IC-IMPACTS

2020-2021 ANNUAL REPORT

IC-IMPACTS 2020-2021 ANNUAL REPORT COVERS THE PERIOD FROM APRIL 1, 2020 TO MARCH 31, 2021.
THIS REPORT IS AVAILABLE FOR DOWNLOAD AT: WWW.IC-IMPACTS.COM

WE ACKNOWLEDGE THAT IC-IMPACTS OFFICE IS SITUATED ON THE TRADITIONAL, UNCEDED TERRITORY OF THE MUSQUEAM NATION.

CONTENTS

YEAR IN REVIEW

The past year was challenging with unprecedented events and the COVID-19 pandemic impacts. These impacts touched us all personally and professionally. Millions of people have lost family members, friends and colleagues increasing stress and anxiety. We are grateful to the frontline healthcare professionals who are attending to the needs of others while risking their lives every day.

Despite the challenges, 2020 was also a year of opportunities, discovery and development. I am pleased to report that IC-IMPACTS has continued to advance research collaboration and knowledge transfer between Canada and India, and applied new technologies in communities in both countries, particularly in cooperation with First Nation communities in Canada. Together, our researchers are breaking new ground—with innovative demonstration projects in safe and sustainable infrastructure, integrated water management, and public health.

IC-IMPACTS unique bilateral model is a tangible demonstration of the importance of collaboration in science and technology and we particularly value the support received from India's Department of Science and Technology (DST), and India's Department of Biotechnology (DBT). Their support has grown and expanded over the years.

We remain committed to providing graduate students and postdoctoral researchers in both countries to develop skills, perspectives, and mindsets to pursue research for social good. The success of our entrepreneurship training can be seen in the employment rate of our graduates.

Through the expanding 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 model for bilateral engagement between Canada and India.

We are grateful to our entire team - Research Management Committee, CEO and Scientific Director, staff, partners, researchers, and students across Canada and India - for their dedication and commitment to IC-IMPACTS. We also acknowledge the amazing support we continue to receive from the Networks of Centres of Excellence (NCE) and the Natural Sciences and Engineering Research Council of Canada (NSERC).

Mr. Barj S. Dhahan
Chairman of the Board of Directors

As challenging as 2020 was, our Centre has made steady progress in advancing its mission. IC-IMPACTS continues to facilitate collaborations between Canada and India, as it is our commitment to expand the very successful model of applied research, through partnerships with industry and the engagement of local communities in order to contribute to the well-being of communities in Canada and India. We remain fundamentally committed to the model of science-based research and social innovations that accelerate trade and transform the lives of citizens.

This report captures some of the main achievements of our work in 2020-2021, highlighting the fight against COVID-19. IC-IMPACTS' work has always been identified and driven by community need. As a result, two projects were funded to support the global fight against COVID-19.

IC-IMPACTS' relationship with the Government of India's Department of Science and Technology and the Department of Biotechnology have only strengthened over the years. These collaborations have resulted in exciting new research in the areas of public health, integrated water management, and safe and sustainable infrastructure. Collaborations with a number of First Nation communities across Canada have led to transformative social changes, particularly the target Indigenous communities, and IC-IMPACTS technologies are now being scaled up and installed in other communities across Canada and India.

Training of Highly Qualified Personnel (HQPs), including graduate students and postdoctoral fellows, remains a key mandate. With 1,163 HQPs trained, IC-IMPACTS continues to create innovative and hands-on training and networking opportunities for our HQPs. Our researchers have produced 1,298 peer-reviewed research publications and launched 8 start-ups. IC-IMPACTS continues to play an important role in developing partnerships between researchers and companies. With more than 360 partnerships created and 31 patents, IC-IMPACTS is accelerating knowledge-based trade between Canada and India.

IC-IMPACTS continues to expand its network by collaborating with universities, NGOs, industry leaders and communities across Canada and India as we progress towards our long-term vision of building a financially sustainable Centre.

Finally, I would like to thank our frontline workers for their efforts in keeping us safe, and for demonstrating resilience and showing great commitment in these unprecedented times.

Dr. Nemy Banthia
Chief Executive Officer and Scientific Director

OVERALL ACHIEVEMENTS

Translating Research Into Communities

SELECT DEMONSTRATION PROJECTS IN INDIA:

- Self-Healing Road, Thodebhavi
- Tika Vaani, Uttar Pratesh
- Screening of HIV Associated Co-Infections, Manipal
- KRS Dam Repair, Mysore
- Testing and Upscaling Phytoremediation Technology, Kashmir
- Engaging Pharmacists in Detection of Tuberculosis, Patna

SELECT DEMONSTRATION PROJECTS IN CANADA:

- Resilient Global Urban Shelter, Toronto
- Water Treatment System, Lytton First Nation
- Self-Healing Pavement, Chawathil First Nation
- Sewer Pipe Coating, Delta
- Elementary School Retrofit, Vancouver
- MacMillan Building Stairway Resurfacing, Vancouver
- Transforming Waste into Pavers, Victoria
- Scour Monitoring of Bridges, Winnipeg

IC-IMPACTS BY THE NUMBERS

74
RESEARCH PROJECTS

1,163
HQP TRAINED

363
PARTNERSHIPS CREATED

1,298
SCIENTIFIC PUBLICATIONS

31
PATENTS FILED

8
START-UPS LAUNCHED

DEVELOPMENT OF INNOVATIVE TECHNOLOGY

COVID-19 and Other Public Health Related Projects

IC-IMPACTS' work has always been identified and driven by community need and during the past year, a call for proposals was launched, tailored to the health, economic, and social challenges communities were facing as a result of the COVID-19 pandemic. Following the call, two projects were funded to support the global fight against COVID-19.

