



IC-IMPACTS

Networks of Centres of Excellence
Building Healthy Communities in Canada & India



2018-2019 ANNUAL REPORT



Dr. Nemy Banthia (right), with Dr. Ashutosh Sharma, Secretary of the Department of Science and Technology, Government of India, at the Canada-India Science & Technology Summit at IIT-Delhi, December 2018.

“

Working hand-in-hand with communities in Canada and India, IC-IMPACTS has been working hard to deploy community-based solutions to the most urgent needs of each nation: poor water quality, unsafe and unsustainable infrastructure, and poor health from water-borne and infectious diseases. IC-IMPACTS core goal remains: to work on discoveries that create and cultivate trade pathways between Canada and India.

— Dr. Nemy Banthia,
CEO & Scientific Director, IC-IMPACTS

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YEAR IN REVIEW

MESSAGE FROM THE CHAIR

On behalf of the Board of Directors, I am pleased to report on IC-IMPACTS' achievements in bilateral collaborations during the 2018–19 fiscal year. IC-IMPACTS has remained focused and motivated since its inception in finding innovative solutions for communities in both Canada and India in the areas of public health, safe and sustainable infrastructure, and integrated water management.

In 2018-19, IC-IMPACTS launched two significant calls for proposals in partnership with the Indian government's funding bodies. The first, launched with the Department of Biotechnology, focused on 'Creating Wealth from Waste' and will fund a scalable technology that can be developed as a commercially viable option to extract wealth from wastewater, and apply to the rejuvenation of polluted water bodies, such as the River Ganga in India. The second, launched with the Department of Science and Technology, seeks proposals related to 'Cyber-Physical Systems to Support Green Buildings in Smart Cities', utilizing technologies and infrastructure to create environmental and economic efficiency while improving the overall quality of life.

In reviewing the goals set out for the 2018-19 fiscal year, I am happy to report that we have made tremendous progress on each of the goals. We will continue to focus on deepening our engagement with Canada's Indigenous communities. In 2018, IC-IMPACTS co-hosted a focus group with the Assembly of First Nations on 'innovation in housing in First Nations communities'. A dedicated call for proposals was launched, receiving many high quality submissions with the potential to drastically improve life in remote First Nations communities. In the 2019-2020 fiscal year, we aim to continue working on our previous goals, as well as strengthen principals of equity, diversity, and inclusion to ensure traditionally underrepresented groups and voices have an opportunity to be heard and to participate in IC-IMPACTS.

The Board of Directors remains committed to ensuring that IC-IMPACTS has the governance capacity and management leadership both scientifically and administratively to lead the research and training objectives of the Centre. I thank our executive and office team, partners, researchers, students, and communities across Canada and India for their dedication and commitment to IC-IMPACTS' vision and mission.



Mr. Barj S. Dhahan
Chair of the Board of Directors, IC-IMPACTS

MESSAGE FROM THE CEO & SCIENTIFIC DIRECTOR

Since its inception in 2013, IC-IMPACTS has stayed true to its mission of bringing together researchers, industry, community organizations, and government agencies from across Canada and India to develop new and innovative solutions for challenges affecting millions. After a year of intense activity, I am pleased to say that IC-IMPACTS has surpassed all goals and targets set for itself, and in the 2018-19 fiscal year alone has opened 13 new bilateral research projects, launched 4 technology deployments, trained 154 HQP, and produced 162 research publications.

Working hand-in-hand with communities in Canada and India, IC-IMPACTS has been working hard to deploy community-based solutions to the most urgent needs of each nation: poor water quality, unsafe and unsustainable infrastructure, and poor health from water-borne and infectious diseases. IC-IMPACTS core goal remains: to work on discoveries that create and cultivate trade pathways between Canada and India.

IC-IMPACTS continues its dedication to principals of equity, diversity, and inclusion, resulting in a personal all-time high of female HQP participation within the last year – a number significantly higher than the national average in both Canada and India.

In 2018-19, IC-IMPACTS continued strategic consultation with India's Department of Biotechnology and Department of Science & Technology, Global Affairs Canada and the Canadian Ministry of Innovation, Science & Economic Development, as well as Canadian and Indian university presidents, prominent researchers and industrial partners from both countries. IC-IMPACTS continues to strive to be a "Gateway to India" for Canadian NCEs, International NGOs, and Canadian companies.

It is an honour to continue to serve as Chief Executive Officer and Scientific Director of IC-IMPACTS. I would like to thank the members of our Board of Directors, students, researchers, partners, and staff for their dedication and achievements.



