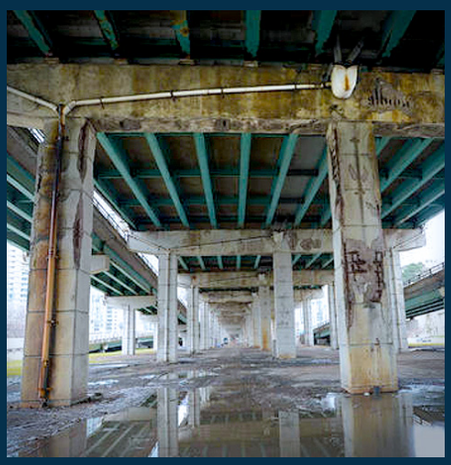
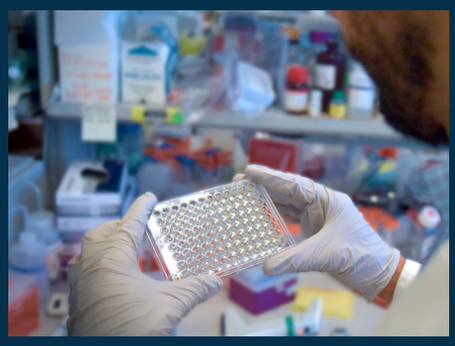
IC-IMPACTS

Canada India Research Centre of Excellence









2015-2016 ANNUAL REPORT

This Government is committed to strengthening Canada's place in the world by re-energizing its efforts to engage with … international partners. This will lead to improved trade, economic growth and support for those who need it most.

BUDGET 2016

CONTENTS

YEAR IN REVIEW

On behalf of the Board of Directors, I am delighted to report that IC-IMPACTS has continued to advance research collaboration and knowledge transfer between Canada and India, and to apply new and innovative technologies in communities in both countries, particularly in cooperation with First Nations in Canada. Together, researchers from Canada and India are charting new ground—building safe and sustainable infrastructure, delivering integrated water management, and investing in public health.

IC-IMPACTS unique approach brings together government, industry, universities, and local communities to solve problems through applied research. It is also a tangible demonstration of the importance of collaboration in science and technology in the relationship between Canada and India. The Centre particularly values its close relationships with India's Department of Science and Technology (DST), and India's Department of Biotechnology (DBT), which have deepened and expanded over the year.

Collaboration with the private sector is a unique feature of IC-IMPACTS' success. The Centre plays an important role in developing partnerships between researchers and companies. The results speak for themselves. With more than 70 industry partners, 79 % of which are SMEs, and 12 new patents, IC-IMPACTS is accelerating innovation and trade between Canada and India.

Highlights for IC-IMPACTS this year in Canada include working with the Lytton First Nation to provide safe drinking water through new water treatment technologies, and exploring how the success in Lytton might be shared with other First Nations communities facing similar challenges. A workshop involving the Assembly of First Nations, governments, health care professionals, and community representatives in March 2016 provided an excellent opportunity to explore future collaboration in areas such as green buildings and other infrastructure.

IC-IMPACTS has also implemented several successful infrastructure projects in India introducing low carbon paving solutions, as well as several demonstration projects focused on water quality that address both pollution and pathogens.

IC-IMPACTS continues to support collaboration among researchers, providing funding to 185 graduate students, and funding 29 partnerships between academics and industry in Canada and India.

As IC-IMPACTS prepares for renewal of its mandate, we are working closely with all our partners to consolidate our achievements. Our goal is to expand the very successful model of applied research, collaboration with industry, and the engagement of local communities in order to contribute to the well-being of communities in Canada and India, and to advance the close ties between our two countries.

The Honourable Roy Maclaren, PC
Chairman of the Board of Directors

Through the efforts of a dramatically growing network of enthusiastic and talented young people, outstanding researchers, innovating industries, and the vision and commitment of governments and communities, IC-IMPACTS has proven itself as an effective and inspiring new model for bilateral engagement between Canada and India.

One of the greatest successes of 2015-2016 has been the cementing of IC-IMPACTS relationship with the Government of India's Department of Science and Technology, and Department of Biotechnology. These strengthened relationships have resulted in joint commitments of $ 7.8 million that are leading to exciting new research in the areas of water treatment technologies, railway monitoring, low carbon materials to reduce greenhouse gas emissions, smart systems for energy and water efficiency and better functioning cities, and portable diagnostics and analyzers for better health care. Together, IC-IMPACTS and the Government of India are creating substantive social change in our countries through science-based collaboration.

An equally important success in 2015-2016 has been the realization of IC-IMPACTS signature "partner community" strategy, with deployments of new pavements in Thondebhavi, India, and new water treatment technologies installed in Lytton First Nations, Canada: the results of which are leading to transformative social changes in both communities and are now being scaled up and adopted in other communities in both countries.

The social changes and real-world impacts of our Centre's activities are wholly attributable to our model of extensive bilateral partnership which brings together researchers, industry organizations, governments and communities to identify needs, produce new technologies, and deploy solutions. This past fiscal year IC-IMPACTS exceeded our target goal of 150 partners. Now with more than 70 industry partners actively engaged in our research and technology deployment activities [79% of whom are small and medium sized organizations (SMEs)], IC-IMPACTS is emerging as a catalyst for trade and a platform for Canadian SME's wishing to engage and enter the Indian market.

We remain fundamentally committed to the model of science-based research and social innovations that accelerate trade and transform the lives of citizens. Our world leading researchers have now produced 265 scientific publications, secured or applied for 12 new patents, released 2 technology inventions, and created 1 start up – all in just 3 years! It is humbling to serve as Scientific Director for such an illustrious network.

This tremendous research success would not have occurred without the inspired and enthusiastic contributions of the 500+ students who have dedicated their time and imagination to the work of the Centre. We are committed to providing graduate students in both countries with the skills, perspectives, and mindsets to create research for social good and to learn how to take ideas from the laboratory into the real world of communities. In 2015-2016 we launched our Summer Institute program which provides 50 graduate students (25 from Canada and 25 from India) intensive training in scientific topics as well as a "boot-camp" style immersion in entrepreneurship. The success of our applied research focus, community-based deployments, and entrepreneurship training can be seen in the 100% employment rate of the now 30 students who have graduated from the IC-IMPACTS research project network.

As some of our research programs reach conclusion of the laboratory phase, 2016-2017 is poised to be a hallmark year for technology translation and community impacts. I am deeply honored to continue to serve as the Chief Executive Officer and Scientific Director and thank our Board, students, researchers, and all the collaborators for their trust and dedication.

Dr. Nemy Banthia
Chief Executive Officer & Scientific Director

HIGHLIGHTS OF SUCCESS

170
MULTI-SECTOR PARTNERSHIPS

56
SMALL-MEDIUM ENTERPRISES

$11M
NON-NCE FUNDING

510
INNOVATORS TRAINED

30
STUDENTS GRADUATED

100%
STUDENTS EMPLOYED

12
ENGAGED COMMUNITIES

6
TECHNOLOGY DEPLOYMENTS

29
RESEARCH PROJECTS

12
PATENTS FILED

INNOVATIVE RESEARCH

IC-IMPACTS funded research is driven by a commitment to research excellence and supports the discovery and application of solutions to some of the most pressing issues in both Canadian and Indian communities. The Centre's successful research program has resulted in a strong bilateral network of scientists and experts who are developing novel patented solutions and sharing their innovations in esteemed publications.

