infrastructure and water-related research.

The partnership between IC-IMPACTS and DST was formally agreed upon in Delhi, India in the presence of The Honourable Ed Fast, Canadian Minister of International Trade and Jintendra Singh, Indian Minister of Science and Technology. IC-IMPACTS and DST aim to help build healthier communities in both nations by strengthening the overall research and innovation relationship between Canada and India.

IC-IMPACTS and DST jointly launched a Call for Proposals to support collaborative research projects on November 24, 2014. By funding collaborative research projects, research experts, industry leaders, and community members from both Canada and India will come together to form unique solutions that will significantly improve communities by providing cleaner sources of water and increasing the durability of infrastructure.

The initiative sparked an unprecedented interest in Canada and India alike resulting in more than 11,000 hits to the competition website. By January 2015, this competition resulted in 47 joint submissions involving 263 researchers from across Canada, 40 industry organizations and 8 government departments / agencies.



*“The possibilities of research collaboration between Canada and India are limitless, as are the benefits for Canadians and Indians alike. Pure research drives the economy of the future through the discoveries of new technology and new products that improve the lives of us all.”*

– The Honourable Ed Fast  
Canadian Minister of International Trade

## RESEARCH & COMMERCIALIZATION

**2015 - 2016** In the past year IC-IMPACTS spent considerable energy securing parallel funding support from India in order for Indian researchers to equally engage and provide meaningful contributions towards the collaborative research program of their Canadian counterparts. With these frameworks and relationships established, IC-IMPACTS will be working to bring innovations from the funded research program to benefit Canadian communities as well as Indian communities. The Centre will also be working to establish its first formal Canadian partner community in 2015-2016.

**Beyond 2016** Looking beyond 2016, IC-IMPACTS is building a framework for the development of parallel technology deployments in both nations. These parallel deployments will not only provide unique opportunities to evaluate the robustness of some of the research outcomes but will also enable Canadian communities to benefit from the expertise and experience of Indian scientists and industry partners who have excelled in having their research outcomes translated into remote regions. Additionally, the Centre will work to ensure that successful researchers find appropriate commercialization partners in order for inventions to find their way into markets and communities.



## COMMUNITY PARTNERSHIPS & DEPLOYMENTS

**2015 - 2016** The Centre will launch both a new program focused on transferring research into community contexts and a series of industry-academia partnership development workshops designed to bring researchers and industry partners together from India and Canada. Additionally, IC-IMPACTS will work to secure partnerships that will demonstrate the effectiveness, viability, and cost competitiveness of technologies for the Indian marketplace.

**Beyond 2016** With the first group of funded research projects reaching maturation within the Centre, IC-IMPACTS is working to ensure that the outcomes from the laboratory-based investigations migrate into communities through deployments, prototype testing, and field trials. An aggressive partnership strategy will help create economic impacts, employment opportunities, and most importantly, transformations to the health, safety and well-being of citizens.