Dr. Nemy Banthia
Chief Executive Officer & Scientific Director, IC-IMPACTS

IC-IMPACTS ACHIEVEMENTS, 2013-19

52

INDO-CANADIAN PROJECTS

21

TECHNOLOGY DEPLOYMENTS

946

INNOVATORS TRAINED

90%

STUDENTS EMPLOYED

970

SCIENTIFIC PUBLICATIONS

28

PATENTS & LICENSES

311

MULTI-SECTOR PARTNERSHIPS

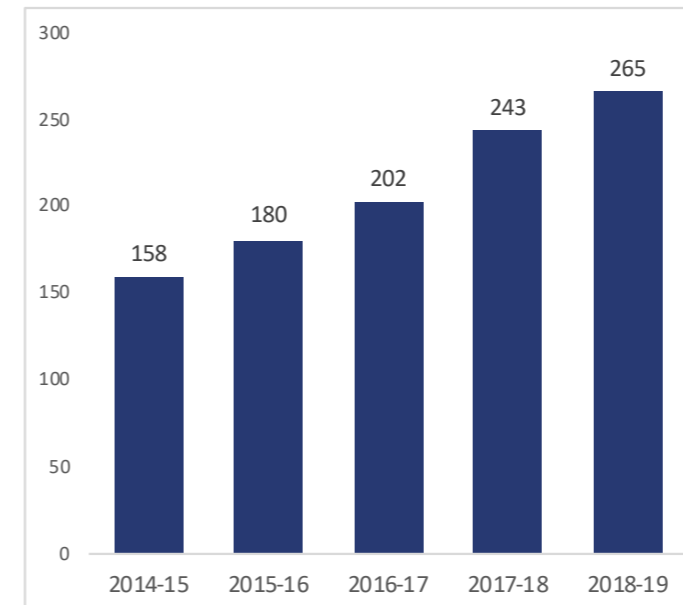
100%

NCE FUNDING LEVERAGED*

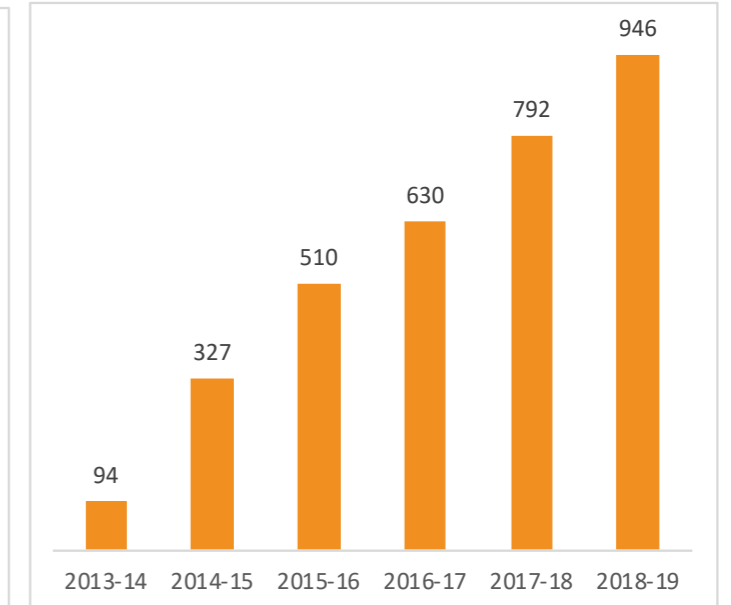
* 100% NCE research funds will be matched by an equal contribution from the Government of India during the funding extension period