29
FUNDED PROJECTS

45
ACADEMIC INSTITUTIONS

265
RESEARCH PUBLICATIONS

9
INFRASTRUCTURE PROJECTS

14
WATER PROJECTS

6
HEALTH PROJECTS

FUNDED RESEARCH PROJECTS

SAFE & SUSTAINABLE INFRASTRUCTURE

Sustainable Infrastructure Using Smart FRPs
Canadian Lead: Dr. Shamim Sheikh, University of Toronto
Indian Lead: Dr. Umesh Sharma, IIT Roorkee

Conservation Of Heritage Masonry Structures Within Cauvery Basin Waterworks
Canadian Lead: Dr. Vivek Bindiganavile, University of Alberta
Indian Lead: Dr. Narayana Suresh, National Institute of Engineering

Modelling And Assessment Of Deficient And Repaired Structures
Canadian Lead: Dr. Frank Vecchio, University of Toronto
Indian Lead: Dr. Umesh Sharma, IIT Roorkee

Characterization And Use Of Industrial Fly Ash
Canadian Lead: Dr. Daman Panesar, University of Toronto
Indian Lead: Dr. Bhupinder Singh, IIT Roorkee

Structural Health Monitoring Of Tall Buildings Using Vibration-Based Techniques
Canadian Lead: Dr. Lucia Tirca, Concordia University
Indian Lead: Dr. Soraj Panigrahi, CSIR – Central Building Research Institute, Roorkee, India

Evaluating The Integrity Of Railway Infrastructure In India And Canada With An Emphasis On Bridges And Tracks
Canadian Lead: Dr. Mustafa Gul, University of Alberta
Indian Lead: Dr. Pradipta Banerji, IIT, Roorkee

Full Field Non-Contact SHM Protocols For Long Span Railway Bridges And Heritage Structures
Canadian Lead: Dr. Rishi Gupta, University of Victoria
Indian Lead: Dr. Esakki Balasubramanian, Vel Tech

Application Of Precast Products Made Using Bottom Ash And Fly Ash For Rural Pavements And Other Infrastructure In India
Canadian Lead: Dr. Rishi Gupta, University of Victoria
Indian Lead: Dr. Urmil Dave, IIT, Nirma University

Strengthening And Sustaining Civil Infrastructure In India And Canada
Canadian Lead: Dr. Nemy Banthia, The University of British Columbia
Indian Academic Institutions: IIT-Hyderabad, IIT-Delhi, IIT-Mumbai, National Institute of Engineering (Mysore), VNIT (Nagpur)

PUBLIC 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

Engaging Community Pharmacists In India To Enhance Early Detection Of Tuberculosis
Canadian Lead: Dr. Madhukar Pai, McGill University
Indian Lead: Dr. Nita Jha, World Health Partners

Dialled In: Tapping Community Voice To Improve Child Immunization Services In India
Canadian Lead: Dr. Mira Johri, University of Montreal
Indian Lead: Dr. Alok Kumar Mathur, Indian Institute of Health Management Research (IIHMR) University

A High Quality Serotype Discriminating Dengue Virus Diagnostic Test Adapted For Field Investigation
Canadian Lead: Dr. Sachdev Sidhu, University of Toronto
Indian Lead: Dr. Amitabha Chaudhuri, SciGenom Labs

Identification Of High Affinity Ligands Against Dengue Virus NS1 For The Development Of An Affordable Point-Of-Care Diagnostic Kit
Canadian Lead: Dr. Tom Hobman, University of Alberta
Indian Lead: Dr. Easwaran Sreekumar, Rajiv Gandhi Centre for Biotechnology

Development Of A Portable Device For Early Detection Of Eye Infection And Dry Eye Disease
Canadian Lead: Dr. James Feng, The University of British Columbia
Indian Lead: Dr. Ashutosh Richhariya, L.V. Prasad Eye Institute

INTEGRATED WATER MANAGEMENT

Development Of An ICT Platform For Water Quality Monitoring
Canadian Lead: Dr. Clarence de Silva, The University of British Columbia
Indian Lead: Dr. Sandhya Shrivastava, Bhavan's Research Centre, Mumbai University

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. Anand Krishnamurthy, GE India

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

A Nanotechnology Enabled Device For The Detection Of Harmful Bacteria In Drinking Water
Canadian Lead: Dr. Michael Serpe, University of Alberta
Indian Lead: Dr. Soumyo Mukherji, IIT Bombay

Handheld P-Laps Pathogen Detector
Canadian Lead: Dr. Thomas Thundat, University of Alberta
Indian Lead: Dr. Bhaskaran Muralidharan, IIT Bombay

Microfabricated, Low-Cost, High-Sensitivity Chlorine And Ph Sensor Systems For Water Quality Monitoring
Canadian Lead: Dr. 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. Krishna Khairnar, CSIR

Compact High-Rate Water Treatment Systems For Small Communities
Canadian Lead: Dr. Ramin Farnood, University of Toronto
Indian Lead: Dr. Vivek Kumar, IIT Roorkee

Development Of A Low-Cost Water Monitoring Kit For Multiplex Heavy Metal Detection Based On Aptamer Sensors
Canadian Lead: Dr. David Juncker, McGill University
Indian Lead: Dr. Rohit Srivastava, IIT Bombay

An Innovative Sustainable Biotechnology For Resource Recovery From Wastewater Streams Using Microwave Enhanced Advanced Oxidation With Algae
Canadian Lead: Dr. Victor Lo, The University of British Columbia
Indian Lead: Dr. Pradeep Kumar, IIT, Roorkee

An Innovative Green Technology For Treating Municipal And Industrial Wastewater Entering Rivers And Streams
Canadian Lead: Dr. Shiv Prasher, McGill University
Indian Lead: Prof. Rameshwar Kanwar, Lovely Professional University

Development Of Capacitive Deionization Technology For Point-Of-Use Water Purification
Canadian Lead: Dr. Madjid Mohseni, The University of British Columbia
Indian Lead: Dr. Sathish Kumar, Eureka Forbes Ltd.

Biomonitoring Of Water Quality In Relation To Human Health Using Biosensors And Improvements Through Nanoparticle Based Purification Systems
Canadian Lead: Dr. Damase P. Khasa, Laval University
Indian Lead: Dr. Manzoor Shah, University of Kashmir

A Study Of Technology And Financial Appropriateness Of Water And Wastewater Infrastructure In Selected Cities Of India
Canadian Lead: Dr. Govind Gopakumar, Concordia University
Indian Lead: Dr. N.C. Narayanan, IIT Bombay

SAFE & SUSTAINABLE INFRASTRUCTURE

A bridge undergoing construction in a densely populated neighbourhood of Kolkata, India collapsed on March 31, 2016 killing 27 people and injuring nearly 100 others. Developing Safer Infrastructure is a key priority for IC-IMPACTS.

GLOBAL CHALLENGES

- In 2010, $2.2 trillion was spent on repairing and replacing corroded infrastructure, approximately 3% of the entire world's GDP. Both Canada and India face huge gaps in Infrastructure spending. India faces a $750 billion infrastructure debt while Canada needs $172 billion to bring its infrastructure up to standard.
- Nearly 300 million people will move from rural to urban areas in India over the next 20 years.
- Canada is among the top 10 emitters and one of the largest developed world per capita emitter of Greenhouse Gases (GHGs).

IMPACTS MADE

- Transformed local economy of 1000 people as new road system improved access to market for farmers, provided accessibility to residents with mobility challenges, increased vehicle purchases, and stimulated construction and renovation boom along new road.
- New sustainable material applied to Highway 1 in Toronto reduced risk of corrosion by 80%.
- New structural modeling software has potential to save lives and millions of dollars through improved asset management.

SUSTAINABLE MATERIALS

New Material 3x Stronger than Steel

Corrosion of reinforced steel in concrete is a significant global issue. Concrete is the single most widely used material in the world and 80% of all damage to concrete is due to the corrosion of reinforced steel. In 2010, $2.2 trillion was spent on repairing and replacing corroded infrastructure, approximately 3% of the entire world's GDP.