Citizen-lead Evaluation of the Public Health Response to COVID-19 in India: Harnessing Information and Communications Technology (ICT) to Promote Real-Time Learning, Human Rights and Good Governance
Indian Lead: Dr. Aaditeshwar Seth, Indian Institute of Technology-Delhi
Canadian Lead: Dr. Mira Johri, University of Montreal (CHUM)

This project provides an essential lifeline to India's poor and vulnerable. It is a nationwide effort, with points of strength in Delhi, Gurgaon, Bihar, Jharkhand, Uttar Pradesh and Tamil Nadu. It established an emergency network of civil society partners to aid in India's COVID-19 response and to evaluate and learn from the work. During the project's first 100 days, from March 13th to June 20th, 2020, the research team initiated a COVID-19 response network reaching 1.15 million individuals with audio content to aid in awareness and health promotion. Shortly after, the network responded to more than 6,000 SOS messages on the ground and offered help. The field staff also created the non-profit *Raah Health & Social Development Foundation*, and the COVID-19 response network continues to function with funding from numerous partners.

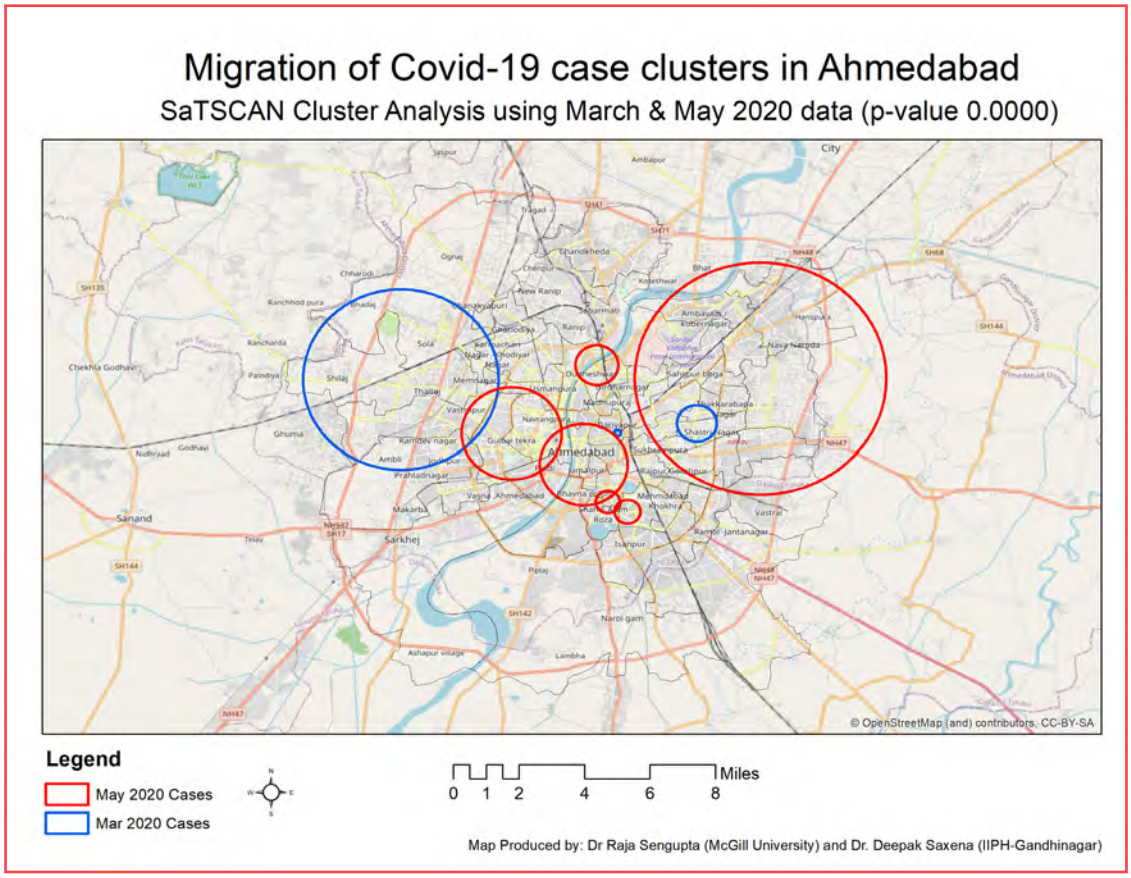
Publication: *The first 100 days: how has COVID-19 affected poor and vulnerable groups in India?*
Link to article: https://pubmed.ncbi.nlm.nih.gov/34002217/

Field Team

Individuals Getting Vaccinated through the Network

Agent-Based Simulation of COVID-19:
Estimating the Spread and Disease Burden Using Advanced Epidemiological Modelling
Indian Lead: Dr. Deepak Saxena, Indian Institute of Public Health-Gandhinagar
Canadian Lead: Dr. Raja Sengupta, McGill University

This project aims to assist the unfolding crisis in India following a second COVID-19 wave. Currently, project personnel from three institutions (McGill, BITS Pilani Goa Campus, and IIPHG) are working closely with Dr. Saxena and IIPHG to provide Geospatial data support for the location of reported COVID-19 cases and identification of hospital resources, which in turn is to be used by Ahmadabad Municipal Corporation (AMC). The team is creating maps to show the location of the reported cases and the medical resources for specific regions of Ahmadabad. These maps aid in decision Making and resource management.