GROWTH OVER TIME

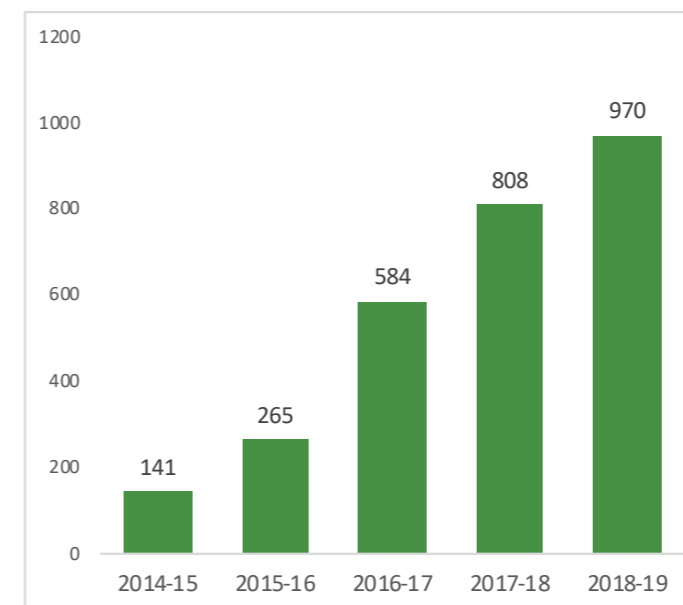
NETWORK INVESTIGATORS



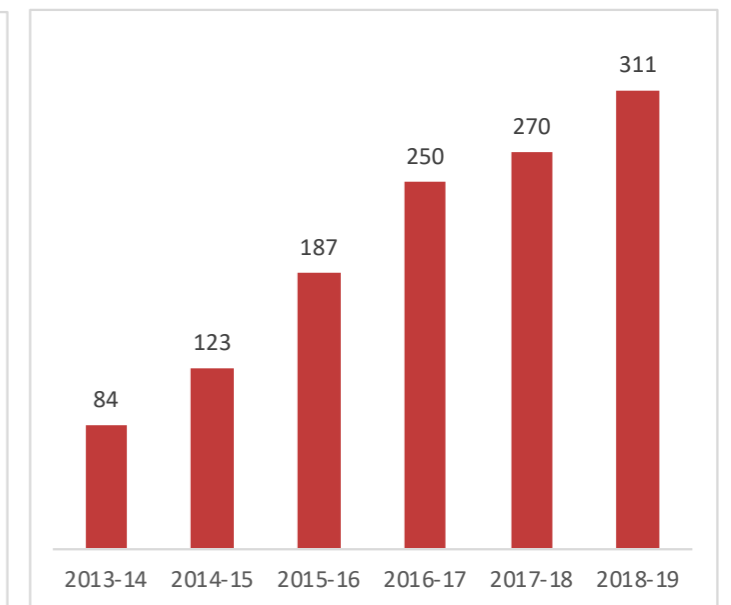
HQP TRAINED



PUBLICATIONS



PARTNERSHIPS



As a top research university that values innovative thinking and international collaboration, UBC is proud to have acted as the host university for IC-IMPACTS, the first and only India-Canada Research Centre of Excellence, since 2013. With more than 950 scientific publications and training of over 900 graduate students, IC-IMPACTS has made significant contributions to research and innovation, including deploying advanced technologies in remote and Indigenous communities. IC-IMPACTS shares a common goal with UBC of advancing sustainable societies across Canada and the world and we look forward to continuing collaboration with the Centre in the years to come.

— **Dr. Santa Ono**,
President and Vice-Chancellor,
The University of British Columbia

SAFE & SUSTAINABLE INFRASTRUCTURE

PROJECTS



Sustainable Infrastructure Using Smart FRPs

Canadian Lead: Dr. Shamim Sheikh, University of Toronto

Conservation Of Heritage Masonry Structures Within Cauvery Basin Waterworks

Canadian Lead: Dr. Vivek Bindiganavile, University of Alberta

Modelling And Assessment Of Deficient And Repaired Structures

Canadian Lead: Dr. Frank Vecchio, University of Toronto

Characterization And Use Of Industrial Fly Ash

Canadian Lead: Dr. Daman Panesar, University of Toronto

Structural Health Monitoring Of Tall Buildings Using Vibration-Based Techniques

Canadian Lead: Dr. Lucia Tirca, Concordia University

Evaluating The Integrity Of Railways Infrastructure In India And Canada With An Emphasis On Bridges And Tracks

Canadian Lead: Dr. Mustafa Gul, University of Alberta

Full Field Non-Contact SHM Protocols For Long Span Railway Bridges And Heritage Structures

Canadian Lead: Dr. Rishi Gupta, University of Victoria

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

High Fracture Toughness, Durable Concrete with Minimized Carbon Footprint Employing Large Amounts of Industrial Waste

Canadian Lead: Dr. Nemkumar Banthia, University of British Columbia

Urban Heat Island Effect and Building Energy Demand: Linkages Explained Using a Dense, Low Cost Sensor Network

Canadian Lead: Dr. Raja Sengupta, McGill University
Indian Lead: Dr. Prasad A. Pathak, Shiv Nadar University

Smart Sensor Deployment in Buildings: Evacuation Planning and Energy Management

Canadian Lead: Dr. Mark S. Fox, University of Toronto
Indian Lead: Dr. Krithi Ramamritham, IIT Bombay

India-Canada Initiative for Resilient Global Urban Shelter

Canadian Lead: Dr. Constantin Christopoulos, University of Toronto
Indian Lead: Dr. Ravi Sinha, IIT Bombay

Solar Energy Powered Net-Zero Energy Smart Buildings

Canadian Lead: Dr. Bruno Lee, Concordia University
Indian Lead: Dr. K. Srinivas Reddy, IIT Madras

Energy and Water Disaggregation for Non-Intrusive Load Monitoring in Buildings

Canadian Lead: Dr. Ivan Bajic, Simon Fraser University
Indian Lead: Dr. Angshul Majumdar, Indraprastha Institute of Information Technology - Delhi

Improving Fire Safety of Structures Through the Development of Fire Retardant Laminated Glass Glazing

Canadian Lead: Dr. Maged Youssef, Western University
Indian Lead: Dr. Ajitanshu Vedrtam, Invertis University

Fire Performance of Aged Reinforced Concrete Structures

Canadian Lead: Dr. Mark F. Green, Queen's University
Indian Lead: Dr. Umesh Kumar Sharma, IIT Roorkee

Assessment of Fire Performance of Structural Elements and Structural Systems Through Conventional Fire Tests and Hybrid Fire Simulation

