Breaking Systemic Barriers to Women's Participation in Science

Call for Proposals

The Foundations for Innovation Program at Canada's International Development Research Centre (IDRC) is launching a call for research proposals to identify and address systemic barriers that stand in the way of a greater participation of women and other under-represented groups[1] in Science, Technology, Engineering and Mathematics (STEM) fields in both the public and the private sector, in low- and middle-income countries (LMICs).

Systemic barriers in STEM are conditions attributable to institutional values, cultures, policies and practices that implicitly or explicitly restrict the potential of institutions[2] to successfully attract, recruit, retain and promote women scientists and other groups in STEM fields where these are currently a minority.

Extensive research into career choices, opportunities and pathways in STEM in high-income countries has identified a variety of obstacles preventing women from achieving their full potential in science. The evidence has helped institutions and organizations active in STEM to develop more effective initiatives and measures to eliminate or reduce barriers of a systemic nature, those which institutions can and must tackle.

Similar understanding of how institutional values, cultures, policies and practices affect the participation and success of women and other under-represented groups in LMICs is currently missing. Such evidence is needed to improve the capacity of LMICs to develop their STEM human capital by improving gender equality and diversity in science education and in the various sectors of their economy. Research is needed to identify what initiatives have been implemented and with what results, as well as those being introduced by institutions. What other innovative approaches could be piloted for learning, for potential mainstreaming within institutions, or for inspiring larger communities in LMICs to do likewise?

This call aims to generate evidence on LMICs, document situations of status quo and progressive initiatives, current or recent, in these countries, as well as support novel actions in LMICs that may advance specific Sustainable Development Goals, such as SDG 5 (Achieve gender equality and empower all women and girls), SDG 10 (Reduce inequality within and among countries) and SDG 9 (Industry, Innovation and Infrastructure).

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[1] Under-represented groups are groups of people, as defined by their sex, age, race, religion, ethnic origin, language or physical or mental handicaps, whose participation rate in STEM fields is markedly smaller than their share of the overall population in a given jurisdiction (usually, the country).

[2] "Institution" in this Call is also synonymous of "organization".

Call Objectives

The call underscores IDRC's commitment to support a major research effort to:

(a) build robust evidence from LMICs on the nature of systemic barriers and their consequences on the engagement of women and under-represented groups in science endeavours;

(b) build robust evidence from LMICs on the results to date of deliberate interventions by specific institutions to mitigate or eliminate systemic barriers to a greater participation of women and other under-represented groups, as well as increase diversity of personnel in fields of STEM; and

(c) provide an opportunity for institutions, both those which have been pro-active and those which until now may have been less so, to design, implement and monitor novel approaches and interventions, in order to learn from these and more effectively address important barriers standing in the way of women and other under-represented groups' fuller participation in STEM fields.

Call details

Total amount of funds available for this call: at least CA$ 2.8 million

IDRC contribution to budget of each proposal: CA$ 200,000 - CA$ 500,000

Number of fundable projects: between 5 and 14

Duration of projects: up to 60 months, depending on type of proposal (see section of this Call on "What types of proposal are eligible?")

Submission deadline: August 15, 2019 at 5:00 PM (EST)

Background and Rationale

UNESCO estimates that less than 30% of the world's researchers are women; where numbers are available, other minorities are even more under-represented. In many countries the percentage of women in STEM fields is even lower as women generally take up fewer STEM subjects than men. It appears that, in many cultural contexts, STEM subjects with the notable exception of the life sciences, are statistically male dominated disciplines, failing to attract or retain female students/professionals, with men therefore prevailing in top decision-making positions. For those women who do pursue careers in STEM, their numbers tend to taper off further up the career ladder; this is attributed to women and girls facing a wide range of barriers throughout their education and careers that contribute to what is often known as the 'leaky pipeline'.

The missing women and other groups in science are low- and middle-income countries' largest reservoir of untapped intellect and creativity. Under-representation of these groups is not only a human rights issue; for country economies and industry in particular this is increasingly a human capital issue. As disruptive technologies come to impact more sectors, recent reports indicate that women tend to be most concentrated in those job categories vulnerable to disruption, while they are under-represented in sectors with higher growth potential. Furthermore, the proportion of women employed in fast-growth sectors exhibits a dramatic decline along the career ladder, from the more junior to the more senior levels; therefore fewer women reach role model status to inspire the upcoming generation of girls and

young women. Low workforce diversity undermines an industry's ability to innovate and seize opportunities to accelerate its growth. Evidence shows that "women-poor" leadership undermines the net profit margins and performance of enterprises.