Map Screenshot Indicating the Migration of COVID-19 in Ahmedabad

Smart App-Based Rapid Multiplex Screening of HIV Associated Co-Infections of At-Risk Populations at the Point-of-Care: A Demonstration Study in India
Indian Lead: Dr. Suma Nair, Manipal Academy of Higher Education (MAHE)
Canadian Lead: Dr. Nitika Pai, Research Institute of McGill University Health Centre (RI-MUHC)

This research project aims to provide deployment of an app-based multiplex testing strategy for many viral and bacterial infections. In this age of the pandemic, where conventional testing/screening proves to be difficult, digital solutions to improve the quality and efficiency of primary care are essential. The project team redeveloped the AideSmart application; in the past year, the new the AideSmart app has been adapted from its previous version to the context of the current project. The testing kits and platform devices provided by Cepheid were shipped and received at MAHE in September 2020 and the fully executed inter-institutional agreement between RI-MUHC and MAHE was completed in February 2021 and IRB approvals were duly obtained. Three systematic reviews have stemmed from the multiplexing project and have been submitted to open access journals.

The research team also published a related review in ***The Lancet HIV*** on Modern Diagnostic Technologies for HIV, with a focus on the role of multiplexed technologies.

Publication: ***Modern Diagnostic Technologies for HIV***
Link to article: https://www.thelancet.com/journals/lanhiv/article/PIIS2352-3018(20)30190-9/fulltext

Integrated Water Management

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

Carbon corrosion is a persistent challenge in electrochemical systems. This project aims to further understand carbon corrosion under a variety of experimental conditions. Amongst these, special attention was given to the effect of applied potential, cycling time, presence of dissolved oxygen in addition to organic and inorganic constituents. Moreover, an electrochemical approach to mitigate the effect of carbon corrosion was explored.

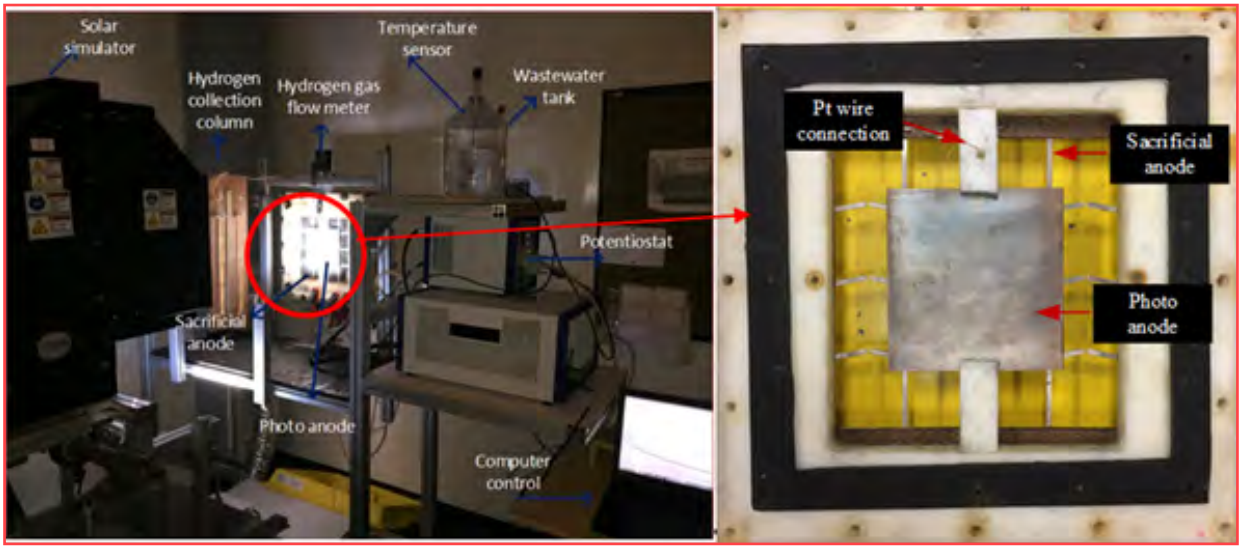
Fundamental work was carried out using an electrochemical cell that allowed fine tuning and exceptional potential control. This helped overcome issues with potential allocation that occur in classic, more practical, two-electrode cells. Once the fundamental studies were finished, a few selected cases were replicated using a two-electrode cell; hence, it was possible to contrast rigorous fundamental work with what is seen in the field, under typical cycling conditions. The research team identified the importance of conducting long-term assessment experiments using a three-electrode cell. This setup enables a careful control over the thermodynamic state of the electrode being studied (i.e., constant driving force). Researchers also revealed the unsuccessful outcome of electrochemical regeneration approaches and demonstrated the need for adequate pre-treatment for iron containing brackish waters to avoid increased decay and loss of performance.

Carbon Neutrality through Combined CO_2 Capture and Novel H_2 Technology with Production of Non-Conventional Fuels for Smart Cities

Indian Lead: Dr. Subrata Borgohain Gogoi, Dibrugarh University
Canadian Lead: Dr. Ibrahim Dincer, Ontario Tech University

CO_2 is recognized as the main pollutant responsible of the super green-house effect, causing global warming and climate change. In this concern, to avoid more dangerous consequences, the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Climate Change Conference (COP21, Paris, 2015) have emphasized the need to reduce CO_2 emissions by at least one half of the current value by 2050, aiming at limiting the global average temperature increase to a maximum of 2°C.

This project aims to convert CO_2 into valuable synthetic, non-conventional and non-renewable fuels for reducing CO_2 emissions and boosting the deficient energy sector. The team at Ontario Tech University designed a unique photo-electrochemical reactor (PEC) for simultaneous wastewater treatment and H_2 production. The PEC reactor experiments have been conducted under solar simulator (artificial light) illumination (Figure 3). Production of H_2 via water splitting by using solar energy using two unique methods and production of ammonia (NH_3) as another carbon-free fuel will aid in the development of smart city roadmaps for Indian and Canadian cities to help expedite moving toward sustainable future.