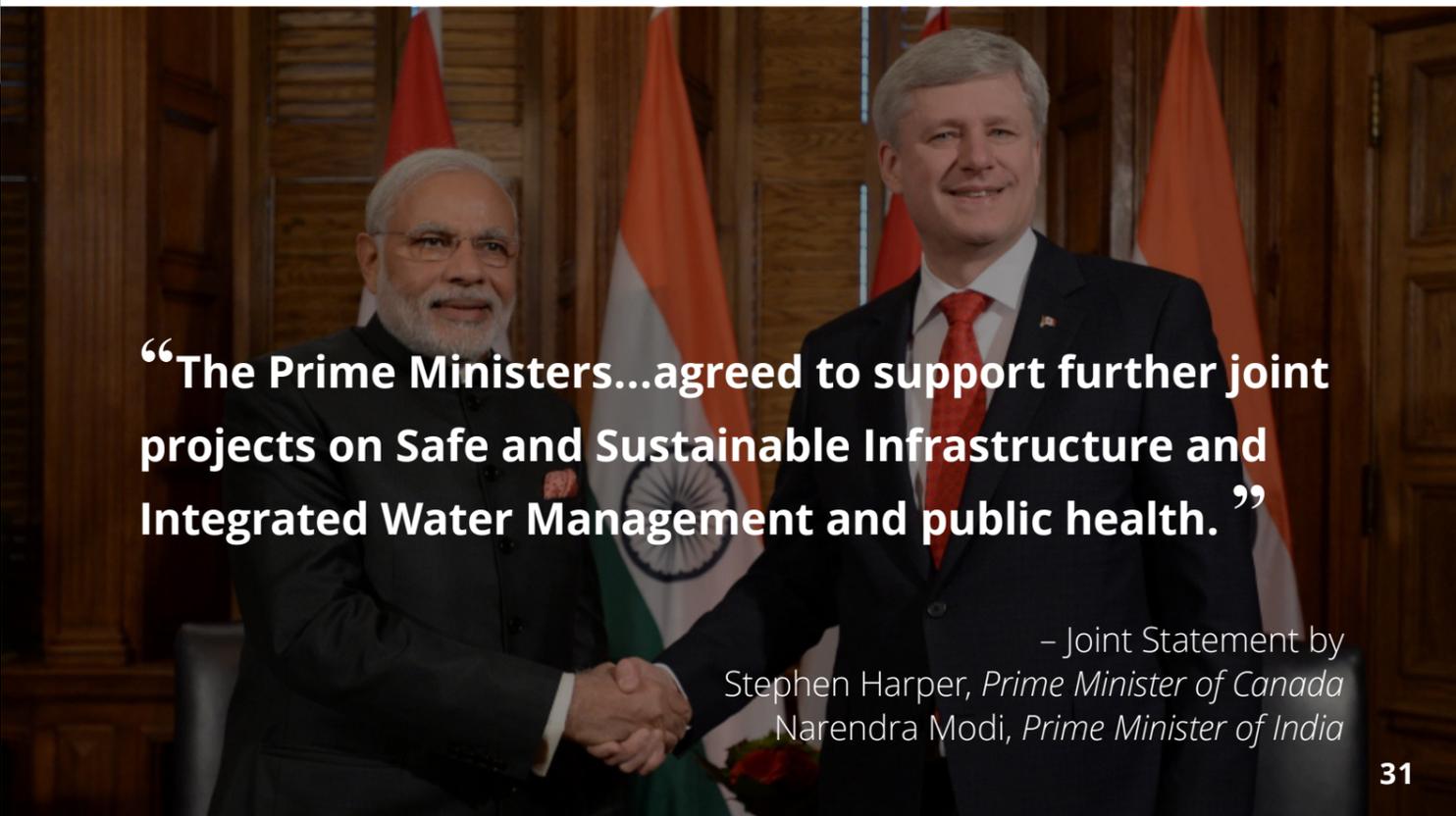
## TRAINING & BUILDING CAPACITY

**2015 - 2016** IC-IMPACTS will be working with its academic and industry partner organizations in Canada and India to develop a multifaceted and comprehensive program of quality improvement educational offerings for professional practitioners and the professoriate within TEQIP (Technical Education Quality Improvement Program) institutions. Additionally, the Centre will continue its work with First Nation communities in Canada and will expand its training programs for graduate students across Canada and India.

**Beyond 2016** The academic institutional partnerships between leading Canadian universities and Indian Institutes of Technology and Indian Institutes of Science provides a unique framework for the development of technical training, professional practitioner training and institutional research capacity development in India. IC-IMPACTS will continue to create new and unique training opportunities to meet its goal of creating 700 Highly Qualified Professionals.

The Centre will also work to enhance the quality of the many post-secondary institutions to ensure that their graduates have the skill sets and knowledge base that will enable them to successfully contribute to their national economy and lead the transformation of critical sectors such as sustainable infrastructure, smart cities development, safe water, and more inclusive and responsive health care.