Canadian Lead: Dr. Oh-Sung Kwon, University of Toronto
Indian Lead: Dr. Dipti Ranjan Sahoo, IIT Delhi

Mobile App for Improving Survival in Fires Through Efficient Egress: The Role of Impromptu Indoor WiFi Localization and Georeferenced Building Maps

Canadian Lead: Dr. Raja Sengupta, McGill University
Indian Lead: Prof. Ashwin Srinivasan, BITS Pilani KK Birla Goa Campus

Innovative Field Demonstration of Sustainable Infrastructure

Canadian Lead: Dr. Shamim Sheikh, University of Toronto

Scour Monitoring of an Overwater Bridge in Manitoba Using Dissolved Oxygen (DO) probes

Canadian Lead: Dr. Faezeh Azhari, University of Toronto

FEATURED INNOVATIONS

STRENGTHENING CONCRETE WITH RECYCLED MATERIALS

CHALLENGE

Up to three billion tires are produced around the world every year, and most are destined for the landfill when they are no longer useful. Regular concrete roads develop cracks and damage over time, frequently needing costly maintenance and repair.

RESPONSE: SELF-HEALING PAVEMENT

This fiber-reinforced concrete was developed by IC-IMPACTS CEO & Scientific Director, Dr. Nemy Banthia, and his research group SIERA (Sustainable Infrastructure Research Group) at the University of British Columbia. The internally cured concrete pavement utilizes scrap tire fibers, cellulose fibers, and other recycled materials, and has the ability to “self-heal”.



Laying the pavement



A solar-powered sensor

The innovative pavement will thus require less maintenance and will last much longer than traditional concrete. The added fibers restrict cracking and provide resilience against everyday wear and tear, as well as resistance to freeze-thaw cycles that come with harsh winters in Canada. In addition to improving the longevity of concrete, adding these fibers reduces landfill waste through the re-use of scrap tires and other recycled materials.



Completed parking lot

The self-healing pavement will serve as a 20 stall parking lot. In order to monitor the performance of the pavement, the team has embedded 30 solar-powered sensors that will transmit data over the internet to

UBC-SIERA researchers. These health-monitoring sensors will provide 24/7 data that will enable efficient future designs and improvements in self-healing pavement technology.

IMPROVING SURVIVABILITY DURING FIRES

CHALLENGE

India has an extremely high number of accidental and avoidable fire-related deaths; according to the Accidental Deaths & Suicides in India (ADSI) of 2015, 17,700 Indians died of accidental fire. A 2011 Canadian federal government report found that only 56% of First Nations communities have adequate fire protection. Fire represents one of the most severe hazards encountered by built environments. Therefore, providing appropriate fire safety measures is a major requirement for building design.



RESPONSE: FIRE-RETARDANT GLASS GLAZING

Dr. Maged Youssef (Western University) and Dr. Ajitanshu Vedrtam (Invertis University) aim to improve the fire safety of structures

through the development of fire-retardant laminated glass glazing. The developed glass has improved post-breakage performance and will offer enhanced thermo-mechanical performance when exposed to fire, and, thus, improve safety levels for high-rise buildings and reduce the number of fire-related deaths.

INTEGRATED WATER MANAGEMENT

PROJECTS



River Ganga in Varanasi, India

An Innovative Sustainable Biotechnology Or 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

Biomonitoring Of Water Quality In Relation To Human Health Using Biosensors And Improvements Through Nanoparticle-Based Purification Systems

Canadian Lead: Dr. Damase P. Khasa, Université Laval
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

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 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 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

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. Anand Krishnamurthy, GE India

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

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.

A High Performance Advanced Septic (HPAS) System for Villages and Roadside Restaurants

Canadian Lead: Dr. Edward McBean, University of Guelph
Indian Lead: Dr. Y. R. Satyaji Rao, National Institute of Hydrology

A Floating Treatment Wetland System for Removing Contaminants from Rivers and Streams using a Biomimicry Approach

Canadian Lead: Dr. Shiv Prasher, McGill University
Indian Lead: Dr. Ramesh Kanwar, Lovely Professional University

Sewage Contaminated Lake Water Quality Restoration through Aeration and Floating Wetland Plants

Canadian Lead: Dr. Rajesh Seth, University of Windsor
Indian Lead: Dr. Rakesh Kumar, CSIR-NEERI

Application of Emerging Biotechnology for Non-point Source Pollution Control of River Ganga, India

Canadian Lead: Dr. Onita Basu, Carleton University
Indian Lead: Dr. Anirban Gupta, IEST Shibpur

Sensors 4 People / 3 Drops

Canadian Leads: Dr. Michael Serpe & Dr. Gaspard Durieux, University of Alberta

Contaminated Land Reclamation Using Hybrid Absorbable Landscape And Native Plant Species

Canadian Lead: Dr. Rishi Gupta, University of Victoria
Indian Lead: Dr. Neeta Raj Sharma, Lovely Professional University

Testing and Upscaling Phytoremediation Technology in Real-World Conditions

Canadian Lead: Dr. Damase Khasa, Université Laval
Indian Lead: Dr. Manzoor Shah, University of Kashmir

FEATURED INNOVATIONS

SUSTAINABLE SOIL REMEDIATION

CHALLENGE

Many of the earth's natural resources are subjected to heavy pollution, posing a major problem worldwide. When looking at potential solutions to these issues, it is necessary to choose methods that do not further damage the environment and instead choose ecological approaches to cleaning the earth.