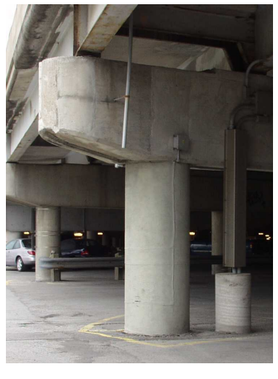
Dr. Shamim Sheikh (University of Toronto, Canada) and Dr. Umesh Sharma (IIT Roorkee, India) are working together to develop alternative construction materials that are safer and more sustainable than steel. Their solution is a material called Glass Fiber Reinforced Polymers (GFRPs), a material that is corrosion-resistant, is three times stronger than steel, and can be used to reinforce columns, bridges, and buildings.

The glass fibers found in this material are covered with a special resin and can be produced as strips and wraps to easily repair structures, or integrated into bars as a replacement for reinforced steel in new structures.

This innovative material is already being used to repair deteriorating bridges. GFRPs applied to bridge columns under Toronto's Highway 1 over Leslie Street reduced the risk of corrosion by 80%. GFRPs also have an added benefit of speeding up the overall repair process – a bridge column can be wrapped and repaired within 1-2 days compared to lengthy repairs using traditional techniques.

Dr. Sheikh and Dr. Sharma are currently testing GFRP reinforced columns in extreme winter and summer conditions to evaluate the application of GFRPs in Canadian and Indian environments. With both the Canadian and Indian governments facing daunting levels of infrastructure in need of repair, GFRPs can be used to increase the durability of new and existing structures, creating safer and more sustainable infrastructure while significantly reducing costs.

New GFRP material applied to bridge columns under Toronto's Highway 1 over Leslie Street reduced the risk of corrosion by 80%.



MONITORING & ASSESSMENT

Bridge Monitoring Drones Reach Areas Inaccessible to Inspectors

Both India and Canada have aging and deteriorating railway infrastructure. India is home to 50,000 major railway bridges, many of which are over 100 years old. There is an imminent need to monitor the condition of aging infrastructure on a timely basis.

Dr. Rishi Gupta (University of Victoria, Canada) and Dr. Balasubramanian Esakki (VelTech University, India) are developing Unmanned Aerial Vehicles (UAVs), commonly known as drones, to better monitor structures using non-destructive techniques.

Most traditional monitoring techniques cause public interference and can be very demanding in terms of manpower. The drones being developed in this project can monitor structures with minimal public interference and can reach areas that are not normally accessible to inspectors. They can also measure and analyze structures in real time, reducing the time required to process data.

The drones are being designed and assembled by Dr. Esakki's team in India, while the sensors and monitoring technology are being developed in Canada. After a successful test flight in Chennai, India, Dr. Gupta and Dr. Esakki are preparing for a test flight in Victoria, Canada, and then will focus on testing the drone's monitoring capabilities on real structures in both countries.

This innovative technology will enable earlier detection of damage, reduce the cost and time needed for repair, and provide greater public safety.

This innovative technology will enable earlier detection of damage, reduce the cost and time needed for repair, and provide greater public safety.

INTEGRATED WATER MANAGEMENT

Elder Grace Redsky of Shoal Lake 40 First Nation performs a healing ceremony on water channel near her home; her community has been under a boil-water advisory for nearly 20 years. Between 2004 and 2014, 400 out of the 618 First Nation communities in Canada have had significant issues with their water supply.

The Canadian Press / John Woods

GLOBAL CHALLENGES

- 663 million people - 1 in 10 - lack access to safe water worldwide.
- In 2015, at least 1,838 drinking water advisories were issued across Canada. Between 2004 and 2014, 65% of the First Nation communities across Canada were affected by water-related issues.
- More than 100 million people in India are living in places where water is severely polluted. In 2015, out of 632 districts examined to determine the quality of groundwater, only 59 districts - less than 10% - had water safe enough to drink.

IMPACTS MADE

- A successful pilot demonstration of a mobile water treatment system has led to the installation of the treatment technology in Lytton First Nation, and the elimination of seasonal boil water advisories.
- IC-IMPACTS is delivering clean water in Tl'azt'en Nation and Texada Island using innovative water treatment technologies.
- The Centre has developed new low-cost pH sensors made from inkjet printers and chlorine sensors made from graphite. By using readily available materials, these sensors can help provide cleaner water to remote and rural communities worldwide.

SENSING TECHNOLOGY

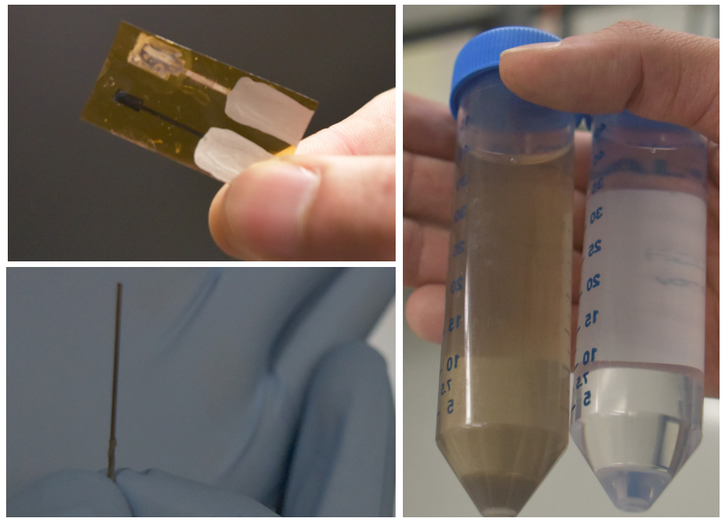
Advanced Sensors Made Using an Inkjet Printer

Delivering clean drinking water is a complex task. Clarity, turbidity, colour, contaminants, and many other parameters all need to be analyzed and adjusted before water is delivered to households. Among these factors, chlorine and pH are extremely significant; incorrect levels of chlorine and pH can lead to incomplete disinfection and long-term health risks for community members.

Dr. Jamal Deen (McMaster University, Canada) is leading a research team to create a point-of-use device that can sense chlorine and pH in real time in order to reduce health risks and provide cleaner and safer water in rural communities. The device is designed to be small and easy to use for community members. The inclusion of wireless capabilities allows these devices to transmit water sensing data to scientists in public health agencies and regional water operators, who can then analyze the data remotely and contact the community to issue a water advisory before an illness occurs.

The sensors used in this project are made from low-cost, readily available materials. The team's pH sensors are simply made using an inkjet printer in their lab. These printed sensors can be produced locally around the world as long as a community has an inkjet printer and the appropriate cartridges. The project's chlorine sensors use functionalized graphite, (a material commonly found in most lead pencils). The brilliant adaptation of these readily available materials enable these technologies to be widely adopted in communities and markets in India and around the world.

By creating a solution that is both simple and easy to use, community members can operate the water sensing technologies themselves and understand the status of their water at any given point without the need for external laboratory facilities.



New water monitoring pH sensors created using an inkjet printer. Communities around the world can print their water monitoring technologies.

TREATMENT SYSTEMS

Innovative Membranes Clean Contaminated Water in Rural Communities

Dr. Ramin Farnood (University of Toronto, Canada) and Dr. Vivek Kumar (IIT Roorkee, India) are developing high-rate water treatment systems for rural and remote regions and communities.