In addition, novel programming will be developed to ensure that graduate students and post doctoral fellows have the entrepreneurship and knowledge translation skills to emerge as the next generation of innovators for our economy. In this regard, IC-IMPACTS will launch new types of incubator initiatives, experiential community engagements, and industry internships, and run multidisciplinary multisector Summer Institutes and Winter Schools.



**“The Prime Ministers...agreed to support further joint projects on Safe and Sustainable Infrastructure and Integrated Water Management and public health.”**

– Joint Statement by  
Stephen Harper, *Prime Minister of Canada*  
Narendra Modi, *Prime Minister of India*

# BOARD OF DIRECTORS

As of March 31, 2015

Name	Title	Organization
Honourable Roy MacLaren	Board Chair	IC-IMPACTS
Dr. Nemy Banthia	Chief Executive Officer & Scientific Director	IC-IMPACTS
Mr. Stewart Beck	President & CEO	Asia Pacific Foundation of Canada
Dr. Roger Cheng	Chair	Department of Civil & Environmental Engineering, University of Alberta
Mr. Barj Dhahan	Director	Canada India Education Society
Mr. Fouad Elgindy	Senior Program Manager, Networks of Centres of Excellence	NCE Secretariat
Dr. Arvind Gupta	President and Vice Chancellor	The University of British Columbia
Dr. Pradeep Khare	Retired, Former Chief Operating Officer	National Energy Board
Mr. Irving Leblanc	Associate Director, Housing, Infrastructure and Emergency Management, Safe, Secure and Sustainable Communities	Assembly of First Nations
Dr. Sujatha Ramdorai	Professor of Mathematics	TIFR Mumbai and The University of British Columbia
Professor Gautam Sen	Chairman	Health Spring Community Medical Centres
Ms. Malini Sen	Senior Editor	The Times of India
Mr. Peter Sutherland	Senior Business Advisor, Asia	Aird & Berlis LLP
Mr. Hari Varshney	President	Varshney Capital Corp.
Mr. Terry Kellam	Secretary to the Board	IC-IMPACTS

# RESEARCH MANAGEMENT COMMITTEE

Name	Title	Organization
Dr. Nemy Banthia	Professor	The University of British Columbia
Dr. Stewart Aitchison	Professor	University of Toronto
Dr. Pradipta Banerji	Director	IIT Roorkee
Mr. Fouad Elgindy	Observer to the RMC Senior Program Manager	NCE Secretariat
Dr. Reed Ellis	Vice President, Practice Lead - Bridges	Stantec Inc.
Dr. Kevin Kane	Professor	University of Alberta
Dr. Madjid Mohseni	Professor, Associate Head Graduate, Scientific Director RES'EAU WaterNet	The University of British Columbia
Dr. Daman Panesar	Associate Professor	University of Toronto
Dr. Thomas Thundat	Professor	University of Alberta

# SCIENTIFIC LEADERSHIP



## DR. NEMY BANTHIA

Scientific Director, Theme Lead for Safe & Sustainable Infrastructure

Dr. Banthia is a Professor of Civil Engineering, a Distinguished University Scholar and a Senior Canada Research Chair in Infrastructure Rehabilitation at the University of British Columbia, Vancouver, Canada. He has co-edited 18 volumes, published over 350 technical papers, and currently holds 5 international patents. As a professional engineer in BC, he continues to serve as Chair on technical committees of various professional societies, including the American Concrete Institute, RILEM, and the Canadian Standards Association. Dr. Banthia also serves on the editorial boards of eight international journals, and is the Editor-In-Chief of the Journal of Cement and Concrete Composites. His awards include WG Hislop Award of the American Concrete Institute: B.C. Chapter, 4 Best Paper Awards, Wason Medal of the ACI International, Wolfson Merit Award of the Royal Society of U.K., Distinguished Researcher Award of the Korea Concrete Institute, Killam Research Prize from the Killam Foundation, Horst Leipholtz Medal of the Canadian Society of Civil Engineering, and the Aftab Mufti Medal. He is a fellow of the ACI International, Canadian Society for Civil Engineering, Indian Concrete Institute, Canadian Academy of Engineering, and the Royal Society of Canada.