Several strategies have been put forward to tackle the underrepresentation of women and other groups in science. Some have focussed solely on increasing the share of these groups in science (for instance, through mandatory quotas, developing individuals' soft skills and building their self-confidence) without openly tackling structural barriers faced by such groups, barriers that stem from entrenched gender and other prejudices in institutions' systems and practices. Such prejudices often reflect more widespread biases and inequalities in the local society. However, over the last decade a growing number of institutions at various levels have been looking into the root causes of the diversity gap in science and into how policy changes in institutions engaged in STEM fields can lead to greater equality and diversity.

Systemic barriers may be found not only in work environments (governance, human resources recruitment, performance appraisal and remuneration, security), but also in higher education establishments where pedagogy can act as a powerful discriminator. Enrolment in STEM fields has stalled in many world regions and, in many sectors and specialties, the gap has been widening between job vacancies/demanded competencies on one hand, and suitable applicants' numbers/acquired qualifications on the other. Pressure is mounting on higher education institutions to revisit how STEM subjects are taught and how research is carried out in academia, how STEM subjects interface with other areas of knowledge and with societal needs, and how STEM students can acquire more diverse skill sets to prepare them better for a rapidly changing world.

For instance, over the last decade efforts have been growing to integrate the Creative and Liberal Arts (e.g., literature; performing and visual arts; social sciences and humanities) into STEM university education and research (STEAM).[3] STEAM approaches have been used to increase recruitment and retention of girls/women and minorities in STEM fields; to improve all graduates' employability; to promote diversity and creativity on professional R&D teams; and to make innovations socially and culturally more relevant and beneficial. Early evidence on the benefits of STEAM approaches comes mostly from high-income countries (Goldman et al., 2016; National Academies of Sciences, Engineering, and Medicine, 2018; Rabalais, 2014). However, universities in emerging economies have also been introducing STEAM approaches to pedagogy and research – yet we still know very little about their importance and results so far, in those countries and elsewhere.

This call is an opportunity for higher education institutions in LMICs to learn from and share their recent experience of promoting new approaches for greater diversity and inclusion in STEM studentship, research teams and leadership. These include, among others, experiences led by academic faculties of education to strengthen pedagogical capacities for such novel approaches, at all levels of the education system.

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[3] STEAM approaches aim at incorporating, where appropriate, the broadly defined "humanist", "artistic" and design-related skills and thinking processes into learning and research in STEM (critical thinking, creativity, problem-solving, initiative, inter-disciplinarity, communications, sense of empathy, social relevance and ethics, as well as aesthetics).

Illustrative Research Issues and Questions

Issues and research questions which could be addressed in proposals for this call include but are not limited to the following:

- **Leadership and power structure:** What policies have been put forward to promote diversity in STEM? With what results so far? What approaches have governing bodies of institutions engaged in STEM fields been using to advance gender equality? How are institutions ensuring that under-represented groups are part of governing bodies? How do they ensure that the burden of diversifying STEM institutions does not fall on the shoulders of the few representatives of such minorities in decision positions in STEM but rather becomes a shared responsibility as a standard of excellence across the whole institution?

- **Employment and Careers:** What policies have been set up to support minorities' enrollment and recruitment, fair remuneration and promotion in STEM (e.g., positive action, quotas, and funding opportunities targeting women and other groups)? With what results so far? How are STEM institutions tackling implicit bias in decision-making that may negatively impact the recruitment and promotion of women and other under-represented groups? What are measures taken by STEM institutions to enable their students/workers to combine work and family responsibilities (e.g., childcare benefits, flexible work arrangements, parental leave)? What checks have been put in place to ensure that family related leaves do not have a negative impact on the recruitment and promotion of women? What type of support is offered, early in their science career, to women and other groups under-represented in STEM to ensure consistent career progression (e.g., onboarding, training, mentoring)?

- **Safety and harassment:** What policies have been put in place to create inclusive, accessible and secure work environments in STEM? With what results so far? How do STEM institutions protect their students/staff from bullying, harassment (including sexual) and violence? How are STEM institutions ensuring that campus grounds, labs and offices are accessible and safe for women and other under-represented groups, including the disabled? What approaches are being used to make workplaces inclusive, so that everyone feels comfortable and part of the team, and to create a workplace that accommodates different styles, approaches and goals for work?

- **Novel Approaches to Training and Research:**
  - **Flexible curricula:** What flexible study programs or hybrid curricula - combining for instance STEM subjects and Creative or Liberal Arts subjects - have been trialed or established in specific institutions, including spaces for undergraduate and/or graduate students to combine coursework and other curricular activities in STEM and the Arts? What has been to date the impact of such innovations on student inclusion and diversity, on additional skills imparted to students or strengthened, as well as on graduates' employability?
  - **Innovative Degrees:** What initiatives have been piloted or mainstreamed by specific institutions, such as formal graduate STEAM-dedicated certification or diploma programs (joint degrees) in education and other fields? How have these been designed, piloted,

monitored and evaluated? With what results on inclusivity and diversity? With what broader impact on pedagogy in the institution so far?