RESPONSE: PHYTOREMEDIATION

Dr. Rishi Gupta (University of Victoria)'s Low Impact Development (LID) technique involves planting genetically modified poplar trees to remediate heavily contaminated soil in formerly industrial areas.

The site chosen in India for demonstration is polluted with heavy metals. The LID innovative system would provide an opportunity to remediate the polluted site, improving quality of life and bringing about a greener environment and public awareness of water quality.



Poplar trees

The system involves rhizofiltration and phytoremediation methods for removing metals and other pollutants with the genetically modified tree species and locally manufactured porous infrastructure using industrial waste, referred to as Geopolymer pavers.

We are pleased to enter into this international agreement with IC-IMPACTS with our shared goal to build healthy communities in Canada and India. Global partnerships that advance our research expertise are critical to UVic's work to contribute to a better future for people and the planet by addressing some of the world's most pressing issues in collaboration with others with the same vision.

— Professor Jamie Cassels,
President and Vice-Chancellor, University of Victoria

COMPREHENSIVE WASTEWATER TREATMENT

CHALLENGE

Proper treatment of wastewater remains a challenge in many parts of the world, especially in small villages. This leads to toxic contamination of water sources and, with an already limited fresh water supply in India, is a critical problem.



Construction of the HPAS system



A workshop was held at Jawaharlal Nehru Technological University, Kakinada, to ensure support

RESPONSE: NEW WASTEWATER TREATMENT TECHNOLOGY

This project will deploy a High-Performance Advanced Septic (HPAS) system to small villages, residential apartments, and roadside restaurants to provide more proficient and comprehensive wastewater treatment and disposal.

The HPAS system is ideal for small rural communities in India because it is relatively simple to operate and has low operation and maintenance costs.

This project, led by Dr. Edward McBean (University of Guelph) and his Indian colleague Dr. Y. R. Satyaji Rao (National Institute of Hydrology), in partnership with Environmental & Power Solutions Inc., is actively deploying in Kakinada, India.

PUBLIC HEALTH

PROJECTS



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

Dialled In: Tapping Community Voice To Improve Child Immunization Services In India

Canadian Lead: Dr. Mira Johri, Université de Montréal
Indian Lead: Dr. Alok Kumar Mathur, Indian Institute of Health Management Research (IIHMR) University

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

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

A Portable Fever Kit For Dengue And Chikungunya

Canadian Lead: Dr. Stewart Aitchison, University of Toronto
Indian Lead: Dr. Manoj Varma, Indian Institute of Science

A Point-Of-Care Device For Malaria Diagnosis And Drug Resistance Genotyping

Canadian Lead: Dr. Stephanie Yanow, University of Alberta
Indian Lead: Dr. Aparup Das, National Institute of Malaria Research

Development Of A Hand Held Molecular Point-Of-Care Test Device For Infectious Diseases

Canadian Lead: Dr. James Mahony, McMaster University
Indian Lead: Professor Daman Saluja, University of Delhi

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

Surface Modulation Of CuS Quantum Dots Using Biginelli Compounds For Construction Of A Portable Fluorescence Sensor For Bacteria

Canadian Lead: Dr. Jan J. Dubowski, Université de Sherbrooke
Indian Lead: Dr. Narinder Singh, Indian Institute of Technology Ropar

Smart App-Based Rapid Multiplex Screening of HIV Associated Co-Infections of at wRisk Populations at the Point-of-Care: A Demonstration Study in India

Canadian Lead: Dr. Nitika Pant Pai, McGill University
Indian Lead: Dr. Suma Nair, Manipal Academy of Higher Education

Development of Portable Spine MEG Scanner for Real-Time Spinal Functional Evaluation and Data Acquisition

Canadian Lead: Dr. Teresa Cheung, Simon Fraser University,
Indian Lead: Dr. Rohit Sharma, Indian Institute of Technology, Ropar

Wearable Technology to Monitor Sitting Posture and Reduce the Pressure Injury Risk

Canadian Leads: Dr. Hossein Rouhani, University of Alberta, Chester Ho, University of Alberta

COPE: Community Health Outcomes and Personalized Education/Exercises for Spinal Injured Individuals

Canadian Lead: Andrei Krassioukov, University of British Columbia
Indian Lead: Dr. Nishu Tyagi, Indian Spinal Injuries Centre

Design2Impact: Uniting Researchers, Makers and Spinal Injury Survivors through Open-Source Technology