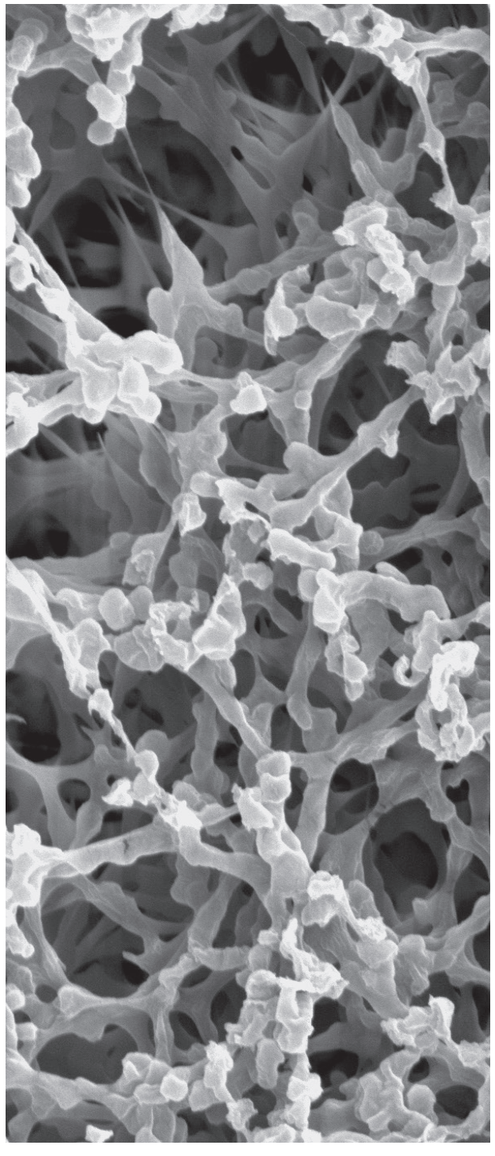
The researchers have focused on developing a water treatment system using environmentally sound technologies - one that uses resources in a sustainble manner, protects the environment, and pollutes less.

Their solution is a membrane-based water treatment system that is decentralized and local to the community, delivering high quality and safe potable water at a relatively low cost.

Dr. Farnood and Dr. Kumar have created a polyvinylidene fluoride (PVDF) nanofiber membrane using an electrospinning process that has a pore size of just 1-2 um. The result is a highly effective membrane for water treatment - it is simple to construct, consumes minimal energy and can remove 100% of pathogens, particulates, salt, and heavy metals without the need of an expensive pre-treatment process.

The research team is now developing an even more sustainable version of this technology called Cellulosic Membranes. Instead of using synthetic polymers, these membranes use natural wood and agricultural fibers, making the technology easier on the environment.

New water treatment systems use wood and plant-based membranes for 100% removal of pathogens, particulates, salt, and heavy metals.



PUBLIC HEALTH

A patient awaits a doctor in the dengue ward of a hospital in New Delhi as he lies under a protective net against mosquitoes. India faced the worst Dengue outbreak in 20 years with over 12,000 cases reported in 2015.

GLOBAL CHALLENGES

- **Tuberculosis affects over 9 million people worldwide and causes 1.5 million deaths each year.**
- **390 million people are infected with Dengue Virus each year and is one of the leading causes of illness and death globally.**
- **Across the world, 1.3 billion people have no access to effective and affordable health care.**

IMPACTS MADE

- **IC-IMPACTS researchers worked in Patna, India to reduce the delay between tuberculosis detection and first treatment by 93%.**
- **IC-IMPACTS supported researchers developed the first mass spectrometry (MS) based multiplexing assays in the world for direct detection and absolute quantitation of infectious viral particles in biological samples.**

HEALTH DELIVERY

Improving the Pathway for TB Diagnosis and Treatment

Tuberculosis is a curable and preventable disease but continues to affect over 9 million people worldwide, and causes 1.5 million deaths every year. With 2.2 million people infected in India alone, this public health problem is considered the world's largest tuberculosis epidemic.

Dr. Madhukar Pai (McGill University, Canada) and Dr. Nita Jha (World Health Partners, India) are developing new methods and techniques to better engage community pharmacists in order to improve early detection and provide effective treatment for tuberculosis.

Pharmacies are the first point of contact for many undiagnosed patients, and serve as optimum entry-points to screening services. Engaging pharmacy providers could help shorten the diagnostic pathway for tuberculosis and enhance early case detection.

The project is first being implemented in Patna, Bihar, one of India's poorest states. By recruiting 105 pharmacies in three areas of Patna, the research team are training pharmacists to triage patients with a cough or suspicious tuberculosis symptoms and send them to a screening and referral service immediately, where they will have access to free digital chest X-rays and other services.

This unique strategy has already proven to create significant change, having reduced time between detection and primary treatment for patients from 60 days to just 4 days.

In Canada, tuberculosis remains a major health problem in the Aboriginal population and novel initiatives are urgently needed to mitigate the impact of the disease.

Researchers have drastically reduced the delay between TB diagnosis and first treatment by 93% (from 60 days to just 4 days).

DIAGNOSTICS

Creating Accurate, Cost-Effective Tools to Fight against Dengue Viruses

With over 390 million people infected annually, dengue virus is the most prevalent mosquito-borne viral infection worldwide and is one of the leading causes of illness and death. While most infections resolve without medical intervention, a significant fraction of dengue patients develop hemorrhagic fever and shock syndrome, which, if untreated, can be fatal.

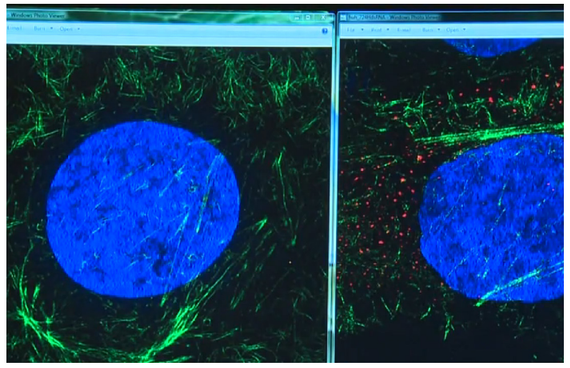
Since initial symptoms of dengue are similar to many other mosquito transmitted viral infections, early and accurate diagnosis of the disease is critical for these patients. Dr. Tom Hobman (University of Alberta, Canada) and Dr. Easwaran Sreekumar (Rajiv Gandhi Centre for Biotechnology, India) are developing rapid diagnostic techniques to identify and treat dengue fever much quicker for infected patients.

The research team is developing pan- and serotype-specific, high-affinity small molecules targeting the NS1 protein for accurate diagnosis of dengue infection. These small molecule ligands will be more stable, affordable and efficient for detecting dengue infection than current solutions. The NS1 protein is an ideal diagnostic marker because it can be detected in patients at the same time as symptoms develop.

Clinics are in desperate need of efficient, low-cost diagnostic tools that can accurately detect dengue virus. Up to 50% of dengue cases are delayed or mishandled because current dengue tests are not sensitive enough, are too expensive, or are too time consuming.

The techniques developed in this project can help mitigate dengue fever and be applied to other emerging viruses, such as Zika virus.

The rapid, low-cost, and accurate diagnostic tools developed in this project will help mitigate the spread of Dengue and Zika Virus worldwide.



TRADE CATALYST

IC-IMPACTS serves as a catalyst for trade and bilateral engagement between Canada and India. By bringing Canadian and Indian researchers, government and industry partners together with communities, partners learn what communities need and co-create solutions they can then deploy in real-world test-beds. Through our signature "partner community" strategy, Canadian and Indian small and medium sized enterprises (SMEs) see expedited development and deployment of their innovative technology solutions and communities benefit sooner from social innovations.