- o **Teaching and Mentoring:** What initiatives by specific institutions have been taken to train university faculty in STEAM or other pedagogies to attract or motivate female students and other under-represented groups? What initiatives have been taken to train, assess and reward faculty competences and practice in such approaches, to teach and research in STEM? What have been their results so far?

- **Using Data and Evidence:**
  - o **Data systems:** Do STEM institutions have mechanisms in place to collect equality and diversity data? Have they set diversity and equality objectives and what systems have been put in place to monitor progress or lack of? How openly are diversity and equality data disclosed and reviewed?
  - o **Mainstreaming Pilots:** How has evidence from pilot initiatives in research and pedagogy been used in non-discriminatory or non-biased ways to reform curriculums, to upgrade teacher competencies and rewards to faculty, to grade student performance, to assess grant applications or review manuscripts differently, to recruit and promote professional scientists? Such changes may have required the lead institutions to work closely with other sectors (academia, policy, civil society, private sector) for new approaches to account for local/regional market needs.

What types of institutions in LMICs are eligible for study by the applicant?

Ministries of education, ministries of science and technology, national coordinating bodies for higher education, national accreditation and rating agencies for higher education studies programs, national agencies for faculty professional development, national science granting councils, national research foundations, scientific journals, national science academies and professional associations, technical and vocational education and training (TVET) institutions, universities (faculties, schools, departments), research institutes, scientific research units within private and public organizations in various sectors of the economy (natural resources and energy, transportation and infrastructure, agriculture and environment, industry and economic development, human resources and skills development, etc.).

What types of proposal are eligible?

Type 1 - Research proposals on status quo situations: Identify, characterise institutional policies and practices which do not deliberately promote diversity and inclusion, and verify their effect on recruitment, retention, promotion of women and other groups in education and research in STEM fields. What and where are the barriers? How are they affecting participation of women and other under-represented groups? What barriers fall under institutions' control? What has been preventing or constraining these institutions from addressing or resolving those issues and how could these be tackled more effectively? **(Up to 36 months, up to CA$ 200,000)**

Type 2 - Research proposals on progressive situations: Identify and characterise policies and practices introduced by the institution(s) to deliberately promote diversity and inclusion, and document their results so far on recruitment, retention, promotion of women and other groups in education and

research in STEM fields. What, where and how have there been advances to improve institutions' ability to address particular barriers, and with what results so far? **(Up to 36 months, up to CA$ 200,000)**

Type 3 - Research action proposals for improving current situations (either status quo or progressive): In addition to characterising the current situation (baseline), design and implement new interventions to significantly improve institutions' ability to recruit, retain and promote the participation of women and other groups in education and research in STEM fields; monitor initial outcomes and reflect on the longer term implications of these new interventions. **(Up to 60 months, up to CA$ 500,000)**

IMPORTANT: In all three types of proposals, the research must be proposed and led by an **independent** research institution. Public or private institutions engaged in STEM fields and concerned with these issues (and/or doing pilots already) are very much encouraged to identify and contact an independent research institution which can apply with a proposal to research the experience of the interested public or private institution. Studies comparing institutional experiences drawn from different contexts (different institutions or types of institution, STEM fields or countries) are encouraged. In Type 3 proposals, and if this is duly justified, the grant could support collaboration with international experts or institutions holding relevant experience useful to those institutions developing new interventions.

Who can apply?

Institutions or consortiums with a strong presence in eligible low- and middle-income countries (see Appendix A for list of eligible countries) and with the following qualifications are invited to submit a proposal.

Type of organization: The proposed research can be carried out by a research institution, a research consortium, or a non-governmental organization with strong research capacity. This institution or group of institutions must be independent from the institution(s) to be studied. Donors, UN entities, multilateral organizations, independent researchers and for-profit consulting firms are not eligible to apply for this call.

Collaboration: The lead applicant institution should be from a LMIC, while institutions based in high-income countries can participate as collaborators on the proposal. As regards to consortia, priority will be given to those led by an institution in a LMIC. IDRC will give preference to proposals which demonstrate a close collaboration between the applying independent research institution(s) and the institutions whose experience is to be studied. A formal statement signed by the latter must be appended to the proposal, which will confirm agreement with, and support to, the proposed research, as well as a commitment to follow up on findings and recommendations, as appropriate.