## DR. THOMAS THUNDAT

Associate Scientific Director, Theme Lead for Integrated Water Management

Prior to becoming the Canada Excellence Research Chair in Oil Sands Molecular Engineering, Dr. Thundat was a University of Tennessee-Batelle/Oak Ridge National Laboratory Corporate Fellow and had led the Nanoscale Science and Devices Group at ORNL. He holds professorships at the University of Tennessee in Knoxville, the University of Burgundy in France, and an honorary professorship at IIT, Madras. Dr. Thundat received his Ph.D. in Physics in 1987 from the State University of New York. He has authored over 285 publications in refereed journals, 48 book chapters, and holds 30 patents. He is a recipient of the Outstanding Achievement Award in the Sensor Division of the Electrochemical Society, the American Society of Mechanical Engineers Pioneer Award, the Batelle Distinguished Inventor Award, and many ORNL awards. He is an elected Fellow of the American Physical Society, the Electrochemical Society, the American Association for Advancement of Science, and the American Society of Mechanical Engineers. Dr. Thundat's research focuses on micro- and nano- mechanical sensors. His expertise lies in the areas of interfaces, biophysics, scanning probes, nanoscale phenomena and quantum-confined atoms.

## DR. STEWART AITCHISON

Associate Scientific Director, Theme Lead for Public Health

Dr. J. Stewart Aitchison received his Ph.D. in Physics in 1987 Heriot-Watt University, Edinburgh, U.K. He joined the Department of Electronics and Electrical Engineering at the University of Glasgow in 1990 and was promoted to a personal chair as Professor of Photonics in 1999. Dr. Aitchison holds the Nortel Chair in Engineering at the University of Toronto since 2001. From 2004 – 2007, he served as the Director of the Emerging Communications Technology Institute at the University of Toronto, where he established an open access micro- and nano- fabrication facility. His research focuses on the development of micro- and nano- scale devices for optical signal processing and sensing applications. In 2009, Dr. Aitchison co-founded ChipCare Corporation, which is currently developing a portable HIV monitoring system. This project won the University of Toronto inventor of the year award in 2012, and the Canada business magazine Innovation Award in 2010. Dr. Aitchison is a Fellow of the Royal Society of Canada and a Fellow of the American Association for the Advancement of Science.

# PARTNERSHIPS

## ACADEMIC AND RESEARCH PARTNERS

The University of British Columbia  
University of Alberta  
University of Toronto  
University Health Network  
McMaster University  
Baba Farid University of Health Sciences  
Bhavan's Research Center, Mumbai University  
Birla Institute of Technology & Science Pilani  
Building Fire Research Centre, National Institute of Engineering  
GMR Institute of Technology  
Indian Institute of Science, Bangalore  
Indian Institute of Technology – Bombay  
Indian Institute of Technology – Delhi  
Indian Institute of Technology – Hyderabad  
Indian Institute of Technology – Kharagpur  
Indian Institute of Technology – Ropar  
Indian Institute of Technology – Roorkee  
Institute of Chemical Technology  
International Centre for Genetic Engineering and Biotechnology (ICGEB)  
Khulna University  
Mitacs  
National Environmental Engineering Research Institute (NEERI)  
National Institute of Engineering (India)  
Pandit Deendayal Petroleum University  
Res'Eau – WaterNET  
Rural Agency for Social & Technology Advancement (RASTA)  
United Nations University – Institute for Water, Environment and Health  
University of Hyderabad  
Vallabhbhai Patel Chest Institute, University of Delhi