170
OVERALL PARTNERS

56
SMALL & MEDIUM ENTERPRISES

6
TECHNOLOGY DEPLOYMENTS

12
PATENTS

2
INVENTIONS

1
START UP

3 SUCCESSFUL STRATEGIES FOR SUCCESS

Accelerating Partnerships & Mobilizing Industry

IC-IMPACTS' unique partnership model rapidly introduces research advances into community contexts resulting in greater knowledge advancement and more effective adoption of technology. This strategy has allowed IC-IMPACTS to provide new pathways for multi-sector engagement between Canada and India and to enhance competitiveness of the industrial sectors in both nations.

Supporting SMEs and Expanding into Emerging Markets

SMEs employ over 60% of Canada's active workforce but less than 10% of SMEs export into international markets.

79% of IC-IMPACTS industrial partners are SMEs.

IC-IMPACTS expedites SME entry into the international market by connecting companies with suitable local partners and creating opportunities for them to demonstrate the effectiveness of their innovations.

Leveraging Government Funding

In 3 years, IC-IMPACTS has more than doubled $8.4 million of Canadian federal investment to secure $11 million in additional funding from Indian government, academic institutions, and industry partners.

BILATERAL ENGAGEMENT IN 2015-2016

- IC-IMPACTS developed a novel low carbon, enhanced strength road system through a multi-faceted partnership involving **6 industrial partners from Canada and India, 4 academic institutions, and the Thondebhavi community**. This project, laid in fall 2015, is changing the lives of the 1,000 people in this first deployment site. The road system is now being transferred and scaled up in three other community contexts in India and one in Canada.

- IC-IMPACTS partnered with the Department of Science and Technology and Department of Biotechnology (both departments of the Federal Government of India) to co-fund 9 applied research collaborations in infrastructure, water and health sectors. **The combined investment of $3.7 million over 3 years involves 16 academic institutions from India and Canada and 9 industry partners**.

- IC-IMPACTS and the Department of Science and Technology have just launched a new $2 million initiative in Smart and Green Buildings for Sustainable Cities which seeks to develop new technologies to lower global greenhouse gas emissions (GHG), create smarter and better functioning urban areas, and improve the safety and longevity of civil, pipeline and railway infrastructure.

- IC-IMPACTS and the Department of Biotechnology have just launched a new $2 million initiative in Portable Diagnostics and Analyzers aimed at new technology development that will speed up detection and diagnosis of communicable diseases, prevent global spread of viruses, and improve the health of women and children in Canada and India.

- IC-IMPACTS held a workshop in Bangalore in December 2016 to develop new industry – academia engagement in the area of medical diagnostics and in March 2016 showcased new research innovations to civil infrastructure industry association members in Nagpur.

COMMUNITY IMPACT

Working together as partners, we can make meaningful and immediate progress on the issues that matter most to your communities ... a respectful, cooperative partnership is not only possible, it is a sacred responsibility inherited from past generations and entrusted to us by future ones.

Justin Trudeau
Prime Minister of Canada

For the first time in India, a challenge [is] being floated, in which the citizens of urban India [can] contribute in the formulation of development visions of their cities.

Narendra Modi
Prime Minister of India

COMMUNITY IMPACT IN CANADA

A New Dialogue with First Nation Communities

In March 8, 2016, IC-IMPACTS invited First Nations community members from BC, government representatives, industry experts, and leading researchers to come together and participate in a workshop on pressing water and infrastructure issues in First Nation communities.

In 2015, 169 drinking water advisories were issued to 126 First Nation communities across the country. First Nation communities also face pressing infrastructure challenges; over 130,000 housing units across Canada are needed over the next 25 years. Although these challenges are complex, they also present opportunities for collaborative and innovative solutions.

The workshop focused on the water and infrastructure priorities and opportunities in First Nation communities, and served as a knowledge exchange about successful partnership stories on community-based projects in Lytton First Nation and Thondebavi Thaluk. The discussions revealed opportunities to cross-fertilize technologies between Canada and India. They also provided valuable lessons for creating new community-driven projects and developing better models of collaboration.

The result was an invigorating workshop that led to new opportunities, innovative solutions, and a shared, deeper understanding of First Nation community needs.

Solutions developed in India can definitely be brought back into First Nation communities, just at a different scale. I think the model that IC-IMPACTS has put in place, working at the community level is excellent. We're ready to embrace new ideas.

Irving Leblanc
Special Advisor, Assembly of First Nations

ON THE GROUND IN CANADA

NEW COMMUNITIES

CONTINUING COMMUNITIES

Providing Clean Water to First Nation Communities

For many rural, remote, and First Nations communities, clean drinking water is far from assured. Many do not have proper infrastructure and resources to treat their water, and boil-water advisories are a frequent occurrence, particularly during spring runoffs.

Jim Brown, a water operator in Lytton First Nation, was tired of the seasonal boil water advisories in his community. He was looking for a cost-effective solution that would deliver clean water to his community and connected with Dr. Madjid Mohseni at The University of British Columbia.

Dr. Mohseni worked closely with Lytton First Nation and industrial partners BI Pure Water and Kerr Wood Leidal to design a treatment system using ultraviolet light and activated charcoal for a pilot site: a community of six households on the far side of the Fraser River. This technology was used to replace a 30-year-old, inadequate water treatment system leaving the community to be under boil-water advisories two or three months out of every year.

IC-IMPACTS helped deploy a mobile treatment system that was hooked up to the community's water supply – allowing for the evaluation of various alternative treatment options. This strategy not only provided an opportunity for the team to learn the best treatment strategy suitable for the community's water, but also helped the community water operators to become acquainted with the proposed solutions and offer feedback towards optimizing the process.

The successful pilot demonstration led to the permanent installation of the technology in the community in 2015, resulting in the permanent elimination of seasonal boil water advisories for the community.

Dr. Mohseni is now actively working with two other communities in BC: Tl'azt'en Nation and Texada Island.

New water treatment technology eliminated seasonal boil water advisories in Lytton First Nation.

COMMUNITY IMPACT IN INDIA

Learning from the Community

IC-IMPACTS gained new perspectives and learned about challenges as the Centre engaged with community members in Thondebavi during the planning and construction of its super-durable pavements.

The community was very accepting of new technologies and welcomed a living laboratory approach, allowing the community to observe differences in the three pavement sections over time. The remarkable positive change resulting from the completed pavements was surprising. IC-IMPACTS watched as community members purchased new vehicles and began home renovations to match the new road. The community was deeply inspired as the roads provided year-round accessibility to markets and nearby cities, significantly stimulating the local economy.

The community response showed IC-IMPACTS the extent of how infrastructure can shape, change, and impact a community.

Through this engagement, IC-IMPACTS discovered major drinking water challenges in the community. Clean drinking water was not readily available and community members did not like the taste of the water from the local water treatment system. They believed the treated water was unsafe as it had a "hardness" to the taste and instead, drank from local wells. After testing multiple sources of water, IC-IMPACTS researchers determined that the treated water was free from pathogenic contaminants and suitable for drinking, and that the

water from local wells contained organic pathogens such as E. coli. Despite this knowledge, community members continued to drink from local wells.

These challenges and perspectives provided better insight in community trust and local knowledge. Throughout this process, IC-IMPACTS has successfully shared knowledge of these water challenges and is developing a solution at a local school to deliver cleaner, safer water that they will trust to drink. The children at this school will be able to transport this water to their homes and spread knowledge and trust of this water throughout the community.

ON THE GROUND IN INDIA

NEW COMMUNITIES

CONTINUING COMMUNITIES

Developing Greener and Stronger Critical Infrastructure

In October 2015, IC-IMPACTS completed construction of it's advanced pavement project in Thondebavi, India. The completed pavement transformed the local community of 1000 people by improving access to market for farmers, enabling improved accessibility for residents with mobility challenges, and by stimulating new construction and renovation along the road.