Canadian Leads: Aaron Yurkewich (University of Toronto, Canada) and Stewart Russell, Makers Making Change at Neil Squire Society

Development of Wearable Artificial Muscle for a Tetraplegic Hand

Indian Leads: Dr. Harvinder Chhabra, Indian Spinal Injuries Centre, India and Dr. Sitikantha Roy, Indian Institute of Technology, Delhi

FEATURED INNOVATIONS

IMPROVING INFECTION TESTING

CHALLENGE

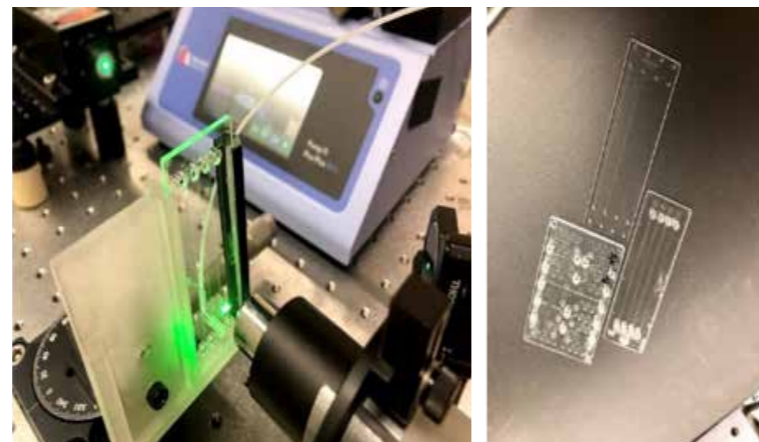
Dengue and Chikungunya, both viral infections carried by mosquitoes, have very similar symptoms despite being different diseases.

Both are prevalent in India, but because of an overlap in symptoms, it is often difficult to know which infection is present and what treatment is required.

RESPONSE: A PORTABLE FEVER KIT

Dr. Stewart Aitchison (University of Toronto) and his Indian colleague Dr. M. Verma (Indian Institute of Science) aim to develop a portable fever kit that can differentiate between the viral infections of dengue and chikungunya.

The result will be a cartridge-based test that will operate using a single finger stick capillary blood sample, and be as easy to operate as a conventional blood sugar meter. This will quickly determine the cause of symptoms, simplifying the diagnostic process and making treatment faster and more accurate.



Dengue test cartridges

- Both dengue and chikungunya are viral infections spread by the *Aedes* mosquito; however, chikungunya is caused by a *Togaviridae* alphavirus, while dengue is caused by a *Flaviviridae* flavivirus.
- In 2006, an explosive outbreak of chikungunya in India affected over 1.4 million people in 13 states.

— World Health Organization



SIMPLIFYING HIV SCREENING

CHALLENGE

HIV remains a leading cause of death worldwide, but according to UNAIDS, one in five people with HIV are unaware of their status. Lack of awareness, rampant social stigma, and discrimination impedes early screening of HIV and many STIs, resulting in disease progression and serious reproductive issues in both men and women.

Available screening methods take up time and money, usually entailing multiple visits that discourage individuals in rural communities from seeking help.

RESPONSE: MOBILE PHONE TECHNOLOGY

The **AideSmart!** app, developed by Dr. Nitika Pant Pai (McGill University) is an app-based rapid point-of-care multiplexed co-infection screening strategy targeting women in rural communities to make diagnosis and treatment of STIs more accessible.

It aims to simplify this process by:

- Integrating any rapid point-of-care screening device for STIs
- Engaging and counselling patients
- Communicating test results
- Geotracking and rapidly linking participants to the nearest provider or facility.

HQP: LEADERS OF TOMORROW

HQP JOBS AND START-UPS

IC-IMPACTS HQP alumni data indicates that of those who complete research projects: 40% find employment in industry, another 40% find employment in academia, and 20% end up in other areas.

Over 90% of HQP alumni are employed in their chosen field, with several who have launched start-ups. Start-up companies by IC-IMPACTS HQP have directly resulted in the creation of 35 jobs.

IC-IMPACTS STUDENT ENGAGEMENT COMMITTEE

In order to empower HQP, IC-IMPACTS supports a Student Engagement Committee (SEC) with a seat on the Board of Directors. This committee is responsible for leading and guiding current and alumni HQP in Canada and India.

WORKSHOPS

IC-IMPACTS HQP Leadership Awards offer students the opportunity to plan and manage workshops, short conferences, and projects.

One such example is the first *Interdisciplinary Seminar and Smart & Sustainable Infrastructure (ISSSI 2019)*, which was held and organized by Salman Soleimani-Dashtaki, UBC Civil Engineering Postdoctoral Fellow and SIERA Group member.



ISSSI 2019 Organizing Committee and Speakers

The workshop was attended by over 60 participants from academia, industry, risk management, and government policy.