## INDUSTRY PARTNERS

ACC Cement  
Ballard Power  
Bekaert Industries Pvt. Ltd.  
BI Pure Water Canada  
Brick & Byte Innovative Products Pvt Ltd  
Bruker Daltonics Inc.  
Canfor  
Cauvery Neeravari Nigama Ltd (CNNL)  
Clearford  
Delcan  
Dufferin Concrete  
FOSROC International  
GE Water  
GMR Highways  
Golder Associates Consulting (India) Pvt. Ltd.  
IT Innovation for Masses (India)  
JPT Peptide Technologies  
Kerr Wood Leidal (KWL)  
Kryton International Inc.  
Lars Enviro Pvt. Ltd.  
Lifecare Innovations Pvt. Ltd.  
Pultrall Inc.  
Rashtriya Ispat Nigam Ltd. (RINL) [Vizag Steel]  
Renolith Inc.  
Reliance Industries Ltd.  
Robonik India Pvt. Ltd.  
Schock Canada  
Sensor Technology Ltd.  
Skillnet Solutions India Pvt Ltd  
SISCAPA Assay Technologies  
Stantec Inc.  
Starmass Environment Technologies Pvt. Ltd.  
Stewols India Pvt. Ltd.  
Stream Technologies Inc.  
Tandon Consultancy Services  
Tata Consultancy Services  
Ushta Infinity Construction Company Pvt. Ltd.  
Vector Corrosion Technologies

## GOVERNMENT PARTNERS

Aboriginal Affairs and Northern Development Canada  
Canadian Institutes of Health Research  
City of Kelowna  
Department of Biotechnology, Government of India  
Department of Science & Technology, Government of India  
Energy and Petrochemical Department, Government of Gujarat  
Government of Karnataka, State Highways Development Project  
Industry Canada, Federal Government of Canada  
Ministry of Environment and Forests (India)  
Ministry of Transportation of Ontario  
Ministry of Water Resources, River Development, & Ganga Rejuvenation  
Nagpur Municipal Corporation  
National Mission for Clean Ganga (NMCG)  
Natural Sciences and Engineering Research Council  
Ontario Ministry of Environment  
Public Health Ontario  
Social Sciences and Humanities Research Council

# PARTNERSHIPS

## COMMUNITY PARTNERS

Alberta Urban Municipalities Association  
Asia Pacific Foundation of Canada  
Black Mountain Irrigation District  
Bureau of Indian Standards  
Butibori Manufacturers' Association  
Canada India Business Council  
Canada India Education Society  
Canada India Network Society  
Canada India Foundation  
Canadian Construction Association  
Indian Association of Structural Engineers  
Indian Concrete Institute  
MaRS Innovation  
Public Health Foundation of India  
Rotary Club Nagpur  
Sengupta Consultancy  
Thondebavi Village  
Vidarbha Industries Association

## REPORT OF THE INDEPENDENT AUDITOR ON THE SUMMARY FINANCIAL STATEMENTS

### To the Directors of IC-IMPACTS Centres of Excellence

The accompanying summary financial statements, which comprise the summary statements of financial position as at March 31, 2015, the summary operations and changes in net assets and summary cash flow statement for the year then ended, and related notes, are derived from the audited financial statements of IC-IMPACTS Centres of Excellence for the year ended March 31, 2015. We expressed an unmodified audit opinion on those financial statements in our report dated May 21, 2015. Those financial statements, and the summary financial statements, do not reflect the effects of events that occurred subsequent to the date of our report on those financial statements.

The summary financial statements do not contain all the disclosures required by Canadian accounting standards for not-for-profit organizations. Reading the summary financial statements, therefore, is not a substitute for reading the audited financial statements of IC-IMPACTS Centres of Excellence.

#### Management's Responsibility for the Summary Financial Statements

Management is responsible for the preparation of the summary of the audited financial statements in accordance with Canadian accounting standards for not-for-profit organizations.