The 650-meter road also provides the village with critical transportation by connecting to an existing road that feeds into a highway network linking to other towns and cities.

During the monsoon months the community became completely unwalkable and undriveable, making it very difficult for residents to get their produce to market and to bring goods into the community. Roads in India can start deteriorating in less than 5 years due to poor materials, intense heat, poor drainage and heavy rains.

The new super-durable pavement developed by IC-IMPACTS uses 60% less cement and early tests indicate that this new design will last at least 15 years.

The pavement is split into three sections, each using a slightly different mix of materials. This approach allows the road to become a living research project that will physically demonstrate which segment of the road performs best. Each section uses super thin pavement technologies that significantly reduce the amount of concrete needed in the construction of the road, and innovative fibers that increase the road's overall strength and durability.

India is in the midst of a major road construction boon to meet its need for 2.4 million kilometres of rural roads. With over 46% of roads in India unpaved, there is immense potential for this technological deployment.

These unique pavement technologies may be widely adopted into thousands of other pavement projects across Canada and India, significantly improving the lives of millions of people in both nations.

New super-durable pavements use 60% less cement, costs 30% less to make, and lasts 3 times longer than average roads in India.

FUTURE LEADERS

As a young researcher I now see better how my work has the potential to serve society

Farid Ahmed
University of Victoria

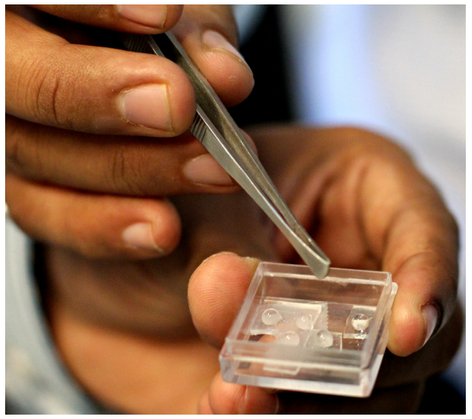
510
INNOVATORS TRAINED

185
ACTIVE STUDENTS ON PROJECTS

30
STUDENTS GRADUATED

100%
STUDENTS EMPLOYED

SCIENCE FOR SOCIETY



Bringing Canadian and Indian Students Together

The IC-IMPACTS Summer Institute is an annual interdisciplinary program designed to equip Canadian and Indian graduate students with an awareness of cutting-edge research, inspire students to develop entrepreneurial mindsets, and develop their science communication, networking, and commercialization skills.

Over the course of the 2015 Summer Institute in Optical Sensing, students learned cutting-edge research techniques from leading experts in the field, viewed demonstrations to show how these research techniques are applied in community contexts, and presented their own scientific research. In addition, the group of students formed teams and were challenged to work as a group on an entrepreneurial challenge.

The 2015 Summer Institute focused on optical sensing technologies spanning infrastructure, water, and public health fields. In total 47 graduate students from 29 Canadian and Indian academic institutions and 18 disciplines participated in the Institute. The participants left the Summer Institute with a rich and expanded network of friendships between Canada and India that will last a lifetime.

Before the Summer Institute I didn't think that I would launch any company but now I really think that if any of my ideas could have potential commercialization I would definitely launch it by myself.

Ravi Kant Upadhyay
SHIV NADAR UNIVERSITY

Providing Tools for Success

To extend the learning experience of students working on research projects, IC-IMPACTS provides value-added training and knowledge development of students that singular research programs within universities are unable to achieve.

The Centre encourages continuous learning through participation in professional development activities to have graduate students becoming better equipped to tackle society's needs-based problems.

Through monthly webinars and in-person workshops, IC-IMPACTS students have learned how to identify research problems with communities, how to use statistical and computational software for their research, how to deliver an effective presentation, and how to create a successful community engagement strategy from a variety of esteemed speakers and professors.

IC-IMPACTS unique bi-national character allows students from both Canada and India to share knowledge and research ideas with each other, creating an innovation pathway between between countries.

Moving Research from Lab to Field

By providing students with field testing opportunities on community-driven projects, IC-IMPACTS is helping provide real-world experiences for graduate students and helping them build skills in applied research and community engagement.

Canadian and Indian IC-IMPACTS students have taken their research skills and have applied them in each other's respective countries. From providing clean water to First Nation communities to engaging pharmacists in India, these students are gaining global perspectives of community challenges and needs and are becoming tomorrow's global researchers.

EMERGING OPPORTUNITIES

In Canada

IC-IMPACTS new structural monitoring and repair technologies are being deployed to increase safety in Canada's civil, rail and pipeline infrastructures which will save Canadian taxpayers billions of dollars in asset repair and drastically reduce Canada's Greenhouse Gas emissions.

New water treatment systems have been deployed by IC-IMPACTS in First Nations communities. IC-IMPACTS is working to remove advisories for the 126 First Nations communities who lack safe water.

IC-IMPACTS has developed new mobile health diagnostic technologies to improve the delivery of health care for Canadians in remote and rural areas.

In India

300 MILLION PEOPLE WILL MOVE TO URBAN AREAS

Nearly 300 million people will move from rural to urban areas in India over the next 20 years. IC-IMPACTS has partnered with India's Department of Science and Technology to create new clean technologies for green buildings, smart cities, and healthy urban environments.

77 MILLION PEOPLE LACK ACCESS TO SAFE WATER

Nearly 77 million people in India lack access to safe water. IC-IMPACTS is transferring new water monitoring and treatment technologies to provide clean water to India.

390 MILLION PEOPLE AFFECTED BY DENGUE EVERY YEAR

An estimated 390 million dengue virus cases occur globally each year. IC-IMPACTS researchers are developing world-leading platform diagnostics that will increase accuracy in diagnosis of dengue, and serve as platforms for similar emerging viruses such as Zika.

SEIZING THE POTENTIAL

Strengthened Bilateral Engagement for Research Success

In the immediate year ahead, IC-IMPACTS will conclude a joint call for proposals with the Department of Science and Technology in Smart and Green Buildings for Sustainable Cities and one in Portable Diagnostics and Analyzers with the Department of Biotechnology, setting in motion a suite of new collaborative research projects. In addition, IC-IMPACTS will launch a new Research Synergy Collaboration initiative that seeks to stimulate cross-project and cross-disciplinary fertilization of research activities, making way for the creation of platform style technologies, disruptive technology approaches in other disciplines, and overall weaving together of IC-IMPACTS three themes. Beyond 2017, IC-IMPACTS will be working with the Indian federal government to plan out a five year plan for the co-development of a joint strategic collaborative research program.

Accelerated Deployment of Research Outcomes

In the past year, IC-IMPACTS supported 6 deployments of technology on-the-ground in communities in Canada and India. With 12 communities now actively being engaged, 2016-2017 is poised to become a hallmark year for further deployment activities. Deployment activity is being accelerated through an initiative launched in 2015-2016 focused on Innovative Technology Demonstration Projects. Since it is at this stage where commercial interests rise significantly, IC-IMPACTS will be working hard to grow the industrial partnership network (now standing at 70+ companies) and facilitate exposure of Canadian SMEs, in particular to the Indian market. Beyond 2017 IC-IMPACTS expects to see marked increase in the transference of technologies beyond initial test-bed communities, and see a strong bi-directional transfer of technology deployments in both Canadian and Indian communities.