Regions of research focus: Latin America and Caribbean, Asia, Sub-Saharan Africa (notably West Africa)

Note: All IDRC prospective grantees must secure and submit to IDRC an official country clearance for their research projects, before they are able to receive IDRC funding. Such official clearance must reach IDRC within a maximum of 90 days following IDRC's funding offer, beyond which IDRC reserves itself the right to cancel its offer.

Application Guidelines and Timeline

Applications should be submitted online by 5:00 PM (EST) on August 15, 2019, either in English or in French. Incomplete applications and applications received after this deadline will not be considered. A complete application includes:

- A completed proposal, to be submitted using the online application form (guidelines included below);
- Up to three (3) samples of work that demonstrate capacity to carry out rigorous research on the proposed topic, as well as integrate gender-based analysis in research (upload publications/PDFs at the end of the application form);
- An estimated budget, with a cost breakdown by categories using the IDRC budget template. Complete all the tabs except the Summary tab, which will be generated automatically. Save the completed and duly signed budget as a PDF document, and attach this to your application. For a list of eligible expenses, please refer to the IDRC "Guidelines for Acceptable Project Expenditures". For general information, refer to General IDRC Funding Guidelines;
- Up to four curricula vitae (CVs) of research team members (each CV should not exceed two pages); and
- A formal statement of interest and commitment from the institution(s) to be studied to support the research and follow up on its findings and recommendations, as appropriate.

The application timetable includes the following stages:

- Launch of Call for Proposals on June 17, 2019
- Questions accepted until and no later than August 5
- Complete applications accepted until and no later than August 15
- IDRC informs successful applicants – by October 11
- Funded projects start in early 2020
- Possible inception workshop with leaders of funded projects in March 2020

Evaluation criteria

Applications will be evaluated according to the following criteria:

Evaluation Criteria	Weighting (%)
Relevance • Alignment of proposal with the objectives of the Call. • Clear demonstration that the proposed work addresses critical issues and questions of concern or interest to the institution(s) under study.	25
Quality and Rigour • Clear description of the problem and its context. • Clear research questions and hypotheses. • Methodological rigour and appropriateness. • Integration of gender equality and diversity (intersectionality)[4] aspects into project design/process, including data collection/analysis. • Innovativeness of the research (e.g., in approach, partnership, or output).	25
Uptake Strategy • Convincing plans for the uptake of research results. • Evidence of the team's ability to generate context-relevant results. • Quality and feasibility of the strategy for knowledge sharing and utilization. • Integration of gender equality and diversity (intersectionality) considerations in terms of expected impacts and their sustainability. • Clear plans to engage relevant stakeholders, including the institution(s) to be studied, so they can act on findings and recommendations.	25
Quality of Research Team • Track record of research team, including globally or regionally acknowledged research outputs (e.g., peer-reviewed publications or equivalent in relevant area) and capacity to successfully complete research projects. • Strengths of research organization and team, including capacity to assemble and coordinate a range of relevant disciplines. • Integration of gender equality and diversity considerations in the allocation of team responsibilities among its members, as relevant to the local/national context under study. • Clear strategy for project implementation and for sharing project ownership with partners.	25
Total	100%

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[4] Intersectionality examines how sex and gender intersect with other identities such as: race, ethnicity, religion, age, parenthood, geography, and physical or mental disability.

Guidelines for Proposals

Your proposal should include the following information:

Project title
Country of research focus
Project duration (in months)
Total project budget (in CAD)
Amount of grant requested of IDRC (in CAD)
Type of proposal: Indicate whether it is **Type 1** - Research proposals on status quo situations; **Type 2** - Research proposals on progressive situations; or **Type 3** - Research action proposals for improving current situations (either status quo or progressive).

Project Abstract (Max 500 words)

- Describe proposal type, issues/challenges to be addressed, research objectives and questions, expected outcomes and impact, as well as proposed research methodology and strategy for output dissemination and results uptake.

Applicant information

- **Lead research institution** (name and address, type of institution) and contact details of principal researcher (name, title, email address, phone number)
- **Partner institution(s)** (name and address) and contact details of resource person (name, title, email address, phone number). A partner institution is one which is represented on the project team and is assigned specific responsibilities on the project.
- **Institution(s) to be studied** (name and address) and contact details of resource person (name, title, email address, phone number)

Background and Objectives (Max 800 words)

- Describe the specific issues or challenges which the proposed project focuses on, in relation to the objectives of the Call.
- Clearly articulate the research objectives, research questions and hypothesis(es).