#### Auditor's Responsibility

Our responsibility is to express an opinion on the summary financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standard (CAS) 810, Engagements to Report on Summary Financial Statements.

#### Opinion

In our opinion, the summary financial statements derived from the audited financial statements of IC-IMPACTS Centres of Excellence for the year ended March 31, 2015 are a fair summary of those financial statements, in accordance with Canadian accounting standards for not-for-profit organizations.



Chartered Accountants  
Vancouver, British Columbia  
May 21, 2015

## Summary Statements of Financial Position As at March 31, 2015 and 2014

	2015	2014
<b>Assets</b>		
<b>Current</b>		
Restricted cash		
Uncommitted	\$ 5,319,512	\$ 4,064,441
Committed to research funding (Notes 4 and 6)	-	71,500
Cash held at other institutions (Note 5)	249,102	189,448
Contributions receivable	75,000	1,182
Prepaid expenses	578	10,123
Unspent research advances	1,022,583	527,313
	<b>6,666,775</b>	<b>4,864,007</b>
<b>Liabilities</b>		
<b>Current</b>		
Accounts payable and accrued liabilities	40,892	43,527
Deferred contributions (Note 7)	6,625,883	4,820,480
	<b>6,666,775</b>	<b>4,864,007</b>
<b>Net assets</b>	\$ -	\$ -

## Summary Statements of Operations and Changes in Net Assets Years ended March 31, 2015 and 2014

	2015	2014
<b>Receipts</b>		
Contribution from Networks of Centres of Excellence (Note 5)	\$ 1,259,613	\$ 569,302
Contributions from Canadian universities	319,534	316,970
Contributions from Indian partners (Note 6)	7,415	26,241
Contributions from other partners	2,000	-
	<b>1,588,562</b>	<b>912,513</b>
<b>Disbursements</b>		
Communications and promotion	6,057	9,383
Highly qualified personnel support	143,882	173,720
Operating costs	202,802	121,242
Professional and consulting fees	27,137	39,867
Research networking	84,344	99,590
Research grants (Note 4)	777,462	139,857
Staff salaries	335,288	276,804
Technology transfer	11,590	52,050
	<b>1,588,562</b>	<b>912,513</b>
<b>Net assets, beginning and end of year</b>	\$ -	\$ -

## Summary Statements of Cash Flows Years ended March 31, 2015 and 2014

	2015	2014
<b>Cash provided by (used in)</b>		
<b>Operating activities</b>		
Cash received from Networks of Centres of Excellence	\$ 2,830,050	\$ 2,830,050
Cash received from Canadian universities	545,060	492,000
Cash received from other contributions	2,000	-
Cash disbursed for research grants	(1,322,732)	(667,170)
Cash disbursed for operations and networking	(811,153)	(828,641)
<b>Increase in cash</b>	<b>1,243,225</b>	<b>1,826,239</b>
<b>Cash, beginning of year</b>	<b>4,325,389</b>	<b>2,499,150</b>
<b>Cash, end of year</b>	<b>\$ 5,568,614</b>	<b>\$ 4,325,389</b>
<b>Cash composed of</b>		
Uncommitted restricted cash	\$ 5,319,512	\$ 4,064,441
Restricted cash committed to research funding	-	71,500
Cash held at other institutions	249,102	189,448
	<b>\$ 5,568,614</b>	<b>\$ 4,325,389</b>

## Summary Notes to the Financial Statements March 31, 2015

### 1. Summary of significant accounting policies

These financial statements have been prepared in accordance with Canadian Accounting Standards for Not-for-Profit Organizations ("ASNPO") on the historical cost basis, except for certain financial instruments which are measured at fair value and are presented in Canadian dollars.

The preparation of these financial statements requires management to make estimates and judgments and to form assumptions, based on historical experience and other factors, that affect the reported amounts and other disclosures in these financial statements. Actual results may differ from these estimates under different assumptions and conditions.