A Difference in Communities

The Thondebhavi innovative pavement and Lytton First Nations water treatment projects concluded in 2015-2016 have shown just how remarkable communities can be changed through the collaborative research innovation supported by IC-IMPACTS and the unique "partner community" model for which we are becoming known. This next year will see a considerable expansion of such communities in transformation, with a concerted effort dedicated to increasing the number of First Nations partner communities in Canada. In addition, we will be working to undertake fuller assessment of the impacts and benefits being experienced by communities and will be adding new opportunities for social, economic and health impact studies to be undertaken in our partner communities. IC-IMPACTS has an ambitious goal to see social change in at least 10 communities by end of its mandate with an additional 10 communities having deployments of novel infrastructure technologies that can lead, when adopted en-masse, to safer, smarter and more sustainable communities.

Deployment of Future Leaders

IC-IMPACTS will continue to focus on providing added-value training to graduate students who will become the world's future innovators and entrepreneurs. This will be achieved through the continuation of the very successful IC-IMPACTS Summer Institute and will also see new partnerships leading to experiential, on-the-ground community-based programs that will provide the next generation of innovators with a strong foundation in communities needs and the research solutions that are required to lead to social transformation. With over 500 graduate students having participated in IC-IMPACTS research and training activities, we will be seeking to continue to engage these students on their successful life journeys.

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President, Canada India Education Society

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Stantec Inc.

Dr. Kevin Kane
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Dr. Madjid Mohseni
The University of British Columbia

Dr. Daman Panesar
University of Toronto

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University of Alberta

Dr. Thomas Thundat *(Concluding Mar 23, 2016)*
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IC-IMPACTS

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President, Global Advantage Consulting Group Inc.

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Prof Sita Naik
Apollo Hospital Education and Research Fund, Delhi

Prof Sundararaman T,
Dean, Tata Institute of Social Sciences Mumbai

Padmabhushan Dr Devi Prasad Shetty
Chairman, Narayana Group of Hospitals Bengaluru

Ms Sujatha Rao
Ex Secretary Health, Ministry of Health & Family Welfare

Mr Keshav Desiraju
Ex Secretary Health, Ministry of Health & Family Welfare

Dr Bipin Batra
Director, National Board of Examination

Dr Anand Bang
SEARCH Gadchiroli

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CEO & Scientific Director, IC-IMPACTS

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President, Canada India Education Society

Mr. Irving Leblanc
Special Advisor, Assembly of First Nations

Ms. Sue Roppel
COO & Network Manager, IC-IMPACTS

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Senior Business Advisor, Asia, Aird & Berlis LLP

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President & CEO, Asia Pacific Foundation of Canada

Mr. Barj Dhahan
President, Canada India Education Society

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Chair, The University of British Columbia

Mr. Pankaj Saini *(MSc Candidate)*
McMaster University

Ms. Parmiss Moji Shaibani *(PhD Candidate)*
The University of Alberta

Ms. Srishti Banerji *(MSc Candidate)*
Concordia University

Mr. Siddharth Bhartia *(MSc Candidate)*

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Associate Director

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Associate Director

Dr. Thomas Thundat *(Concluding Mar 23, 2016)*
Associate Director

Ms. Sue Roppel
COO & Network Manager

Mr. Ashish Mohan
Manager of Communications

Ms. Helena Fehr
Manager of Training Programs

Ms. Angie Reid
Executive Assistant

Mr. Faisal Beg
Manager of India Engagement

FINANCIAL ADMINISTRATION
(BY THE UNIVERSITY OF BRITISH COLUMBIA)

Raymond Kwok
Acting Senior Finance Manager –
Large Scale Projects, UBC

Jackie Cheung
Finance Office – Large Scale Projects, UBC

Amanda Main
Administration Coordinator, UBC

AS OF MARCH 31, 2016

CANADIAN PARTNERS

Aboriginal Affairs and Northern Development Canada – BC, (Indigenous and Northern Affairs Canada)
Alberta Research Chemicals
Alberta Urban Municipalities Association
Alberta Virology Institute (Li Ka Shing Institute of Virology)
Asia Pacific Foundation of Canada
Atlantis Holdings
BI Pure Water Canada
Black Mountain Irrigation District
British Columbia Ministry of Forest-Lands and Natural Resource Operations (FLNRO)
Brxton LLP
Canada India Business Council - BC Chapter
Canada India Foundation
Canada India Network Society
Canadian Construction Association
Canadian Institutes of Health Research
Canadian National Railways
Canfor
ChroMedX Corp
City of Kelowna
Concordia University
Delcan
District of Lake County
Droycon Bioconcepts
Dufferin Concrete
Euclid Chemicals Co.
Fibreline Canada
GE Water North America
Genes Alberta Canada
Glenmore Ellison Irrigation District
Holcim Cement - now named CRH
I.S.E.D, Federal Government of Canada (through Networks of Centres of Excellence
IBM Canada Research & Development Centre
Kerrr Wood Leidal (KWL)
Kryton International Inc.
Lafarge Canada Inc.
Lehigh Cement
MaRS Innovation
McGill University
McMaster University
Ministry of Transportation and Infrastructure of BC
Ministry of Transportation of Ontario
Mitacs
National Instruments Corporation, Western Canada
National Sciences and Engineering Research Council
North Okanagan Regional District
Ontario Ministry of Environment
Ontario Ministry of Transportation
ProMinent Fluid Controls Ltd.
Public Health Ontario
Pultrall Inc.
Read Jones Christofferson
Res'Eau - WaterNET
Schock Canada
Sensor Technology Ltd.
Social Sciences and Humanities Research Council
Southern Ontario Water Consortium
Stantec Inc.
Stream Technologies Inc.
Sundance Alberta
The Research Institute of the McGill University Health Centre
The University of British Columbia
Tricon Concrete Finishing Company
Trojan Technologies
United Nations University - Institute for Water, Environment and Health
Universite Laval
University de Montreal
University Health Network
University of Alberta
University of Guelph
University of Toronto
University of Victoria
Vector Corrosion Technologies
Village of Thorsby
Voltek Energy Inc.
Xerox Research Centre of Canada

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Hyperion Inc.
JPT Peptide
Khulna University
Pultron Composites Ltd.
Schock Germany
SISCAPA Assay Technologies

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Ambuja Cement
Amrita University
Apollo Hospitals
Archaeological Survey of India
Ashtech (India) Pvt Ltd
Baba Farid University of Health Sciences
Bekaert Industries Pvt Ltd.
Bhavan's Research Centre, Mumbai University
Birla Institute of Technology & Science Pilani
Brick & Byte Innovative Products Pvt. Ltd.
Building Fire Research Centre, National Institute of Engineering
Bureau of Indian Standards
Butibori Manufacturers' Association
Cauvery Basin Waterworks
Cauvery Neeravari Nigama Ltd (CNNL)
Department of Biotechnology
Department of Environment and Forests
Department of Science & Technology
Energy and Petrochemical Department, Government of Gujarat
Eureka Forbes Inc.
FOSROC International
GE Water India
GHCL, Veraval, Gujurat
GMR Highways
GMR Institute of Technology
Golder Associates Consulting (India) Pvt. Ltd.
Government of Karnataka, State Highways Development Project
Grama Panchayathi Thondebavi, Government of Karnataka
Indian Association of Structural Engineers
Indian Concrete Institute
Indian Institute of Health Management and Research (IIHMR) University, Jaipur
Indian Institute of Science Education and Research (IISSER), Pune
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 - Roorkee
Indian Institute of Technology - Ropar
Indian Railways
Institute of Chemical Technology
International Centre for Genetic Engineering and Biotechnology
IT Innovation for Masses
L.V. Prasad Eye Institute
Lars Enviro Pvt. Ltd.
Lifecare Innovations Pvt. Ltd.
Lovely Professional University
Ministry of Environment and Forests (India)
Nagpur Municipal Corporation
National Environmental Engineering Research Institute (NEERI)
National Health System Resource Center
National Institute for Research in TB
National Institute of Engineering (India)
National Mission for Clean Ganga
NHSRC Ministry of Health and Family
OnionDev Technologies Pvt. Ltd.
Pandit Deendayal Petroleum University
Public Health Foundation of India
Rajiv Gandhi Centre for Biotechnology
Rashtriya Ispat Nigam Ltd. (RINL) [Vizag Steel]
Regional Medical Research Centre for Tribals (India Council of Medical Research)
Reliance Industries Ltd.
Robonik India Pvt. Ltd.
Rotary Club Nagpur
Rural Agency for Social and Technological Advancement
SciGenom Labs
Sengupta Consultancy
SkillNet Solutions India Pvt. Ltd.
Starmass Environment Technologies Pvt. Ltd.
Stewols India Pvt. Ltd.
Tandon Consultancy Services
Tata Consultancy Services
Telecon Pvt. Ltd. Bangalore
Universal Enterprise
University of Hyderabad
University of Kashmir
Ushta Infinity Construction Company Pvt. Ltd.
Vallabhbhai Patel Chest Institute, University of Delhi
VelTech Rangarajan
Vidarbha Industries Association
Water Technology Centre, Indian Agricultural Research Institute
World Health Partners