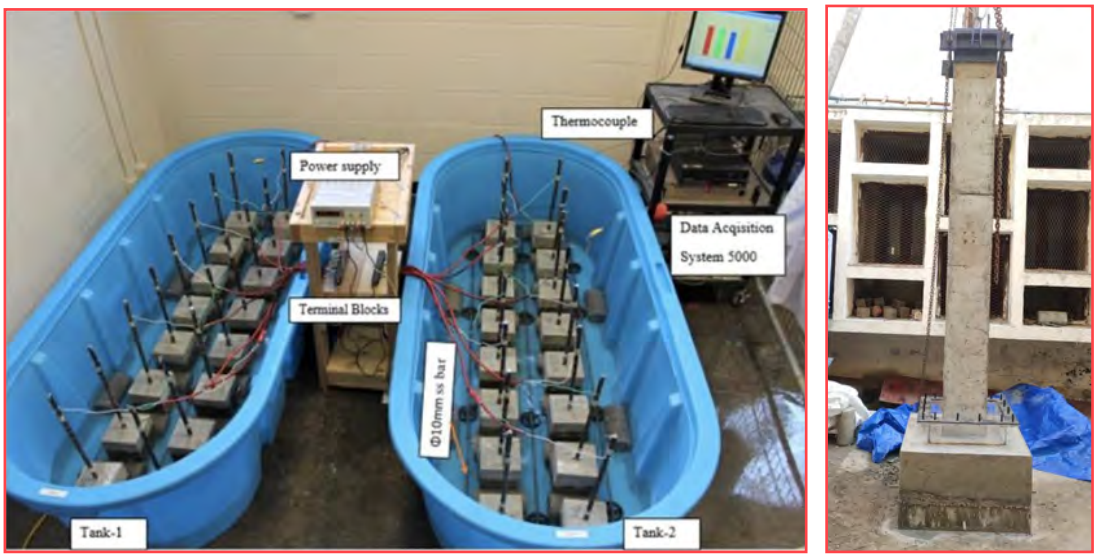
PEC System with the Solar Simulator

Safe and Sustainable Infrastructure

Fire Performance of Aged Reinforced Concrete Structures
Indian Lead: Dr. Umesh Kumar Sharma, Indian Institute of Technology - Roorkee
Canadian Lead: Dr. Mark Green, Queen's University

Throughout the world, reinforced concrete structures are crumbling due to the effects of age and corrosion. In both India and Canada, these structures could potentially collapse with great impact to human safety. One particularly important risk is the lack of understanding of how the strength and durability of aged and corroded reinforced concrete structures are impacted by fire. Current design codes are often developed using pristine specimens developed and tested in a laboratory setting with no exposure to corrosion or the impacts of ageing. This project brings together researchers in the areas of reinforced concrete corrosion, fire performance of structures, and numerical modelling to tackle this complex issue.

The research is largely application-based because of the focus on developing an understanding of the performance of corroded reinforced concrete columns in fire. The practical objectives are to enable the design of new reinforced concrete structures for better fire performance despite age related deterioration and to help to develop suitable fire-resistant repair strategies for corroded/aged existing structures.



Overall Test Setup and Casting Process

Large Area Microbolometer Uncooled Focal Plane Arrays for Thermal Imaging
Indian Lead: Dr. Madhusudan Singh, Indian Institute of Technology - Delhi
Canadian Lead: Dr. Ghassan Jabbour, University of Ottawa

The team is developing the needed designs and process technologies for application of low-cost thermographic imaging for reliable, retrofittable and real-time monitoring of potential hot spots (such as utilities) for the tell-tale rise in temperatures that usually presages outbreaks of fires. Researchers will develop VOx materials and printed deposition technology at IIT-Delhi, integrating it at University of Ottawa, with a large feature size read out integrated circuits (ROIC). The research team is shifting focus now, due to COVID-19 and the constraints of social distancing in the laboratories, to study the aspects of the project that can be undertaken without affecting the outcomes. The primary focus in this regard is on setting up and testing all of the required materials in printing, processing, and patterning protocols.

High Vacuum Train Deposition System

Smart Infrastructure with High Fracture Toughness, Durable Concrete Employing Large Amounts of Industrial Wastes
Canadian Lead: Dr. Nemkumar Banthia, The University of British Columbia

Repairing aged and deteriorated infrastructure is an ongoing challenge for many municipalities. This is complicated by the fact that aging infrastructure is often located in crowded and developed areas that have changed significantly since the original design and installation. Cement-based repair materials have been historically used to repair damaged and deteriorated infrastructure, however, production of cement is responsible for nearly 8% of the global CO_2 emissions. This project looks at sustainable repair materials that can be used by the construction industry to efficiently repair deteriorated infrastructure.

Over the past years, the research team developed and tested a novel cement-free, corrosion-resistant multiphase composite coating material. In early 2021, and in a collaboration with Metro Vancouver, the team successfully demonstrated the application of this novel coating material at a sewer chamber in Delta, BC.

This project is a great example of how IC-IMPACTS researchers are transferring technologies from laborites to communities.

Metro Vancouver currently has around 9,000 kilometres of sewer pipes which will at some point in the near future need to be repaired.

Metro Vancouver Demonstration Site

PARTNERSHIPS AND SOCIAL IMPACT

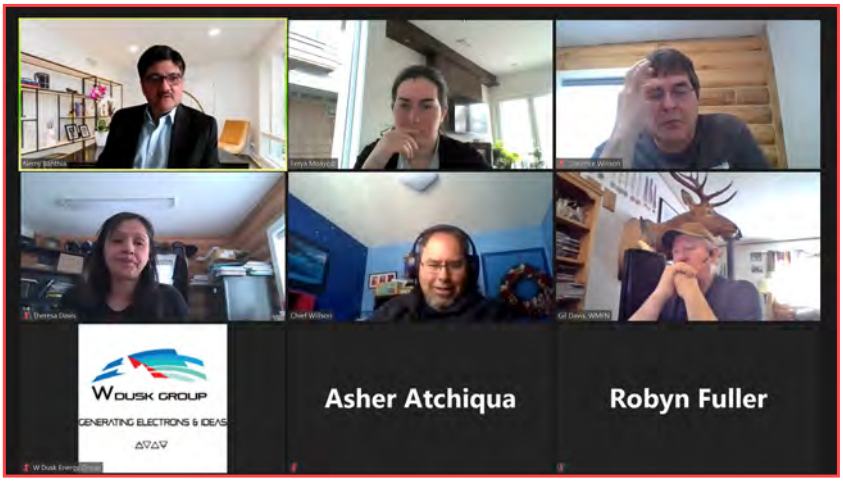
Continuing the Dialogue with First Nation Communities

IC-IMPACTS is developing 3D printing technology for rapid housing construction in First Nation Communities. Researchers are looking at target communities to build a demonstration house using 3D Concrete Printing (3DCP).