Relevance (Max 500 words)

- Explain the importance of the proposed research, how it will add to existing knowledge and/or know-how, locally and more generally, how innovative it may be, in terms of approach, partnership, and/or outputs.

Approach/Methodology (Max 1000 words)

- Define, explain and justify the broad methodological approach, including specific methods to be used.
- Explain how gender equality and diversity (intersectionality) aspects will be integrated into project design and process, including data collection and analysis. Research teams are encouraged to seek advice from external advisors/more experienced institutions as needed, throughout the project.

Expected Outputs and Outcomes (Max 600 words)

- Identify concrete outputs and outcomes expected, and comment on the applicability of research results.
- Explain how gender equality and diversity (intersectionality) considerations will be integrated into such outputs and outcomes, as well as in expected impacts and their sustainability.
- This section should describe a clear impact pathway (activities planned, short-term outputs and outcomes expected, as well as outcomes envisioned in the mid- and longer term and their contribution to specific Sustainable Development Goals).

Research Uptake (Max 600 words)

- Describe your plans for research result uptake (knowledge sharing and utilization), including: identification of target audience, your engagement with key stakeholders (incl. institutions to be studied), your level of engagement with these during the project and your approach to sharing information and knowledge with them.
- Outline your proposed approach to monitor project progress and measure or appreciate its impact.

Project Team (Max 400 words)

- Describe the composition of the project team, its members' expertise and the distribution of team responsibilities among them.
- Indicate how gender equality and diversity considerations will be accounted for in the allocation of team responsibilities, as relevant to the local/national context under study.
- Comment on the team and the organization's capacity to implement successfully the project and share the ownership of it with project partners.

Challenges and Risks (Max 400 words)

- Identify the main challenges (e.g.: team members' time commitment, feasibility of timeline, collaboration with others, uptake of results) and risks (e.g., availability of expertise) you anticipate in carrying out the work; explain how you propose to overcome these or mitigate their impact on the success of the project.
- Highlight any areas of expertise or particular skills for which there is a need to strengthen the capacity of the team in the context of the project.

Ethical Considerations (Max 500 words)

- Describe briefly what ethical provisions will be taken to protect the freedom of consent and, as required, the identity and confidentiality of information to be provided by individuals involved in the research.

Note: If the proposed research project requires ethics approval, IDRC prospective grantees must secure and submit to IDRC an official research ethics clearance from the local ethics board that is available to them (e.g., national and/or university boards).

Important Note: All selected proposals will have to comply with IDRC's Open Access Policy, Open Data Statement, IDRC Corporate Principles on Research Ethics, and IDRC's Standard Terms and Conditions for a Grant Agreement.

Appendix A: List of eligible countries/territories

Organizations and researchers based in the countries/territories below can have their costs of participation met from eligible budget expenses. Project collaborators based in countries not included in the list below will need to cover the costs of their participation from sources other than IDRC.

Note: Small Island States and other low- and middle-income countries with populations under one million are not included here. Individuals from such countries may be considered eligible if the organization is affiliated with a regional university system.

• Afghanistan*	• Ghana	• Nicaragua
• Algeria	• Guatemala	• Niger
• Angola	• Guinea	• Nigeria
• Argentina	• Guinea-Bissau*	• Pakistan
• Bangladesh	• Guyana	• Panama
• Benin	• Haiti	• Papua New Guinea
• Bhutan	• Honduras	• Paraguay
• Bolivia	• India	• Peru
• Botswana	• Indonesia	• Philippines
• Brazil	• Ivory Coast	• Rwanda
• Burkina Faso	• Jamaica	• Senegal
• Burundi*	• Jordan	• Sierra Leone
• Cambodia	• Kenya	• South Africa
• Cameroon	• Laos	• South Sudan*
• Central African Republic*	• Lebanon	• Sri Lanka
• Chad*	• Lesotho	• Swaziland
• Colombia	• Liberia	• Tanzania
• Congo (Brazzaville)	• Madagascar	• Thailand
• Costa Rica	• Malawi	• Togo
• Cuba	• Malaysia	• Tunisia
• Democratic Republic of Congo (Kinshasa)*	• Mali	• Turkey
	• Mauritania	• Uganda
• Dominican Republic	• Mauritius	• Venezuela*
• Ecuador	• Mexico	• Vietnam
• Egypt	• Mongolia	• West Bank* and Gaza*
• El Salvador	• Morocco	
• Equatorial Guinea	• Mozambique	• Zambia
• Ethiopia	• Myanmar*	• Zimbabwe*
• Gabon*	• Namibia	
• Gambia	• Nepal	

*Applications that involve research collaborators based in these countries are eligible; however such applications may be subject to a further stage of review within IDRC before these can be approved.