#### Restricted cash

Restricted cash represents government contributions received which are subject to expenditure eligibility requirements and restrictions defined in the Funding Agreements (Note 5).

#### Financial Assets and Financial Liabilities

The Network's financial instruments are initially recorded at fair value, and subsequently as:

- Cash and contributions receivable are classified as "loans and receivables" and are measured at amortized cost. The recorded amounts at March 31, 2015 and 2014 approximate fair value.
- Accounts payable and accrued liabilities are classified as "other financial liabilities" and are measured at amortized cost. The recorded amounts at March 31, 2015 and 2014 approximate fair value.

#### Recognition of Contributions

The Network follows the deferral method of accounting for restricted contributions. Restricted contributions received are deferred and recognized as receipts in the year in which the related disbursements are made. Unrestricted contributions are recognized as receipts in the current year, if the amount to be received can be reasonably estimated and collection is reasonably assured. Any contributions received from the NCE and not spent when the Network is ended are to be refunded to the NCE, no later than three months after the Network is ended.

### 3. Grants to network members

During the year ended March 31, 2015, the Network granted \$1,222,732 (2014 - \$617,170) of NCE contributions to Network Members. Of the total NCE contributions granted to Network Members, \$932,144 (2014 - \$477,313) was unspent at the end of the fiscal year and is expected to be spent by the Network Members during the next fiscal year.

### 4. Funding agreements

#### Networks of Centres of Excellence

Fiscal Year	NSERC	CIHR	SSHRC	Total	
2012 – 2013	\$ 1,609,000	\$ 743,000	\$ 124,150	\$ 2,476,150	Received
2013 – 2014	1,840,050	849,000	141,000	2,830,050	Received
2014 – 2015	1,840,050	849,000	141,000	2,830,050	Received
2015 – 2016	1,840,050	849,000	141,000	2,830,050	
2016 – 2017	1,840,050	849,000	141,000	2,830,050	
<b>Total Funding</b>	<b>\$ 8,969,200</b>	<b>\$ 4,139,000</b>	<b>\$ 688,150</b>	<b>\$ 13,796,350</b>	

#### Universities

Fiscal Year	University of British Columbia	University of Alberta	University of Toronto
2012 – 2013	\$ 23,000	\$ 170,000	\$ 230,000
2013 – 2014	92,000	170,000	230,000
2014 – 2015	154,500	170,000	230,000
2015 – 2016	154,500	170,000	230,000
2016 – 2017	154,500	170,000	230,000
2017 - 2018	131,500	-	-
<b>Total Funding</b>	<b>\$ 710,000</b>	<b>\$ 850,000</b>	<b>\$ 1,150,000</b>

### 5. Contributions from Indian partners

During the 2015 fiscal year, the Network announced two separate partnerships with the Department of Biotechnology, Government of India ("DBT") and the Department of Science & Technology, Government of India ("DST"), to support collaborative research projects focused on developing and evaluating new technologies in the research areas of water and health. The Network has committed \$1.5 million to each of these partnerships with matching contributions expected from each of DBT and DST. The Network is in process of evaluating research proposals and funding is expected to occur in the 2016 fiscal year.

### 6. Deferred contributions

	2015	2014
Balance - Beginning of year	\$ 4,820,480	\$ 2,384,702
Contributions received during the year		
Grant from NSERC	1,840,050	1,840,050
Grant from CIHR	849,000	849,000
Grant from SSHRC	141,000	141,000
Grants from Canadian universities	554,500	492,000
Other contributions	2,000	-
	<b>8,207,030</b>	<b>5,706,752</b>
Amounts recognized as contributions during the year	(1,581,147)	(886,272)
<b>Balance - End of year</b>	<b>\$ 6,625,883</b>	<b>\$ 4,820,480</b>

For complete financial statements with notes, please contact Angie Reid at [reid@ic-impacts.com](mailto:reid@ic-impacts.com)

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