3DPC will provide design flexibility, faster construction speed, enhanced sustainability, greater product quality, reduction in cost, while significantly reducing waste. In addition, through consultation with the target community at the planning stage, the design of each unit can uniquely incorporate the needs of those who will reside in the house.

When compared to traditional construction, 3DPC presents numerous opportunities for collaborative and innovative solutions, especially in communities facing challenges such as severe winter weather.

3D Concrete Printer



Discussing 3DPC House Prototype with West Moberly First Nation Community

FUTURE LEADERS

Bringing Canadian and Indian Skills Together

IC-IMPACTS remains committed to training the next generation of leaders for a fast-changing future. Highly Qualified Personnel (HQP) at IC-IMPACTS are exposed to unique training and learning opportunities. HQPs, including graduate students, postdoctoral fellows, research associates and research staff, get to work with both Canadian and Indian researchers, exchange ideas and are able to broaden their field of knowledge and develop new international connections.

Since 2013, IC-IMPACTS has trained a total of 1,163 HQPs (reported here as HQP-Years), 32% of whom are female. Working on an IC-IMPACTS demonstration project enables HQPs to get involved with the community and observe the impact of scientific research and its deployment on the society. In addition to what HQPs gain through involvement in research projects, IC-IMPACTS diverse programs provide further opportunities for HQPs to learn through volunteering.

Start-ups and non-profit foundations launched:

1. Raah Health & Social Development Foundation, Delhi, India
2. INpact, Ontario, Canada
3. Buyuanxiar Inc., Ontario, Canada
4. Mithra Sustainable Solutions, British Columbia, Canada
5. Boost Environmental Systems Inc., British Columbia, Canada
6. HRG Infrastructure, British Columbia, Canada
7. ChipCare, Ontario, Canada
8. Tricca Technologies Inc., Alberta, Canada

THE IMPACT THAT IC-IMPACTS IS HAVING ON THE GROUND IN INDIA IS SIGNIFICANT, FROM CREATING NETWORKS OF PARTNERSHIPS THAT WORK ON INNOVATIVE PROJECTS AND HARNESS TECHNOLOGY, TO THE CREATION OF START-UPS THAT MARK THE FUTURE OF THE CANADA-INDIA RELATIONSHIP.

HIS EXCELLENCY AJAY BISARIA
HIGH COMMISSIONER OF INDIA IN CANADA

ENSURING SUSTAINABILITY, RESILIENCE AND GROWRTH

With a solid foundation and growing support from the Government of Canada and the Government of India, IC-IMPACTS is now also focusing on the Centre's sustainability and growth, to deliver technologies more effectively and ultimately help create a strong economy that is good for all sectors. Working with esteemed scientists, community members, industry leaders and government offices in Canada and India, IC-IMPACTS has consistently exceeded its established targets. With the guidance received from our partners, IC-IMPACTS will continue to systematically identify critical challenges and develop cutting-edge technologies to address those challenges.

Meeting with MP Nelly Shin

IC-IMPACTS BEING THE GATEWAY FOR SCIENTIFIC COLLABORATIONS BETWEEN CANADA AND INDIA, IS TAKING STUDENT TRAINING AND MOBILITY TO A NEW LEVEL. UBC IS PROUD OF BEING THE HOST INSTITUTE OF THIS GREAT ORGANIZATION.

PROFESSOR SANTA J. ONO
PRESIDENT, UBC

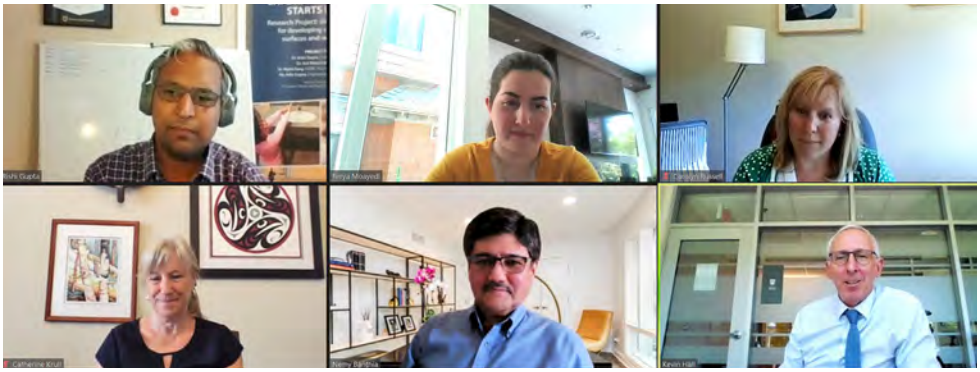
PARTNER UNIVERSITIES INVOLVED IN GOVERNANCE

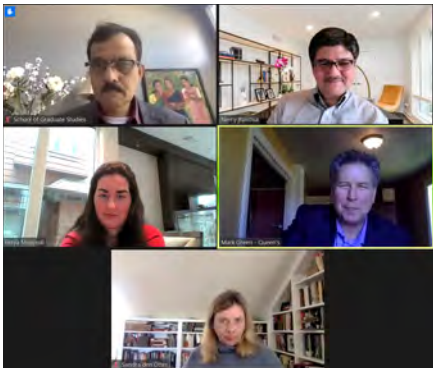
All universities in Canada and India can avail funds from IC-IMPACTS on a competitive basis. However, IC-IMPACTS has several exclusive partnerships with prominent universities (listed here) that steer IC-IMPACTS research program, lead research themes, adjudicate Calls for Proposals and serve in prominent governance positions including IC-IMPACTS Board of Directors and Research Management Committee.