Another successful workshop hosted by IC-IMPACTS HQP was the *Workshop on Detecting Electrically Charged Biomolecules (DECBio'2019)*, held at Université de Sherbrooke and organized by Dr. Amanpreet Singh. Participants came together to discuss advancements in the biosensing field.



DECBio'2019

I have been involved with IC-IMPACTS' Student Engagement Committee (SEC) for the past two years and it has been very active in engaging students from India and Canadian research institutions in activities of IC-IMPACTS. SEC has been involved in organizing student-led workshops, webinars, Café-Scientifique meetings and involving students from new IC-IMPACTS member institutions. We at SEC are also currently planning to organize other events in the future. I believe IC-IMPACTS is doing a great job in contributing towards a sustainable future in the field of water, infrastructure and health.

— Jaskaran Dhiman,
Current SEC Chair, PhD Candidate, McGill University



ISSSI 2019

GENDER BALANCE

IC-IMPACTS is dedicated to principals of Equity, Diversity, and Inclusion, and supporting traditionally underrepresented groups.

According to *Engineers Canada*, women represent less than 13% of practicing licenced engineers in the country. IC-IMPACTS is proud that female participation among HQP is at 34% in 2018-19 – well above the national average and steadily growing from previous years.

NETWORKING AND PARTNERSHIPS

Simon Fraser University and the University of Victoria have both formally joined the network as Affiliated Partner Universities in 2019, with additional universities planned for the upcoming year. IC-IMPACTS has started to leverage connections and NCE funds to bring in greater contributions from other NGOs to build a more diversified Canada-India program, offering our partners access to greater training programs, pan-India opportunities, and maximizing return on NCE investments.

Working with the Rick Hanson Institute and the Indian Spinal Cord Injuries Centre (India's top-ranked rehabilitation centre), IC-IMPACTS created a \$325,000 program for joint development and commercialization of five technologies in the area of spinal cord injury care that will affect thousands of SCI survivors in Canada and India.



Dr. Banthia and Prof. Jamie Cassels, President and Vice-Chancellor, UVic, September, 2019



Dr. Banthia and Dr. Joy Johnson, Vice-President, Research and International, SFU, March, 2019



Dr. Renu Swarup, DBT Secretary, and Dr. Banthia in Delhi, India, February, 2019

IC-IMPACTS is now well-positioned with strategic relations to industry in Canada and India. We are leveraging existing connections to raise funds and logistical support for several projects, mobilizing significant business resources to assist with programs in First Nations communities, including water treatment projects in off-grid areas.

Simon Fraser University is thrilled to be an affiliated partner with IC-IMPACTS. As Canada's engaged university we are committed to advance our shared values of creating healthy and sustainable communities in Canada, India—and beyond.

— **Dr. Joy Johnson,**
Vice-President, Research and International, Simon Fraser University

PARTNERSHIP WITH INDIGENOUS COMMUNITIES

IC-IMPACTS has achieved recognition and immense support from Canada's Indigenous community through strategic consultations, recognition of systematic challenges, and finding common ground through respect and understanding.

On July 17, 2018, IC-IMPACTS and the Assembly of First Nations co-hosted a 'Focus Group on Innovation in Design & Construction of First Nations Housing'. The focus group brought together prominent members of First Nations communities, leaders in the housing industry, and university researchers with the aim of launching a working group and a dedicated call for proposals. A First Nations Working Group has been formed to act as an advisory committee to IC-IMPACTS on First Nations housing innovations. As a result, IC-IMPACTS has initiated several progressive and collaborative projects across Canada.



Assembly of First Nations and IC-IMPACTS Focus Group



Agreement signing at Chawathil First Nation, Hope, BC

LOOKING FORWARD

In 2018-19, IC-IMPACTS was invited to take on the role of strategically charting future Canada-India relations in science, technology, and innovation. IC-IMPACTS is encouraged by support from Canadian academia and industry as well as India's Department of Science and Technology, Department of Biotechnology, and the Principal Scientific Adviser to the Government of India.

IC-IMPACTS has initiated several strategic calls, including the "Wealth from Wastewater" project that will have a deep impact in India, especially towards the rejuvenation of the River Ganges in the Varanasi region.



Canada-India Science & Technology Summit in New Delhi, Hosted by IC-IMPACTS, DBT, and DST in December 2018



Some of the exciting initiatives IC-IMPACTS is embarking on for the coming year and beyond include:

1. Continuing to make progress on our core goal of facilitating Canada-India collaboration
2. Focusing on bilateral research projects with a high Technology Readiness Level
3. Continuing to deepen our engagement with Canada's First Nations communities
4. Strengthening principals of equity, diversity, and inclusion
5. Launching strategic HQP initiatives to promote workshops, conferences, and collaborations that will lead to commercialization of HQP technology.

IC-IMPACTS, the first and only International Networks of Centres of Excellence in Canada, has greatly cross-fertilized innovation and science between Canada and India. This has brought about important breakthroughs and technologies for transfer to end-users and the training of a new generation of young scientists and innovators with international/global acumen in both countries.