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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 statement of financial position as at March 31, 2016, the summary statements of operations and changes in net assets and of cash flow 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, 2016. We expressed an unmodified audit opinion on those financial statements in our report dated June 1, 2016.

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 a summary of the audited financial statements on the basis described in Note 1.

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, 2016 are a fair summary of those financial statements, on the basis described in Note 1.

Hay + Watson

Chartered Professional Accountants
Vancouver, British Columbia
June 1, 2016

IC-IMPACTS Centres of Excellence

Summary Statements of Financial Position
As at March 31, 2016 and 2015

	2016	2015
Assets		
Current		
Restricted cash		
Uncommitted	$ 5,005,787	$ 5,319,512
Cash held at other institutions	283,045	249,102
Accounts receivable	44,166	-
Contributions receivable	25,000	75,000
Prepaid expenses	23,178	578
Unspent research advances	1,918,391	1,022,583
	7,299,567	6,666,775
Liabilities		
Current		
Accounts payable and accrued liabilities	62,409	40,892
Deferred contributions (Note 6)	7,237,158	6,625,883
	7,299,567	6,666,775
Net assets	$ -	$ -

Summary Statements of Operations and Changes in Net Assets
Years ended March 31, 2016 and 2015

	2016	2015
Receipts		
Contribution from Networks of Centres of Excellence (Note 4)	$ 2,321,701	$ 1,259,613
Contributions from co-hosting universities	484,074	319,534
Contributions from Indian partners (Note 5)	-	7,415
Contributions from other partners	8,706	2,000
Total Receipts	2,814,481	1,588,562
Disbursements		
Research and training programs		
Highly qualified personnel support	268,105	143,882
Research networking	325,617	84,344
Research grants (Note 3)	1,526,120	777,462
Technology transfer	70,908	11,590
	2,190,750	1,017,278
Administrative operations		
Communications and promotion	19,988	6,057
Operating costs	146,312	202,802
Professional and consulting fees	16,705	27,137
Staff salaries	440,726	335,288
	623,731	571,284
Total Disbursements	2,814,481	1,588,562
Net assets, beginning and end of year	$ -	$ -

IC-IMPACTS Centres of Excellence

Summary Statements of Cash Flows
Years ended March 31, 2016 and 2015

	2016	2015
Cash provided by (used in)		
Operating activities		
Cash received from Networks of Centres of Excellence	**$ 2,830,050**	$ 2,830,050
Cash received from Canadian universities	**637,000**	545,060
Cash received from other contributions	**8,706**	2,000
Cash disbursed for research grants	**(2,350,310)**	(1,322,732)
Cash disbursed for operations and networking	**(1,405,228)**	(811,153)
(Decrease) Increase in cash	**(279,782)**	1,243,225
Cash, beginning of year	**5,568,614**	4,325,389
Cash, end of year	**$ 5,288,832**	$ 5,568,614
Cash composed of		
Uncommitted restricted cash	**$ 5,005,787**	$ 5,319,512
Cash held at other institutions	**283,045**	249,102
	$ 5,288,832	$ 5,568,614

Notes to the Summary Financial Statements
March 31, 2016

1. Summary financial statements

The summary financial statements are derived from the audited financial statements of IC-IMPACTS Centres of Excellence (the "Network"), prepared in accordance with Canadian accounting standards for not-for-profit organizations, as at and for the year ended March 31, 2016.

The preparation of these summary financial statements requires management to determine the information that needs to be reflected in them so that they are consistent in all material respects with, or represent a fair summary of, the audited financial statements.

Management prepared these summary financial statements using the following criteria:

(a) The summary financial statements include the same statements of financial position, operations and changes in net assets and cash flows as the audited financial statements.
(b) Information in the summary financial statements agrees with the related information in the audited financial statements.
(c) The summary financial statements contain the information, in all material respects, necessary to avoid distorting or obscuring matters disclosed in the audited financial statements, including the notes thereto.

The audited financial statements of IC-IMPACTS Centres of Excellence are available upon request by contacting the Network.

2. Summary of significant accounting policies

The preparation of these summary 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 summary 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 NSERC, CIHR and SSHRC and other expenditure eligibility requirements and contributions from Canadian universities which are subject to restrictions defined in the Funding Agreements (Note 4).

2. Summary of significant accounting policies (continued)

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 one year months after the Network is ended.

3. Grants to network members

During the year ended March 31, 2016, the Network granted $2,431,000 (2015 - $1,222,732) of NCE contributions to Network Members. Of the cumulative NCE contributions granted to Network Members, $1,769,870 (2015 - $932,144) 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 funding schedule:

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	*Received*
2016 – 2017	1,840,050	849,000	141,000	2,830,050	
Total Funding	$ 8,969,200	$ 4,139,000	$ 688,150	$ 13,796,350	

Canadian universities funding schedule:

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	187,000	170,000	230,000
2016 – 2017	154,500	170,000	230,000
2017 - 2018	131,500	-	-
Total Funding	$ 742,500	$ 850,000	$ 1,150,000

5. Contributions from Indian partners

During the 2015 fiscal year the Network held collaborative research workshops in India with the Indian Institute of Technology, Hyderabad, and other Indian partner organizations. Contributions from the Network's Indian partners toward the Network's costs incurred in India for these workshops and courses have been recognized in these summary financial statements as "Contributions from Indian partners". During the 2015 fiscal year, the Network agreed to collaborate with the Department of Biotechnology, Government of India ("DBT") and the Department of Science & Technology, Government of India ("DST"), to support and co-fund collaborative research projects focused on developing and evaluating new technologies in the infrastructure and water sectors. To date nine research projects with a duration of three years each, have been selected, for which the total budgeted funding from the Network in Canada is expected to be $1.650 million ($525,000 disbursed during the 2016 fiscal year) and the total budgeted funding in India from DBT and DST is expected to be $1.753 million.

6. Deferred contributions

	2016	2015
Balance - Beginning of year	**$ 6,625,883**	$ 4,820,480
Contributions received during the year		
Grants from NSERC, CIHR and SSHRC	**2,830,050**	2,830,050
Grants from Canadian universities	**587,000**	554,500
Other contributions	**8,706**	2,000
	10,051,639	8,207,030
Amounts recognized as contributions during the year	**(2,814,481)**	(1,581,147)
Balance - End of year	**$ 7,237,158**	$ 6,625,883

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