These sustaining university partners also advise the Network on community engagement, business partnerships, student programs, engagement with Indian and Canadian Governments and future research directions.


IC-IMPACTS and SFU Signing Ceremony

IC-IMPACTS India Week: Panel Discussion with Delegates


Meeting with University of Victoria


Meeting with Queen's University

EMERGING CANADA-INDIA OPPORTUNITIES

Knowledge, Mobility and Technology Exchange

Providing demonstration and field-testing opportunities on community-driven projects, IC-IMPACTS will continue to facilitate knowledge exchange between Canadian and Indian networks, focusing on technology deployment and commercialization. IC-IMPACTS will continue to help provide real-world experiences for graduate students and postdoctoral researchers. Canadian and Indian graduate students will continue to take their research skills and apply them in each other's respective countries. From providing clean water and self-healing roads in First Nation communities to engaging pharmacists in India, IC-IMPACTS researchers are gaining global perspectives of community challenges and needs and train to become tomorrow's global leaders.

Location of IC-IMPACTS Webinar Participants

INNOVATION

DEMONSTRATION

COMMERCIALIZATION

CURRENT THEMES

- **PUBLIC HEALTH**
- **INTEGRATED WATER MANAGEMENT**
- **SAFE & SUSTAINABLE INFRASTRUCTURE**

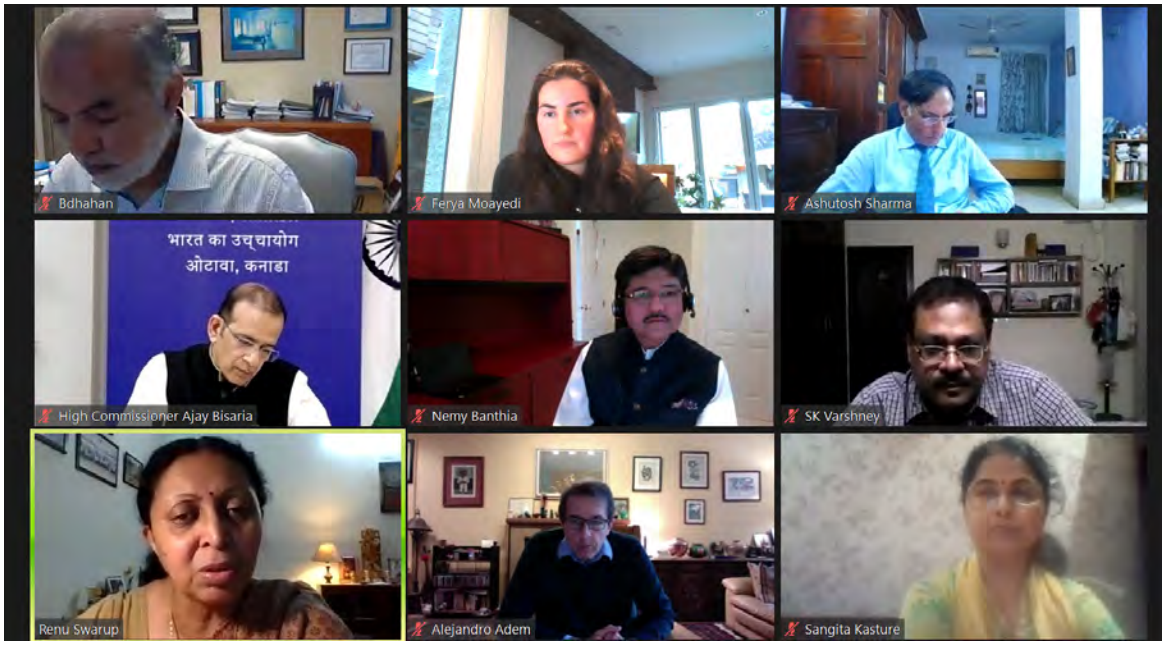
NEW THEMES

- **FOOD SECURITY**
- **CLEAN ENERGY**

Launch of New Calls for Proposals

IC-IMPACTS, the Department of Biotechnology (DBT) and the Department of Science and Technology (DST) plan to have new joint calls for proposals in the coming years. One such call which was jointly announced in November 2020, is titled ***'Ideas to Prototyping and Commercialization (I2PC)'.*** I2PC is a joint initiative to facilitate deployment of technologies in communities as operational prototypes to fast-track commercialization.

Additionally, IC-IMPACTS is broadening its sectors of interest by focusing on new themes such as Food Security and Housing, in efforts to enhance community transformation and sustainability.



Invited Speakers at IC-IMPACTS 2020 Annual Research Conference

Commitment to the Principles of Equity, Diversity and Inclusion

IC-IMPACTS respects, honours, and celebrates the diversity of its network and as an international research centre, is fully aware of the benefits brought on by having a diverse team. IC-IMPACTS remains committed to fostering and maintaining an inclusive environment that brings together diverse perspectives from our students, researchers, partners, and members of the community. Throughout the past year, we have continued to develop and promote equity, diversity, and inclusion initiatives in our programs and online events.