This unique model of international research and partnerships needs to be supported and even expanded to address important problems of clean water and sanitation, safe and sustainable infrastructure and good health and well-being in the context of global change in the 21st century.

— **Dr. Damase Khasa,**
IC-IMPACTS Theme Lead in Integrated Water Management

Despite daunting challenges faced by Canada and India, I remain optimistic about the potential outcomes of IC-IMPACTS projects and collaborations with DBT and DST. We believe that these joint efforts and relationships will allow for exceptional research, communication, development, and relationships between IC-IMPACTS, DBT, and all other partners.

— **Professor K. VijayRaghavan,**
Principal Scientific Advisor to the Government of India



Professor K. VijayRaghavan



Dr. Damase Khasa

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INDEPENDENT AUDITOR'S REPORT

To the Directors of IC-IMPACTS Centres of Excellence

Opinion

We have audited the financial statements of IC-IMPACTS Centres of Excellence ("the Network"), which comprise the statement of financial position as at March 31, 2019, the statement of operations and changes in net assets and the statement of cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion the accompanying financial statements present fairly, in all material respects, the financial position of the Network as at March 31, 2019 and its financial performance and cash flows for the year then ended in accordance with Canadian Accounting Standards for Not-for-Profit Organizations.

Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Network in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian Accounting Standards for Not-for-Profit Organizations and for such internal control as management determines is necessary to enable the preparation of non-consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the non-consolidated financial statements, management is responsible for assessing the Network's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Network or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Network's financial reporting process.

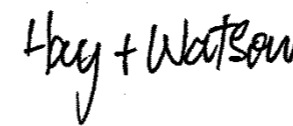
Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Network's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Network's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the non-consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Network to cease to continue as a going concern.
- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.



Chartered Professional Accountants
Vancouver, British Columbia
May 31, 2019

IC-IMPACTS Centres of Excellence
Statements of Financial Position
As at March 31, 2019 and 2018



	2019	2018
Assets		
Current		
Cash	\$ 21,711	\$ 14,355
Restricted cash – Uncommitted (Note 4)	3,247,093	1,337,542
Restricted cash – Held at other institutions (Note 4)	252,927	83,700
Accounts receivable	-	1,931
Contributions receivable (Note 4)	33,186	225,000
Unspent research grants receivable (Note 5)	36,539	80,000
Unspent research grants (Note 5)	1,092,518	2,101,042
Prepaid expenses	20,813	16,487
	4,704,787	3,860,057
Liabilities		
Current		
Accounts payable and accrued liabilities	18,741	28,336
Deferred contributions (Note 7)	4,664,335	3,817,366
	4,683,076	3,845,702
Net assets	\$ 21,711	\$ 14,355

IC-IMPACTS Centres of Excellence
Statements of Cash Flows
Years ended March 31, 2019 and 2018

	2019	2018
Cash provided by (used in)		
Operating activities		
Cash received from Networks of Centres of Excellence	\$ 2,760,000	\$ -
Cash received from Canadian universities and other partners	961,301	774,500
Cash received from other contributions	7,600	14,515
Cash returned from unspent research grants	80,000	25,800
Cash disbursed for research grants	(730,370)	(2,452,180)
Cash disbursed for operations and networking	(992,397)	(1,459,466)
Increase (decrease) in cash	2,086,134	(3,096,831)
Cash, beginning of year	1,435,597	4,532,428
Cash, end of year	\$ 3,521,731	\$ 1,435,597
Cash composed of		
Cash	\$ 21,711	\$ 14,355
Restricted cash – Uncommitted	3,247,093	1,337,542
Restricted cash – Held at other institutions	252,927	83,700
	\$ 3,521,731	\$ 1,435,597

The accompanying notes are an integral part of these financial statements.

IC-IMPACTS Centres of Excellence
Statements of Operations and Changes in Net Assets
Years ended March 31, 2019 and 2018



	2019	2018
Receipts		
Contribution from Networks of Centres of Excellence	\$ 2,204,688	\$ 3,407,432
Contributions from co-hosting universities	477,830	744,555
Contributions from other partners	7,600	14,515
Total Receipts	2,690,118	4,166,502
Disbursements		
Research and training programs		
Highly qualified personnel support	152,101	644,436
Research networking	53,235	85,412
Research grants (Note 5)	1,702,355	2,661,608
Technology transfer	168,514	129,375
	2,076,205	3,520,831
Administrative operations		
Communications and promotion	13,641	15,446
Operating costs	109,624	114,541
Professional and consulting fees	39,603	49,687
Staff salaries	443,689	451,642
	606,557	631,316
Total Disbursements	2,682,762	4,152,147
Excess of receipts over disbursements	7,356	14,355
Net assets, beginning of year	14,355	-
Net assets, end of year	\$ 21,711	\$ 14,355

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WWW.IC-IMPACTS.COM



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