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Dr. Chris Kelly
Deputy Director, Networks of Centres of Excellence (NCE)

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Dr. Arvind Gupta
Professor, The University of Toronto

SCIENTIFIC TEAM

Dr. Nemy Banthia
Scientific Director and Theme Lead, Safe and Sustainable Infrastructure, The University of British Columbia

Dr. Stewart Aitchison
Theme Lead, Public Health: Disease Prevention and Treatment, Professor, Electrical & Computer Engineering, The University of Toronto

Dr. Damase Khasa
Theme Lead, Integrated Water Management, Professor, Department of Wood and Forest Sciences, Université Laval

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Associate Professor, The University of Victoria

Dr. Kevin Kane
Professor, The University of Alberta

Dr. Damase Khasa
Professor, Université Laval

Dr. Madjid Mohseni
Professor, The University of British Columbia

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Professor, The University of Toronto

Dr. Ash Parameswaran
Professor, Simon Fraser University

Dr. Stephanie Yanow
Professor, The University of Alberta

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Women Scientist B, Indian Institute of Technology, Roorkee

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Masters of Applied Science Student, The University of British Columbia

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Event Coordinator – India
PhD Student, Indian Institute of Technology, Roorkee

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Webinar Coordinator
PhD Candidate, The University of British Columbia

Mr. Hiroki Fukuda
PhD Student, The University of British Columbia

Mr. Timir Baran Roy
PhD Candidate, Concordia University

Mr. Karl Zimmermann
Webinar Coordinator
PhD Student, The University of British Columbia

FUNDED RESEARCH PROJECTS

PUBLIC HEALTH

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

A Point-of-Care Device for Malaria Diagnosis And Drug Resistance Genotyping
Canadian Lead: Dr. Stephanie Yanow, The University of Alberta
Indian Lead: Dr. Aparup Das, National Institute of Malaria Research

A Portable Fever Kit for Dengue and Chikungunya
Canadian Lead: Dr. Stewart Aitchision, The University of Toronto
Indian Lead: Dr. Manoj Varma, Indian Institute of Science

Agent-Based Simulation of COVID-19: Estimating the Spread and Disease Burden using Advanced Epidemiological Modelling
Canadian Lead: Dr. Raja Sengupta, McGill University
Indian Lead: Dr. Deepak Saxena, Indian Institute of Public Health, Gandhinaga

Citizen-lead Evaluation of the Public Health Response to COVID-19 in India: Harnessing Information and Communications Technology (ICT) to Promote Real-Time learning, Human Rights and Good Governance
Canadian Lead: Dr. Mira Johri, Université de Montréal
Indian Lead: Dr. Aaditeshwar Seth, Indian Institute of Technology, Delhi

COPE: Community Health Outcomes and Personalized Education/Exercises for Spinal Injured Individuals
Canadian Lead: Dr. Andrei Krassioukov, The 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: Dr. Aaron Yurkewich, The University of Toronto, and Stewart Russell, Makers Making Change at Neil Squire Society

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, The 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

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

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

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

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, The University of Alberta
Indian Lead: Dr. Easwaran Sreekumar, Rajiv Gandhi Centre for Biotechnology

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

Smart App-Based Rapid Multiplex Screening of HIV Associated Co-Infections of at Risk 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

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
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Wearable Technology to Monitor Sitting Posture and Reduce the Pressure Injury Risk
Canadian Lead: Dr. Hossein Rouhani, The University of Alberta

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INTEGRATED WATER MANAGEMENT

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

A High-Performance Advanced Septic (HPAS) System for Villages and Roadside Restaurants
Canadian Lead: Dr. Edward McBean, The University of Guelph
Indian Lead: Dr. Y. R. Satyaji Rao, National Institute of Hydrology

A Nanotechnology Enabled Device for the Detection of Harmful Bacteria in Drinking Water
Canadian Lead: Dr. Michael Serpe, The University of Alberta
Indian Lead: Dr. Soumyo Mukherji, Indian Institute of Technology, Bombay

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, Indian Institute of Technology, 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

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, Indian Institute of Technology, Roorkee

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, IIEST Shibpur

Biovalorization of Lignin
Canadian Lead: Dr. Vikramaditya G. Yadav, The University of British Columbia
Indian Lead: Dr. Syed S. Yazdani, International Centre for Genetic Engineering and Biotechnology

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, The University of Kashmir

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

Contaminated Land Reclamation Using Hybrid Absorbable Landscape and Native Plant Species
Canadian Lead: Dr. Rishi Gupta, The University of Victoria
Indian Lead: Dr. Neeta Raj Sharma, Lovely Professional University

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, Indian Institute of Technology, Bombay

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

Development and Scale-Up of Technology for Microbial Extraction of Xylose from Agro-Waste Materials and Subsequent Conversion into Xylitol
Canadian Lead: Dr. Tatjana Stevanovic, Université Laval
Indian Lead: Dr. Baljinder Kuar, Punjabi 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.

Direct Cryptosporidium Detection for Developed and Developing Nations
Canadian Lead: Dr. Mina Hoorfar, The University of British Columbia
Indian Lead: Dr. Krishna Khairnar, CSIR – National Environmental Engineering Research Institute

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

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

Microfabricated, Low-Cost, High-Sensitivity Chlorine and PH Sensor Systems for Water Quality Monitoring
Canadian Lead: Dr. Jamal Deen, McMaster University

Passive UF Membrane Demonstration
Canadian Lead: Dr. Pierre Bérubé, The University of British Columbia

Quantum Dot Solar Panels for Water Treatment In Remote Settings
Canadian Lead: Dr. Edward Sargent The University of Toronto

Sensors 4 People / 3 Drops
Canadian Lead: Dr. Michael Serpe, The University of Alberta

Sewage Contaminated Lake Water Quality Restoration through Aeration and Floating Wetland Plants
Canadian Lead: Dr. Rajesh Seth, The University of Windsor
Indian Lead: Dr. Rakesh Kumar, CSIR-NEERI

Testing and Upscaling Phytoremediation Technology in Real-World Conditions
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Indian Lead: Dr. Manzoor Shah, The University of Kashmir

Thondebhavi Water Quality Assessment
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Thorsby Water Quality Assessment
Canadian Lead: Dr. Michael J. Serpe, The University of Alberta

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SAFE AND SUSTAINABLE INFRASTRUCTURE

Application of Precast Products Made Using Bottom Ash and Fly Ash for Rural Pavements and other Infrastructure in India
Canadian Lead: Dr. Rishi Gupta, The University of Victoria
Indian Lead: Dr. Urmil Dave, Institute of Technology, Nirma University

Assessment of Fire Performance of Structural Elements and Structural Systems through Conventional Fire Tests and Hybrid Fire Simulation
Canadian Lead: Dr. Oh-Sung Kwon, The University of Toronto
Indian Lead: Dr. Dipti Ranjan Sahoo, Indian Institute of Technology, Delhi

Carbon Neutrality through Combined CO_2 Capture And Novel H_2 Technology With Production Of Non-Conventional Fuels For Smart Cities
Canadian Lead: Dr. Ibrahim Dincer, Ontario Tech University
Indian Lead: Dr. Subrata Borgohain Gogoi, Dibrugarh University Assam

Characterization and Use Of Industrial Fly Ash
Canadian Lead: Dr. Daman Panesar, The University of Toronto
Indian Lead: Dr. Bhupinder Singh, Indian Institute of Technology, Roorkee

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

Development of Cost-Effective, Energy-Efficient, and Resilient Housing Technologies for First Nations Communities
Canadian Lead: Dr. Ashutosh Bagchi, Concordia University

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

Evaluating the Integrity of Railways Infrastructure in India and Canada with an Emphasis on Bridges and Tracks
Canadian Lead: Dr. Mustafa Gul, The University of Alberta
Indian Lead: Dr. Banerji, Indian Institute of Technology, Roorkee

Fire Performance of Aged Reinforced Concrete Structures
Canadian Lead: Dr. Mark F. Green, Queen's University
Indian Lead: Dr. Umesh Kumar Sharma, Indian Institute of Technology, Roorkee

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

Harnessing the Potential of Renewable Energy (Solar / Wind) for Sustainable Building Energy Management through Compressed Air Energy Storage
Canadian Lead: Dr. Fariborz Haghighat, Concordia University
Indian Lead: Dr. V Gayathri, Vellore Institute of Technology

High Fracture Toughness, Durable Concrete with Minimized Carbon Footprint Employing Large Amounts of Industrial Waste
Canadian Lead: Dr. Nemkumar Banthia, The University of British Columbia

Improving Building Energy Demand Predictions in Smart Cities through Sensor Observations and Considerations of Landscape Characteristics
Canadian Lead: Dr.Fitsum Tariku, British Columbia Institute of Technology
Indian Lead: Dr. Prasad Avinash Pathak, FLAME University

Improving Fire Safety of Structures Through the Development of Fire Retardant Laminated Glass Glazing
Canadian Lead: Dr. Maged Youssef, Western University
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India-Canada Initiative for Resilient Global Urban Shelter
Canadian Lead: Dr. Constantin Christopoulos, The University of Toronto
Indian Lead: Dr. Ravi Sinha, Indian Institute of Technology, Bombay

Innovative Field Demonstration of Sustainable Infrastructure
Canadian Lead: Dr. Shamim Sheikh, The University of Toronto
Indian Lead: Dr. Umesh Kumar Sharma, Indian Institute of Technology, Roorkee

Large Area Microbolometer Uncooled Focal Plane Arrays for Thermal Imaging
Canadian Lead: Dr. Ghassan Jabbour, The University of Ottawa
Indian Lead: Dr. Madhusudan Singh, Indian Institute of Technology, Delhi

Metamaterial Walls for Improved Acoustic Performance in Green Building
Canadian Lead: Dr. Umberto Berardi, Ryerson University
Indian Lead: Dr. Arpan Gupta, Indian Institute of Technology, Mandi

Metawall: Metamaterial Based Lightweight Panel Wall For Enhanced Building Acoustic And Seismic Resistance
Canadian Lead: Dr. Sreekanta Das, The University of Windsor
Indian lead: Dr. Arnab Banerjee, Indian Institute of Technology, 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: Dr. Ashwin Srinivasan, BITS Pilani KK Birla Goa Campus

Modelling and Assessment of Deficient and Repaired Structures
Canadian Lead: Dr. Frank Vecchio, The University of Toronto
Indian Lead: Dr. Umesh Kumar Sharma, Indian Institute of Technology, Roorkee

Scour Monitoring of an Overwater Bridge in Manitoba Using Dissolved Oxygen (DO) Probes
Canadian Lead: Dr. Faezeh Azhari, The University of Toronto

Smart Sensor Deployment in Buildings: Evacuation Planning and Energy Management
Canadian Lead: Dr. Mark S. Fox, The University of Toronto
Indian Lead: Dr. Krithi Ramamritham, Indian Institute of Technology, Bombay

Solar Energy Powered Net-Zero Energy Smart Buildings
Canadian Lead: Dr. Bruno Lee, Concordia University
Indian Lead: Dr. K. Srinivas Reddy, Indian Institute of Technology, Madras

Structural Health Monitoring of Tall Buildings Using Vibration-Based Techniques
Canadian Lead: Dr. Lucia Tirca, Concordia University
Indian Lead: Dr. S.K. Panigrahi, CSIR-CBRI, Roorkee

Sustainable Infrastructure Using Smart FRPs
Canadian Lead: Dr. Shamim Sheikh, The University of Toronto
Indian Leads: Dr. Umesh Sharma, & Dr. Pradeep Bhargava, Indian Institute of Technology, Roorkee

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

Wildfire House
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